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FINAL

Site-Specific Remedial Investigation Report
Sites 11, 13, 17, 21, and 25

Naval District Washington Indian Head
Indian Head, Maryland

Contract Task Order 0122

April 2004

Prepared for

Department of the Navy
Engineering Field Activity, Chesapeake
Naval Facilities Engineering Command

Under the

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Prepared by

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Herndon, Virginia

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Executive Summary

This site-specific remedial investigation (RI) report is submitted to the Department of the Navy, Engineering Field Activity, Chesapeake, Naval Facilities Engineering Command under contract task order 122, under the Comprehensive Long-Term Environmental Action, Navy, contract number N62470-95-D-6007. The RI was conducted at the Naval District Washington Indian Head (NDWIH), Indian Head, Maryland. The RI focused on installation restoration Sites 11, 13, 17, 21, and 25.

The report presents the data collected during the RI and subsequent investigations, as deemed necessary, and interpretations and evaluations relating to the nature and extent of contamination (i.e., contaminant types, concentrations, distribution, and migration pathways) and contaminant fate and transport. Additionally, the report presents an assessment of the potential risks to human health and the environment and recommendations regarding additional activities.

This executive summary outlines the RI work performed for each site and any additional investigations conducted after the RI, and specific findings and recommendations. The information is provided below in a separate section for each site.

Site 11—Caffee Road Landfill

General Information

An initial RI was conducted at Site 11 (Caffee Road Landfill). The RI objectives were to determine (1) the extent and thickness of waste at the site, (2) whether the waste is a source of contamination to soils and groundwater, (3) whether soils have been impacted, and (4) whether the adjacent creeks have been impacted. Field activities were conducted between July 20 and August 9, 2000. The work consisted of surface and subsurface soil sampling, waste sampling, sediment and surface water sampling, in situ groundwater sampling, and monitoring well installation and sampling.

A follow-up RI investigation was conducted on the eastern portion of the site (the former burning grounds). The objectives of the follow-up RI investigation were to determine (1) whether environmental media have been impacted by former burning pits in this area, (2) whether waste is present in the area east of Building 1607, (3) the extent and thickness of waste, if present, and (4) whether environmental media have been impacted from past land use in the area between Building 1607 and the former burning pits. Field activities were conducted between February 25 and March 26, 2002. The work consisted of surface and subsurface soil sampling, sediment and surface water sampling, and monitoring well installation and sampling.

The RI objectives of both investigations were met. The lateral extent and depth of waste in the landfill portion of the site was determined. It was further determined that much of the waste lies below the water table. Waste and subsurface soil samples had similar types of semivolatile organic compounds (SVOCs), metals, and explosives, strongly suggesting that

the waste has contaminated the underlying soil. However, there were few contaminants in groundwater, indicating that the waste has not severely affected the groundwater quality.

Numerous SVOCs were detected in surface and subsurface soil in the eastern portion of the site, suggesting that former burning operations have impacted soils in this area.

There is little question that operations at Site 11 have impacted surface soils because many analytes were detected in surface soil at concentrations well above both facilitywide and site-specific background concentrations. Finally, there is evidence that metals in surface soil have contaminated sediment in the adjoining creeks.

Nature and Extent of Contamination

The nature and extent of contamination at Site 11 were evaluated on the basis of a "short list" of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

For simplicity, the landfill and burning grounds are referred to as Areas A and B, respectively.

Surface and subsurface soils in Area A contained few volatile organic compounds (VOCs) at low concentrations and several SVOCs widely distributed across the landfill and in its vicinity (including around Building 24). Concentrations in subsurface soils were much lower than those in surface soils. Metals in surface soil were detected at their highest levels and greatest frequency in the western and central part of the site and around Building 24. Numerous surface and subsurface soil samples contained arsenic, iron, and lead at concentrations above their background 95 percent upper confidence limits (UCLs). Total petroleum hydrocarbons–diesel range organics (TPHs-DROs) were observed to have a widespread distribution in surface soil and concentrations ranged as high as 400 mg/kg. Several explosives were detected in surface soil, particularly in the western part of the site, including a high concentration of perchlorate . Few explosives were detected in subsurface soil, although one high value of perchlorate was present.

Surface and subsurface soils in Area B contained few VOCs at low concentrations. SVOCs were present in numerous surface samples and all but one subsurface sample. Concentrations generally decreased from surface to subsurface soil. Notably, concentrations increased from IS11SS44 to IS11SB44, located at one of the former burning pits. Metals in surface soil did not show a distinct pattern. There are generally fewer metals in subsurface soil than in surface soil. The highest levels and greatest frequencies occur at one of the former burning pads. TPHs-DROs were not detected in surface soil but were detected in some subsurface soil samples. Concentrations were low. Two explosives, nitroglycerine (NG) and perchlorate, were detected in surface soil. No explosives were detected in subsurface soil.

Only very low concentrations of VOCs and SVOCs were detected in groundwater at both Areas A and B. Total arsenic was detected in four monitoring well samples in Area A and in one sample in Area B but was not detected in the background data set. Iron was detected in all wells, at similar concentrations in both unfiltered and filtered samples. The calculated mean concentration of iron in groundwater in Area A was greater than 2.5 times the background mean. The calculated mean concentration of iron in groundwater in Area B was

greater than 2 times the background mean. Total lead was detected in all eight of the monitoring wells but was not detected in the background data set. In general, metal concentrations were lower in filtered samples than in unfiltered samples, suggesting that many of the metals remained adsorbed to solid material in the subsurface. Few explosives (and then only at low concentrations) and little TPH-DRO were detected in groundwater.

In sediment at both Areas A and B, only low concentrations of VOCs, SVOCs, explosives, and TPH-DRO were detected. However, several metals, including arsenic, iron, and lead, were detected above background in the sediments, particularly in the Mattawoman Creek. Concentrations of almost all analytes in surface water were too low to warrant extensive discussion.

On the basis of a review of site data and knowledge, it appears that runoff is the primary mechanism for the spread of inorganics. The evidence for this is as follows:

- The site is almost entirely unvegetated;
- Concentrations of contaminants in subsurface soil are lower than those in surface soil samples; and
- Concentrations in sediment are higher than those in background.

It is likely that such inorganics as iron and manganese are being transported by groundwater to surface water. However, concentrations of these metals in surface water are not elevated with respect to background.

Human Health Risk Assessment

The human health risk assessment (HHRA) indicates that there are potential human health hazards and risks above United States Environmental Protection Agency (USEPA) target levels associated with exposure to surface soil, combined surface and subsurface soil, and groundwater.

Under current site use the hazard to the industrial site worker slightly exceeds the USEPA benchmark value. However, there are no individual constituents, and no target organ/effects with hazards above the USEPA benchmark value. The hazard calculated using the central tendency (CT) assumptions is below USEPA's target level.

Although unlikely, future residential use of the site may result in hazards and risks to children and adults above USEPA's target levels. Cadmium and iron in the soil and aluminum, arsenic, barium, chromium, iron, manganese, and vanadium in the groundwater are the main contributors to the hazards and risks. The maximum detected concentrations in groundwater were used as the groundwater exposure point concentrations because fewer than five samples were available, which may have resulted in an overestimation of the risk. The concentrations of all of these inorganic constituents are greater than the concentrations detected in the site-specific background groundwater and soil samples.

Future industrial use of the site may result in a reasonable maximum exposure (RME) hazard slightly above USEPA target levels associated with exposure to cadmium in soil by an industrial worker. However, none of the individual constituents pose a hazard above USEPA target levels, and there are no target organs/effects with a hazard above USEPA's target level. Additionally, the CT hazard is below 1.0. A future construction worker may

have a hazard slightly above 1.0 because of exposure to the cadmium and iron (neither pose a hazard above USEPA's target level alone) detected in the soil. The CT hazard for the construction worker is below 1.0.

Ecological Risk Assessment

There are several inorganics in sediment and soil that were selected as chemicals of potential concern (COPCs) for ecological risk. These inorganics may pose a risk to soil invertebrates, plants, insectivorous birds and mammals, carnivorous terrestrial birds, and piscivorous birds. In addition, polynuclear aromatic hydrocarbons and explosives in sediment along a 300-ft stretch of the Mattawoman Creek may pose a risk to benthic invertebrates and aquatic plants. On the basis of preliminary reviews of concentration distribution, additional risk assessment work will likely focus on the soil and sediment in the vicinity of Site 11.

Conclusions

The human health and ecological risk assessments determined that there are potentially unacceptable risks associated with soil, sediment, and groundwater at Site 11. Following submittal of the draft final RI report in August 2002, the Navy, in agreement with the EPA and MDE, will address each medium as follows:

Sediment – A Baseline Ecological Risk Assessment (BERA) will be conducted to access potential ecological risk from contaminants along the shoreline and in the unnamed creek. Therefore, recommendations for sediment will await the results of the BERA, which will provide more site-specific information regarding potential ecological risk. The Mattawoman Creek Study assessed potential risk in general areas of the creek (i.e., Area 1, Area 2, etc), rather than potential risk at individual sites. Thus, the results will be used as a supplement to the BERA to determine recommendations for site sediment. If the BERA indicates ecological risks, then the sediment will be addressed in the feasibility study for the landfill.

Groundwater and Soil – A feasibility study will be conducted to address the source area and upland soil (i.e. Building 28). The feasibility study will examine a number of alternatives; however, the presumptive remedy for the site is a cap. Capping of the landfill will prevent contact by humans and wildlife with contaminated soil, reduce water infiltration that would further mobilize contaminants from soil into groundwater, and prevent further erosion of soil into the Mattawoman Creek (thus preventing further contamination of sediment).

Site 13—Building 870

General Information

An RI was conducted at Site 13 (Building 870, the paint solvents disposal ground). The objective of the RI was to determine whether surface and subsurface soils have been contaminated by solvent disposal. Field activities were conducted between July 17 and 31, 2000. The work consisted of surface and subsurface soil sampling.

The RI objective was met. No evidence of significant solvent disposal was detected. The presence of some inorganics at concentrations above background levels suggest contamination by materials other than solvents.

Following the RI, additional investigation was conducted to reduce the level of uncertainty regarding potential volatile organic compounds (VOCs) contamination in groundwater. Only toluene was detected but the concentration was less than EPA's Region III RBC in tap water and MCLs.

Nature and Extent of Contamination

Surface and subsurface soil at Site 13 contained several VOCs and SVOCs at low levels. Arsenic, barium, cadmium, copper, and mercury concentrations exceeded the facilitywide background 95 percent UCL with one or more detections in surface soil, but only arsenic exceeded its UCL in subsurface soil. Only one explosive (at a low concentration) and little TPH-DRO were detected.

Human Health Risk Assessment

The risk assessment indicates that there are no potential unacceptable human health hazards or risks. The only receptor with a hazard above USEPA's target hazard level is the future child resident. However, there are no individual constituents with HIs above 1.0, and when the hazard is separated by a target organ/effect, there are no hazards greater than 1.0 to a target organ/effect. Additionally, the health hazard posed to the future CT child resident is within the acceptable range.

Additionally, based on the historic use of the site, the presence of the inorganic constituents chromium, iron, and manganese at Site 13 may not be related to past land use. The concentrations of chromium and manganese in the site soil appear to be similar to the concentrations detected in the background sample. The concentration of iron in site soil appears to be greater than the concentration detected in the background sample. The comparison between the site soil concentration and the background soil concentration is qualitative. A statistical comparison could not be made between the two data sets as only one background soil sample was analyzed, which is a statistical limitation on the background data set. Although arsenic poses a carcinogenic risk greater than 10^{-5} to the future lifetime resident, at $2x10^{-5}$, the estimated risk is within the target range of 10^{-4} to 10^{-6}.

Ecological Risk Assessment

The results of the risk assessment indicate that chemicals in the soil at Site 13 pose minimal risk to ecological receptors. Supporting evidence is as follows:

- There were no LOAEL-based hazard quotients (HQs) in excess of 1 for the upper trophic level for the average exposure case;
- Concentrations of several of the metals that exceeded screening values were comparable to background levels;
- The aerial extent of concentrations in excess of screening values was small;
- Toxicity evaluations for the three metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely; and
- The historically documented area of stressed vegetation was not present.

Conclusions

Human health or ecological risks were not identified in soil at levels that require remediation. Consequently, no further action was recommended for this site. The EPA and MDE, however, recommended that a monitoring well be installed and sampled to assess impact to groundwater. Appendix I provides the technical memorandum, in which the results indicate that operations at Building 870 have not impacted groundwater and have only minimally impacted soil. These results confirm the initial recommendation for no further action for Site 13. No further action is recommended for Site 13. The Navy, EPA, and MDE concur with this recommendation.

Site 17—Discarded Metal Parts Area

General Information

An RI was conducted at Site 17 (discarded metal parts area). The objectives of the RI were to determine (1) whether the metal parts disposed of along the shoreline of the Mattawoman Creek contaminated sediment and surface water in the creek and (2) whether the drums and/or their contents contaminated the surface and subsurface soil and groundwater in the surrounding area. Field activities were conducted between July 21 and October 12, 2000. The work consisted of surface and subsurface soil sampling, monitoring well installation, groundwater sampling, and sediment and surface water sampling in the Mattawoman Creek.

The RI objectives were met. Neither human health nor ecological risks were determined for the surface water, indicating that the metal debris at the site has not contaminated surface water. Whether the debris has contaminated sediment is less clear. Although site concentrations of metals such as iron and lead are higher than background concentrations, it is more likely that they occur in the sediment because of proximity to Site 11. This is concluded because the concentrations of these metals in sediment increase downstream toward Site 11. It appears that disposal of some kind, whether from drums or by other means, has contaminated soil and groundwater at the site.

Since submittal of the draft final RI report, a pre-FS investigation has been conducted and the results were presented in a technical memorandum entitled Pre-Feasibility Study Field Activities and Results, Site 17, Indian Head Division-NSWC, Indian Head, Maryland (September 30, 2002). The results from the pre-FS investigation will be used in the feasibility study for groundwater at the site.

Nature and Extent of Contamination

The nature and extent of contamination at Site 17 was evaluated based on a “short list” of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

Surface soil contained a few VOCs and SVOCs, particularly in the western part of the site, but only at low levels. The highest concentrations and most frequent detections of metals were in the eastern and western parts of the site. In particular, arsenic, iron, and manganese

exceeded their background 95 percent UCLs. Only low concentrations of explosives were detected.

Subsurface soil contained few VOCs (at low levels) but contained a few elevated concentrations of SVOCs, particularly in the eastern part of the site. The highest concentrations and greatest frequency of metals detections in subsurface soil were in both the eastern and western parts of the site. Metals concentrations in subsurface soil typically were lower than those in surface soil. Few explosives were detected.

High concentrations of VOCs (particularly vinyl chloride and 1,2-dichloroethene (DCE)) were detected in both wells on the site. Filtered samples from one onsite well contained the highest concentrations of metals (especially iron and manganese). In general, metals concentrations were lower in filtered samples than in unfiltered samples, suggesting that many of the metals remain adsorbed to solid material in the subsurface. Few explosives were detected in groundwater and then only at low concentrations.

Several metals, including arsenic, iron, lead, and manganese were detected above background levels in the sediments. However, the highest concentrations were in the samples nearest Site 11, and it is likely that Site 11 rather than Site 17 is the source of the contamination. Concentrations of almost all analytes in surface water were too low to warrant extensive discussion. VOCs and SVOCs were not analyzed for in sediment or surface water.

Based on a review of the data and knowledge of the site, it appears that in the past, the primary mechanism for the spread of VOCs was infiltration. At present, it appears the primary mechanism is groundwater flow. The evidence for this is as follows:

- The site is almost entirely vegetated;
- There were few detections of VOCs in soil;
- Concentrations of VOCs were higher in subsurface soil than surface soil; and
- High concentrations of VOCs were detected in groundwater.

In the past, the primary mechanism for the spread of inorganics may have been runoff. However, it is likely that inorganics are no longer migrating from the site at elevated concentrations. The evidence for this is as follows:

- Elevated concentrations of inorganics were detected in sediment but only downstream near Site 11; and
- The site is almost entirely vegetated.

Human Health Risk Assessment

The risk assessment indicates that human health hazards and risks above USEPA target levels are associated with potential future exposure to combined surface and subsurface soil and groundwater. Hazards and/or risks above USEPA target levels may occur for future site use.

Future residential use of the site is unlikely. However, future residential use of the site may result in hazards and risks to children and adults above USEPA's target levels. Vinyl chloride, cis-1,2-DCE, aluminum, chromium, iron, manganese, and vanadium in groundwater are the main contributors to the hazards and risks. The maximum detected

concentrations in groundwater were used as the groundwater exposure point concentrations because fewer than five samples were available, which may result in an overestimation of the risk. The concentrations of the inorganic constituents detected in the groundwater are greater than the concentrations detected in the facility-wide background groundwater samples.

Exposure to soil by future child residents may result in a hazard slightly greater than USEPA's target. This hazard is associated with iron. The concentration of the iron detected in the soil is greater than the concentrations detected in the site-specific background soil samples. However, iron is considered an essential human nutrient, and the concentration of iron detected in the soil would result in a daily intake of iron of 5.4 mg/day, which is below the recommended daily intake established by the National Academy of Sciences of 10 mg/day. Therefore, exposure to combined surface and subsurface soil would not result in an unacceptable hazard, on the basis of the assumption that iron is an essential nutrient and not present at a concentration above that required for healthy children.

Future construction at the site may result in a hazard slightly above USEPA target levels associated with exposure to groundwater (mainly the vinyl chloride detected in the groundwater) by a construction worker.

Ecological Risk Assessment

There are several inorganics in sediment and soil that were selected as COPCs. These inorganics may pose a risk to soil invertebrates, plants, insectivorous birds and mammals, carnivorous terrestrial birds, and piscivorous birds. In addition, polynuclear aromatic hydrocarbons (PAHs) and explosives in sediment along the Mattawoman Creek may pose a risk to benthic invertebrates and aquatic plants. On the basis of preliminary reviews of concentration distribution, the soil and sediment in the vicinity of Site 17 will likely be the focus of additional risk assessment work.

Conclusions

The human health and the ecological risk assessments determined that there are risks associated with soil, sediment, and groundwater at Site 17. There may be an unacceptable risk to a future residential user from the VOCs and metals in groundwater. There is also risk to a future construction worker from vinyl chloride in groundwater. Finally, inorganics in soil and sediment pose unacceptable ecological risks.

The draft final RI report submitted in August 2002 recommended that an FS be performed for the site. It was also recommended that additional data were required to define the bounds of contamination in groundwater for the purposes of the FS.

Since submittal of the draft final RI report, a pre-FS investigation has been conducted and the results were presented in a technical memorandum entitled Pre-Feasibility Study Field Activities and Results, Site 17, Indian Head Division-NSWC, Indian Head, Maryland (September 30, 2002). The results from the pre-FS investigation will be used in the feasibility study for groundwater at the site.

Ecological risks identified in sediment at the site will be further evaluated in a baseline ecological risk assessment. A Baseline Ecological Risk Assessment (BERA) will be conducted

to access potential ecological risk from contaminants along the shoreline and in the unnamed creek. Therefore, recommendations for sediment will await the results of the BERA, which will provide more site-specific information regarding potential ecological risk. The Mattawoman Creek Study assessed potential risk in general areas of the creek (i.e., Area 1, Area 2, etc), rather than potential risk at individual sites. Thus, the results will be used as a supplement to the BERA to determine recommendations for site sediment. If the BERA indicates ecological risks, then the sediment will be addressed in the feasibility study for the landfill.

Ecological risks identified in soil will be addressed in an Engineering Evaluation/Cost Analysis. The Navy with the EPA and MDE agreed to soil removal to mitigate potential ecological risks from lead, mercury, and zinc in soil. Soil removal would prevent contact by humans and wildlife with contaminated soil, eliminate sources of contamination in soil from which infiltration could mobilize contaminants from soil into groundwater, and prevent further contamination of sediment in the Mattawoman Creek.

Site 21—Bronson Road Landfill

General

An RI was conducted at Site 21 (Bronson Road Landfill). The objectives were to determine the extent of waste at the site and determine whether the waste is a source of contamination to soil and groundwater underlying the site. Field activities were conducted between July 27 and August 4, 2000. The work consisted of surface soil sampling, geophysical surveying, soil-boring confirmation, test pit confirmation, monitoring well installation, and groundwater sampling.

The objectives of the RI were generally met. The thickness and depth of the fill was estimated using a geophysical survey, and the lateral extent was determined using the survey and test pits. The fill appears to extend from the road to the break in slope that existed before the borrow pit was filled in (i.e., most of the borrow pit area contains fill). It is uncertain how much of the fill actually represents waste, but the assumption is that most if not all of it does except perhaps the upper 5 to 10 ft. No soil samples were collected from immediately below the fill in order to avoid penetrating the waste itself. Therefore, it is difficult to be certain that the soil underlying the waste has been affected. However, the fact that the groundwater contains perchlorate and some metals (notably manganese) at levels greater than background suggests that there has been an impact by the waste on the underlying groundwater. Alternatively, the groundwater contamination may have been derived from the contamination detected in the surface soil.

In July 2002, pre-FS investigation was conducted, which consisted of the collection of groundwater samples from the four monitoring wells (IS21MW01, IS21MW02, IS21MW03, and IS21MW04) at the site. The results are presented in a technical memorandum entitled *Pre-Feasibility Study Groundwater Sampling Activities Site 21 (Bronson Road Landfill), Indian Head Division-NSWC Indian Head, Maryland* (CH2M HILL, October 8, 2002).

The pre-FS sampling confirmed the presence of perchlorate in the upgradient well at Site 21. However, the source was not readily identifiable. Additionally, the groundwater flow regime at Site 21 was not well defined. Thus, an additional investigation was conducted to

determine if perchlorate in groundwater is associated with the landfill (Site 21). The results are presented in a technical memorandum entitled *Investigation of Groundwater Flow and Perchlorate at Site 21, Indian Head Division-NSWC, Indian Head, Maryland* (CH2M HILL, March 5, 2003), provided in Appendix K.

Nature and Extent of Contamination

The nature and extent of contamination at Site 21 was evaluated based on a "short list" of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

VOCs, SVOCs, and explosives were detected in surface soil; however, observed concentrations of these contaminants were very low. Arsenic and iron concentrations exceeded the background 95 percent UCL. Most high and frequent detections of metals occurred in the eastern and northern parts of the site. Few explosives were detected and then only at low concentrations.

VOCs, SVOCs, and explosives were observed in groundwater at two locations; however, detected concentrations were very low and do not warrant further discussion. Of note is that perchlorate was detected in IS21MW04 at a concentration of 2,000 µg/L. A perchlorate investigation was conducted in December 2002; results showed that perchlorate impacts are not associated with the landfill. Iron and manganese exceeded background in filtered samples in downgradient wells. Few explosives were detected and then only at low concentrations, except for a high concentration of perchlorate in the background well.

On the basis of the data and knowledge of the site, it appears there is little chance for additional contaminant migration. The evidence for this is as follows:

- Surface and subsurface soil contained few contaminants;
- With the exception of iron, manganese, and perchlorate, contaminants were not detected in groundwater;
- The distance between the site and the Mattawoman Creek is too large for runoff to be a significant process; and
- Groundwater occurs in the fill and likely also occurs in the waste.

Human Health Risk Assessment

The risk assessment indicates that the only human health hazards above USEPA target levels are posed to the future RME child and adult resident. Future residential use of the site is not very likely. Manganese in the groundwater is the dominant contributor to this health hazard, with additional contributions from iron and thallium. The health hazards posed to the future CT child and adult residents are also above USEPA's benchmark hazard index (HI). The concentrations of iron and manganese detected in one well were much higher than those detected in the background sample or either of the other two site-related samples. Because of the limited number of samples, these maximum detected concentrations were used as the sample concentrations, which may result in an overestimate of the actual risks. Additionally, the hazard to the child resident associated with exposure to surface soil is above USEPA's target HI; however, none of the individual constituents or target organ/effects pose HIs above 1.0 alone. Iron and manganese intakes are also consistent with Recommended Dietary Allowance (RDA).

Ecological Risk Assessment

The results of the risk assessment indicate that chemicals in the soil at Site 21 pose minimal risk to ecological receptors. Supporting evidence is as follows:

- There were no LOAEL-based HQs in excess of 1 for upper trophic level for the average exposure case;
- Concentrations of several of the metals that exceeded screening values were comparable to background; and
- Toxicity evaluations for the two metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely.

Additionally, likely future action at the site includes a soil cover for the landfill and filling in of the stormwater management pond. These actions will address any remaining risk issues. An active bald eagle nest is located off the eastern edge of the site. The presence of this nest may affect the timing of any construction on the site.

Conclusions

The presence of human health risks from residential use of groundwater indicates that an FS should be performed. The extent of surface soil contamination has been defined to the extent required for an FS. The results of the pre-FS groundwater sampling indicated that the concentrations of manganese and perchlorate in groundwater detected during the RI were not anomalous. The results of the subsequent perchlorate investigation indicated that perchlorate is not associated with the landfill.

An FS will be conducted to address both the soil and groundwater (for manganese) at the site. The FS will examine a number of alternatives; however, the presumptive remedy for the site is a cap. Capping of the landfill (and the storm water management pond) will prevent contact by humans and wildlife with contaminated soil, and reduce water infiltration that would further mobilize contaminants from soil into groundwater.

Site 25— Hypo Discharge from X-ray Building No. 2, Building 588

General Information

An RI was conducted at Site 25 (Building 588 drainage ditch). The objective was to determine whether the untreated wastewater discharged from Building 588 into the IW46 drainage area contaminated the underlying soil and groundwater. Field activities were conducted between July 17 and October 24, 2000. The work consisted of surface and subsurface soils sampling, monitoring well installation, and groundwater sampling. A follow-up round of groundwater sampling was conducted to confirm the concentration s of inorganics detected during the first round. The sampling occurred on February 26, 2002.

The objective of the RI was met. Very little silver was detected in surface soil in the IW46 drainage swale, and that was limited to one sample near the head of the swale and one

sample near the south end of the swale. Also, no silver was detected in groundwater downgradient of the site.

Nature and Extent of Contamination

The nature and extent of contamination at Site 25 was evaluated according to a "short list" of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

Few VOCs were detected in surface soil and only at low concentrations. However, several elevated concentrations of SVOCs were detected, particularly around Building 588. Most of the high and frequent detections of metals also occurred around Building 588. Arsenic, cadmium, copper, and mercury were detected above their background 95 percent UCLs, and silver was detected particularly south and east of Building 588. No nitroglycerin (the only explosive analyzed for) was detected in surface soil.

In subsurface soil, few VOCs and SVOCs were detected and then only at low levels. Metals were detected at fairly uniform concentrations across the site, suggesting little site impact, except for an elevated detection of silver east of Building 588. No nitroglycerin (the only explosive analyzed for) was detected in subsurface soil.

Groundwater, sampled only along the road south of the site, contained no significant levels of organics and contained a few metals above background 95 percent UCLs (e.g., barium, beryllium, cobalt, manganese and nickel). The metals detected in the groundwater are different from those detected in the soil, which suggests a different source. Of note, manganese was detected in IS25MW01 at 352 μg/L. Silver was not detected in the groundwater.

Similar concentrations of inorganics were observed in groundwater between rounds one and two.

Human Health Risk Assessment

The risk assessment indicates that the only potential unacceptable threats to human health are those posed to the future child and adult residents. The dominant contributor to these health hazards is manganese in groundwater, while iron in soil also slightly contributes to this hazard. Four SVOC soil COPCs and silver and cadmium contribute negligibly to these hazards. The other metals with some associated risk are barium (groundwater only), iron, aluminum (soil only), arsenic (soil only), chromium (soil only), thallium (soil only), and vanadium (soil only). It should be noted that, on the basis of historical land use, silver was expected to have the greatest potential for adverse impact.

Ecological Risk Assessment

The results of the risk assessment indicate that chemicals in the soil at Site 25 pose minimal risk to ecological receptors. Supporting evidence is as follows:

- There were no LOAEL-based HQs in excess of 1 for the upper trophic level for the average exposure case;
- Concentrations of three metals that exceeded screening values for soil invertebrates and plants were consistent with background; and

- Toxicity evaluations and/or reviews of the distributions of four metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely.

Review of the distribution of chemicals suggests that there is low surface transport potential from the site to the Mattawoman Creek. However, there is some uncertainty in this conclusion, which will be reduced by future sampling efforts.

Additional information regarding a potential transport pathway has become available since the start of the RI process for Site 25. Additional sediment samples are planned to investigate the potential impacts to sediments of the Mattawoman Creek. The results of this sampling will be incorporated into the Site 25 ecological risk assessment (ERA).

Conclusions

No further investigation is recommended for Site 25. Following the soil sampling in 2000, construction activities adjacent to Site 25 resulted in the removal of soil in the vicinity of sample IS25SS21/SB21, an area where many of the highest concentrations of metals were detected. The excavated soil was disposed offsite in accordance with federal and state regulations.

Although there are potential human health risks from future residential use of groundwater, there is no reason to suspect the risk is related to CERCLA release. Therefore, no further action is recommended for this site because risks to human health and the environment were within acceptable values.

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Acronyms and Abbreviations

ARARs	applicable or relevant and appropriate requirements
B&RE	Brown and Root Environmental
BAF	bioaccumulation factor
BERA	baseline ecological risk assessment
bgs	below ground surface
BIR	Background investigation report
CD	compact disk
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract laboratory program
CNO	Chief of Naval Operations
CNS	Central nervous system
COPC	Chemical of potential concern
CS	Confirmation study
CSF	Carcinogenic Slope Factors
CT	Central tendency
CTO	Contract task order
DAF	Dilution-attenuation factor
DCE	Dichloroethene
DRO	Diesel range organic
EFA CHES	Engineering Field Activity, Chesapeake
EKG	Electrocardiogram
EM	Electromagnetic
ER	Electrical resistivity
ERA	Ecological risk assessment
FS	Feasibility study
GRO	Gasoline range organics
HASP	Health and safety plan
HEAST	Health effects assessment summary tables
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard quotient
HRS	Hazard ranking system
HSA	Hollow stem auger
IAS	Initial assessment study
ID	Inside diameter
IDW	Investigation-derived wastes

IEUBK	Integrated exposure uptake biokinetic model
IHIRT	Indian Head installation restoration team
IR	Installation restoration
LD50	Median lethal dose
LMSA	Linearized multistage model
LOAEL	Lowest observed adverse effect level
LOEC	Lowest observed effect concentration
MCL	Maximum contaminant level
MDE	Maryland Department of the Environment
MF	Modification factor
msl	Mean sea level
MTBE	Methyl-tertiary-butyl ether
NEESA	Naval Energy and Environmental Support Activity
NDWIH	Naval District Washington Indian Head
NG	Nitroglycerin
NOAA	National Oceanographic and Atmospheric Administration
NOAEL	No observed-adverse-effect level
NOS	Naval Ordnance Station
NPL	National Priorities List
NQ	Nitroguanidine
NWI	National Wetlands Inventory
PA	Preliminary assessment
PCBs	Polychlorinated biphenyls
PETN	Pentaerythritol tetranitrate
PAHs	Polynuclear aromatic hydrocarbons
PID	Photoionization detector
ppb	Parts per billion
PPE	personal protective equipment
ppm	Part per million
PVC	Polyvinyl chloride
QA	Quality assurance
QC	Quality control
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RL	Reporting limit
RFA	RCRA Facility Assessment
RfD	Reference dose
RI	Remedial investigation
RME	Reasonable maximum exposure
SERA	Screening ecological risk assessment
SI	Site inspection
SOP	Standard operating procedure
SQL	Sample quantitation limit

SSL	Soil screening level
SVOC	Semivolatile organic compound
TAL	Target analyte list
TAT	Turn-around time
TCA	Trichloroethane
TCE	Trichloroethene
TCL	Target compound list
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
TtNUS	TetraTech NUS
UCL	Upper confidence limit
UF	Uncertainty factor
USEPA	United States Environmental Protection Agency
USCS	Unified Soil Classification System
VOC	Volatile organic compound

SECTION 1

Introduction

This Site-Specific Remedial Investigation (RI) Report is submitted to Department of the Navy (Navy), Engineering Field Activity, Chesapeake (EFA CHES), Naval Facilities Engineering Command under Contract Task Order (CTO) 122, under the Comprehensive Long-Term Environmental Action, Navy (CLEAN), contract number N62470-95-D-6007. The RI was conducted at the Naval District Washington Indian Head (NDWIH), Indian Head, Maryland. The focus of the RI was installation restoration (IR) Sites 11, 13, 17, 21, and 25 at the NDWIH.

The report presents the data collected during the RI and interpretations and evaluations relating to the nature and extent of contamination (i.e., contaminant types, concentrations, distribution, and migration pathways) and contaminant fate and transport. Additionally, this report presents an assessment of the potential risks to human health and the environment.

1.1 Objectives of the Remedial Investigation

The primary objective of the RI conducted at NDWIH was to define the nature and extent of soil and groundwater contamination at IR Sites 11, 13, 17, 21, and 25. The specific objectives of the RI were to:

- Identify the sources of contamination at the IR sites
- Determine the nature and extent of organic compounds, inorganics, petroleum hydrocarbons, explosives, and perchlorate detected in soil, groundwater, surface water, and sediment at the IR sites
- Determine the potential for risks to human health based on exposure to soil, groundwater, surface water, and sediment at the sites
- Identify and characterize the hydrogeologic factors affecting the transport of groundwater contamination in the subsurface
- Determine whether potential groundwater contamination could migrate into the Mattawoman Creek

1.2 Organization of the Remedial Investigation Report

Section 1 discusses the objectives of the RI; the organization of the RI report; and a description of NDWIH, including its current and historical land uses, discussions of previous investigations conducted at NDWIH; and descriptions of the sites where the RI was conducted. Section 2 provides detailed information on the natural environment, including physiography, topography, climate, surface water hydrology, geology, hydrogeology, ecology, and cultural and historical resources. Section 3 provides information on field activities, approaches, and concepts that are common to all five of the sites. Section s 4, 5, 6, 7, and 8 present the data pertaining to types, concentrations, and distribution of

contaminants for affected media and an analysis of migration pathways for the identified contaminants within Sites 11, 13, 17, 21, and 25, respectively. Human health and ecological risk assessments conducted for each site are presented in their respective chapters. Supporting information is provided in the appendixes to the report. Tables and figures are provided at the end of each section; appendixes are provided in Volume II of this report.

1.3 Site Description

NDWIH is a military facility located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, District of Columbia (Figure 1-1). The facility consists of two tracts of land: the main installation on the Cornwallis Neck Peninsula and the Stump Neck Annex located across the Mattawoman Creek (Figure 1-2).

The main installation contains approximately 2,500 acres and is bounded by the Potomac River to the northwest, west, and south, the Mattawoman Creek to the south and east, and the town of Indian Head to the northeast (Figure 1-2). Included as part of the main installation are Marsh Island and Thoroughfare Island, which are located in the Mattawoman Creek. Elevations range from sea level to approximately 125 ft above mean sea level (msl).

The Stump Neck Annex contains approximately 1,000 acres and is bounded by the Mattawoman Creek on all sides except the southeast (Figure 1-2). Elevations range from sea level to approximately 10 ft above msl.

Both the main installation (Cornwallis Neck Peninsula) and the Stump Neck Annex are on the National Priorities List (NPL). The main installation and Stump Neck Annex are separated by the Mattawoman Creek (noncontiguous), have separate United States Environmental Protection Agency (USEPA) identification numbers, and perform dissimilar operations. Investigation of the Stump Neck Annex is being conducted through the Installation Restoration (IR) program. The five sites discussed in this report are located on the main installation.

1.3.1 Current and Historical Uses of NDWIH

NDWIH was established in 1890 and is the Navy's oldest continuously operating ordnance station. At various times during its operation, NDWIH has served as a gun and armor proving ground, a powder factory, a propellant plant, and a research facility. The U.S. Government purchased Stump Neck Annex in 1901. The property provided a safety buffer for the testing of larger naval guns that were tested by firing into the Potomac River, and at Stump Neck.

The Indian Head installation was enlarged by another 1,160 acres of adjacent land in 1918, during World War I. This expansion included the purchase of Hopewell Farm and Hog Island, which was then an islet in the Mattawoman Creek and has since become attached to the Cornwallis Neck peninsula. When the Dahlgren Naval Proving Ground was established as a separate command in 1932, NDWIH was redesignated the Naval Powder Factory (Parsons, 2000).

The production of gunpowder and development of new explosives during the onset of World War II resulted in the construction of several new facilities at Indian Head, as well as the construction of Route 210 as a Defense Access Road in 1943. Development and improvements at Indian Head continued throughout the 1950s and 1960s, and in 1966, NDWIH was renamed the Naval Ordnance Station (NOS). Rum Point, an 80-acre promontory in the Mattawoman Creek near Stump Neck, was also acquired in this year. Bullitts Neck was obtained in five small acquisitions between 1965 and 1966 in order to meet safety and security needs arising from explosive magazines at the Indian Head station (Parsons, 2000).

After the Vietnam conflict, the mission of NDWIH shifted from primarily a production facility to a highly technical engineering support operation. In 1987, the NOS was established as a Center for Excellence to promote technological excellence in the following specialized fields: energetic chemicals; guns, rockets and missile propulsion; ordnance devices; explosives; safety and environmental protection; and simulators and training (Parsons, 2000). Current military land use includes operations and training; production; maintenance and utilities; research, development, testing and evaluation; explosive storage; supply and nonexplosive storage; administration; community facilities and services; housing; and open space.

Forest stands comprise approximately 47 percent, or 1,603 acres, of NDWIH and include pine, pine-hardwood, and hardwood forest cover types. Recreation areas at Indian Head include approximately 1,150 acres of designated hunting areas, approximately 2 miles of shoreline fishing areas, and 1.5 miles of nature trails.

1.3.2 Surrounding Land Uses

NDWIH is generally surrounded by commercial, residential, and State Park land to the east and south of the main installation and Stump Neck Annex. The town of Indian Head is located just east of IHDIV-NSWC, where most residential developments are located. The Indian Head Highway (Route 210) extends eastward from the NDWIH main gate, attracting businesses and providing access to residential areas off the main highway. The Potomac River borders the main installation to the north and west and Stump Neck to the west. Mason Neck National Wildlife Refuge is located across the Potomac River, north of the main installation. The Mattawoman Natural Environment Area is state-owned property located along the southern edge of the Mattawoman Creek east of the main installation.

The Stump Neck Annex is bordered to the north by the Mattawoman Creek, to the east by General Smallwood State Park and Sweden Point Marina, and to the south by Chicamuxen Creek, agricultural lands, and low-density residential development. The Chicamuxen Wildlife Management Area is located adjacent to and south of the Stump Neck Annex.

1.4 Previous Investigations

In June 1982, Naval Energy and Environment Support Activity (NEESA) conducted an Initial Assessment Study (IAS). Submitted in May of 1983 (Hart, 1983), the report evaluated the various sites at NDWIH to determine if a potential threat to human health or the environment existed. The report identified five sites (Sites 5, 6, 8, 12, and 25) as exhibiting a potential threat. A Confirmation Study (CS) was conducted at three of these sites (Sites 5, 8,

and 12) and was published in September 1985 by CH2M HILL. Removal actions subsequently were conducted at Sites 5 and 8. Site 12 has undergone further investigation by TetraTech NUS (TtNUS).

A Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted in 1988 and a supplemental Preliminary Assessment (PA) Report was prepared by NEESA in January 1992. The report evaluated an additional 17 sites (Sites 39 to 55). All but two sites (Sites 51 and 52) were recommended for further work. As a follow-up to the supplemental PA, a Site Inspection (SI) was conducted on Sites 39 through 50, and at Sites 53, 54, and 55 in two phases. Phase I focused in Site 42, Olson Landfill. Phase II focused on the remainder of the sites. Based on the results of the SI, all of the sites were recommended for further study.

As required under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the USEPA applied the Hazard Ranking System (HRS) for NDWIH. The Activity scored a 50, which is above the 28.5 cut-off score. Therefore, NDWIH was proposed to the NPL on February 13, 1995, and was officially placed on the list on September 29, 1995.

1.5 Site-Specific Descriptions

1.5.1 Site 11–Caffee Road Landfill

The Caffee Road Landfill is situated at the southern end of Caffee Road, extending about 200 ft on either side of the road to the edge of the unnamed creek on the west and to the Mattawoman Creek on the south. Review of historical aerial photos indicated that filling activities have extended the shoreline into the Mattawoman Creek as much as 150 ft from its original position. Site reconnaissance verified that the majority of the Mattawoman Creek shoreline next to Site 11 consists of concrete, debris, and fill. One-quarter of the site, the area adjacent to the unnamed creek, is classified as a wetland.

The landfill was used until the early 1960s (Kearney, 1988) for the disposal of bulk metal items and trash, rocket motor casings, exploded building debris, rifles, demilitarized ordnance, propellant grains residue, and open burning residues. There is no information concerning the date the landfill was first used. In 1980, NDWIH reportedly removed 5,000 to 6,000 cubic yards of flashed metal parts from this wetland area. Flashed metal refers to metal debris that was burned to remove trace amounts of explosives residue. The waste treated was placed in a pile and approximately 15 gallons of diesel fuel were poured over the waste as fuel source.

The surface above the landfill is now used as the Decontamination Burn Point and a large collection of flashed metal parts are located on top of the landfill, which are periodically removed for sale. The eastern area of the site is now used for drum storage and waste segregation. The site was never permitted as a landfill, so there were no cover material application procedures to secure deposited or stored waste materials. The IAS indicated that various materials were dumped or left uncovered for extended periods. Surface runoff, site leachate, and air emissions present potential site hazards. The nearest potable water wells are Well 16A, located 1,400 ft north-northwest, and Well 17, located 1,600 ft north-northeast of the site.

During a site visit, additional debris was observed in the wooded swale northwest of the site, towards the Nitroamine Fine Grind facility. The debris consisted of bricks, metal parts, a washing machine, and the end of a fiberglass tank, and appeared to be deposited on the surface only (i.e., not buried). It is unclear whether this debris is associated with disposal activities at Site 11.

Information uncovered after the RI was underway indicated that there were two incinerators located on the eastern side of Site 11. One was a chemical incinerator (Building 1549) that reportedly was never used and the other was an incinerator for classified documents (Building 1607). Additionally, a literature search conducted at NDWIH following the acceptance of the draft final work plan (CH2M HILL, May 2000), revealed that four open burning pits previously existed along the western edge of Site 11. This also suggested that additional unknown land uses may have occurred in the entire area east of Building 1607.

Samples were not collected during the IAS or the RFA and, before this investigation, there were no known analytical data for the site.

1.5.2 Site 13—Building 870

Site 13 is the paint shop (Building 870) that was constructed in 1953 and remains in operation today. Approximately 50 ft to the south and west of the building the terrain slopes down into a wooded area. Two drainage swales radiate from the foot of this slope to the northwest and southwest of Building 870. The drainage swales contain water only during storm-runoff events. The nearest potable water wells are Well 2, located 1,800 ft north, and Well 7, located 1,950 ft southeast of the site. An asphalt drive surrounds the Paint Shop.

The Paint Shop was used to paint various items by hand using aerosol sprays or paint spray booths. According to the 1983 IAS, between 1953 and 1979, approximately 115 gallons per year of kerosene, mineral spirits, lacquer thinners, and solvents may have been deposited in a depressed area located in the woods behind the Paint Shop. It is also estimated that approximately 1 percent of the 3,380 gallons of paint used annually may have been washed off during paint equipment cleaning operations, which took place over bare soil areas behind Building 870.

Site reconnaissance during the IAS in May 1983 noted severe vegetation and foliage stress over a 400-ft^2 area behind the shop, and a strong solvent odor up to 25 ft from the back of Building 870. However, the area was visited twice during the 1988 Phase II RFA and the reconnaissance team could not determine the exact location of this area. They were unable to locate an area of bare or depressed soil and instead they found trees that appeared to be more than 10 years old. The only evidence of contamination noted in the Site 13 area during this visit was one rusted and empty 55-gallon drum located in the wooded area south of the shop. They also noted a solvent odor near the present waste oil storage pad, and stained soil beneath a wooden pallet used for storage of paint cans. The reconnaissance team interviewed the foreman of the maintenance shops and the Paint Shop foreman and neither of them knew of the existence of a paint solvents disposal area.

Samples were not collected during the IAS or the RFA and, before this investigation, there were no known analytical data for the site.

1.5.3 Site 17–Discarded Metal Parts Area

Site 17, located adjacent to Site 11 to the east-northeast, is defined as a 1,000-ft stretch of shoreline along the Mattawoman Creek where metal parts were discarded. Buildings 1569 and 1570 are situated on a ridge, 20 ft above the site The nearest potable water well is Well 17, located 1,000 ft north of the site.

Metal parts were discarded along the Mattawoman Creek shoreline from the 1960s until the early 1980s. The discarded materials included rocket motor casings, shipping containers, empty drums, and various metal parts. A site reconnaissance done for the IAS in 1983 confirmed the presence of rusted metal parts in the vicinity of the reported disposal area. During the reconnaissance, it was noted that the submerged materials were covered over with bottom sediments. The Phase II RFA in August 1988 stated that the metal parts were to be removed in 1989 under the direction of the Army Corps of Engineers and the Fish and Wildlife Department. It is assumed that this removal occurred because recent site reconnaissance could not locate any large metal items on the shoreline.

The defined area of this site was expanded in 1997 to include the forested area 100 ft from the shoreline where dozens of rusted drums were identified. A site reconnaissance during January 2000 found the drums disintegrated with rust and partially buried in the soil. The majority of the drums had holes exposing a yellow wax-like material. In 1997, the first time these drums were located, the substance was described as being fluid and the drums were noted to be more intact. The origin of these drums cannot be verified by base personnel; however, the Indian Head laboratory has analyzed the contents and determined that the substance is wax. The contents were found to be safe to handle (e.g., not explosive) though they may contain residual levels of explosives.

Samples were not collected during the IAS or the RFA and, before this investigation, there were no known analytical data for the site.

1.5.4 Site 21–Bronson Road Landfill

Site 21 is located on Bronson Road across from Building 1384 approximately 500 ft from the Mattawoman Creek. It extends from Building 478 on the north to Building 480 on the south. An unpaved road runs along the eastern side of the reported site limit. Originally, the site was the location of a 2-acre gravel-mining pit. However, around 1975 the NOS Public Works (PW) Department began filling in the pit with trash generated in the explosives manufacturing area. This practice ended in November 1981 when a 40-cubic-yard dumpster was placed at the site to act as a transfer station. The dumpster was collected weekly by a private contractor for off-station disposal. The site also accepted sludges from paint spray booths and bagged asbestos until June 1982. The IAS reports that the underlying soils are relatively impermeable and that the groundwater is an estimated 40 to 50 ft below the deposited materials, but there are no known soil borings or monitoring wells at the site to support this statement. The site was formerly surrounded by 20-ft cliffs on three sides; however, placement of fill from other sites on NDWIH has brought the ground surface nearly up to the elevation of the cliff tops. The nearest potable water well is Well 18, located 450 ft north of the site.

The landfill was filled using trench excavation methods and is estimated to contain approximately 1,500 tons of trash and various quantities of paint sludges, asbestos, and barium sulfate.

Site reconnaissance conducted in 1982 indicated the landfill had a partial cover over the deposited material (6 in. to 1 ft in depth). Uncovered bags of asbestos were observed, as well as several small dark brown colored pools of water that may have been leachate. However, by 1989 the inactive landfill had been completely covered with a soil cap. The thickness of the cap is being continually increased using soil from various locations at IHDIV-NSWC. The dumpster was removed in 1996 and the area was regraded so that the current ground surface is approximately 10 to 15 ft higher than the level of the dumpster. Excavation of a sediment pond near the north end of the site in 1996 uncovered waste consisting mostly of plastic, glass, and metal.

The IAS conducted by NEESA in 1983 did not recommend a confirmation study because NEESA concluded that the contaminants would not migrate due to the nature of the site hydrology. However, the IAS did recommend that the portion of the landfill that was uncovered be capped and properly closed to minimize any potential for subsurface or air-borne contamination migration. The Phase II RFA conducted in 1988 reported that a soil cover had been placed over the site. Samples were not collected during these studies and, before this investigation, there were no known analytical data for the site.

1.5.5 Site 25–Hypo Discharge from X-ray Building 2, Building 588

Site 25 is the drainage ditch that runs from the Rocket Motor Loading Building (Building 588) into the industrial wastewater outfall IW46. Flow in the ditch is intermittent, occurring only during stormwater runoff events or when there is discharge from the building. Water draining from Building 588 flows southwest down a steep slope into the ditch. The drainage then flows south for approximately 500 ft until it reaches the road which leads to Building 871, where it takes a sharp turn to the west and follows the road for about 100 ft before flowing under the road. The outfall into the Mattawoman Creek is approximately 100 ft south of this road. The Rocket Motor Loading Building, constructed in 1944, contained facilities used for X-ray film developing. The X-ray section of this building is no longer in use. The nearest potable water well is Well A, located 400 ft southeast of the site.

For the period beginning in 1944 and ending circa 1964, wastewater discharges from this facility included fixer (sodium thiosulfate); developer (hydroquinone); and silver, discharged in a silver thiosulfate complex. This silver represents the most significant contaminant from the standpoint of potential adverse environmental impact. Team site reconnaissance for the IAS indicated no vegetation stress or contamination immediately behind the building at the point of outfall discharge. However, there was evidence of disposal of painting materials and accessories, including paint brushes, empty solvent cans, and trash.

Building 588 has a temporary waste accumulation area. The concrete pad, which is located at the southwest corner of the building, is currently used as a satellite accumulation area for the storage of nonexplosive hazardous waste (e.g., waste acetone). Secondary containment is provided when the site is used (i.e., a drum in a drum or a mobile secondary containment pad with cover is used). However, prior to 1996, the concrete pad held a dumpster that was

used for the storage of solid explosive hazardous waste. Drainage in the pad area is directed to the south.

The IAS conducted by NEESA in 1983 recommended the study of this site only if silver wastes at Site 5 were found to be a danger to aquatic life. This decision was based on the assumption that the chemistry and probable fate of sodium thiosulfate, hydroquinone, and silver would be similar to that of contaminants found in other X-ray photo lab discharges. A CS was conducted on Site 5 in September 1985. High concentrations of silver were detected in soil samples collected from the drainage ditch. The results of the CS at Site 5 indicated that the environment at Site 25 might also be contaminated with silver; however, samples were not collected during the IAS or the RFA.

1.6 References

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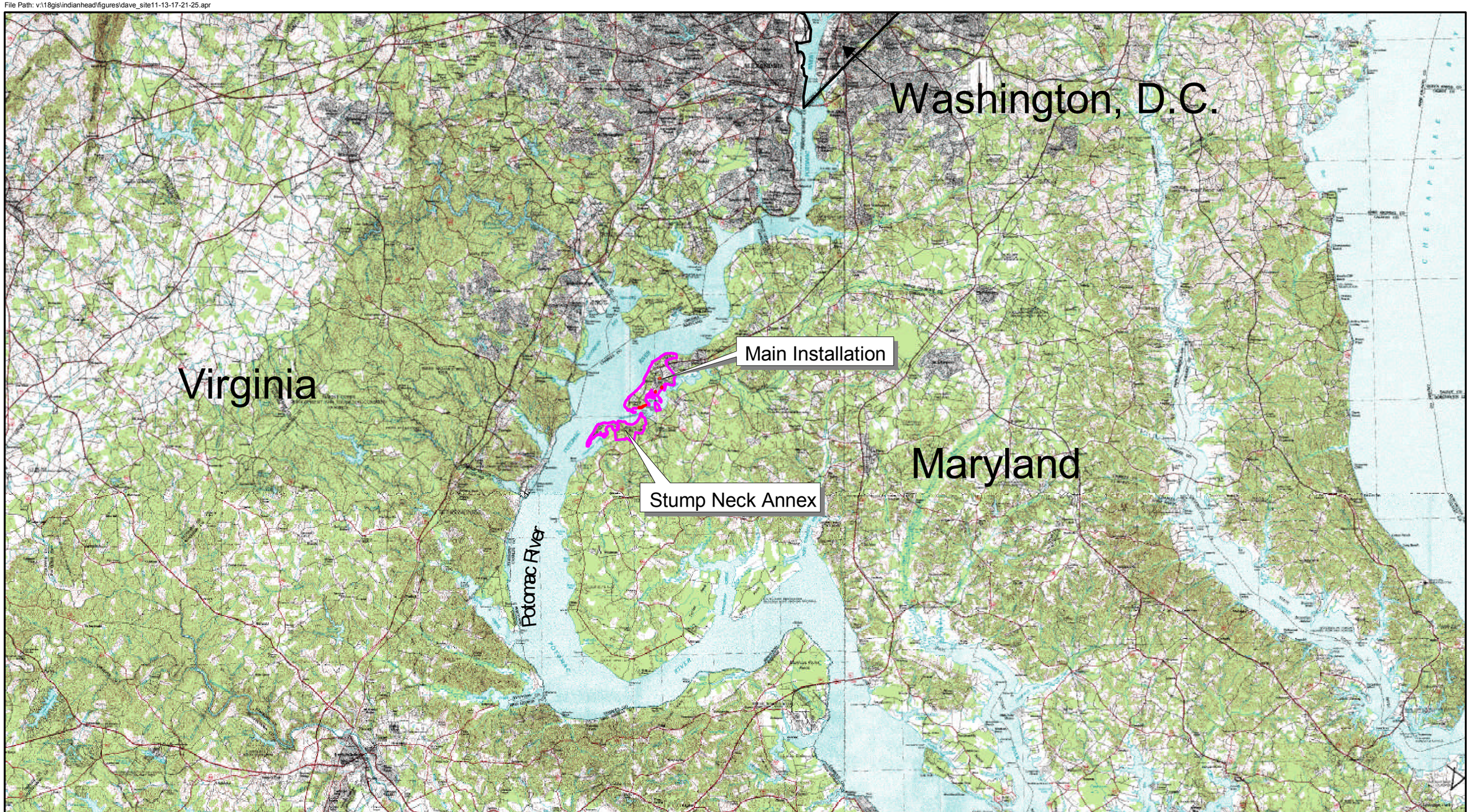

LEGEND

- Site Boundary
- District of Columbia
- Water Body

N

30000 0 30000 60000 Feet

Figure 1-1
Facility Location Map
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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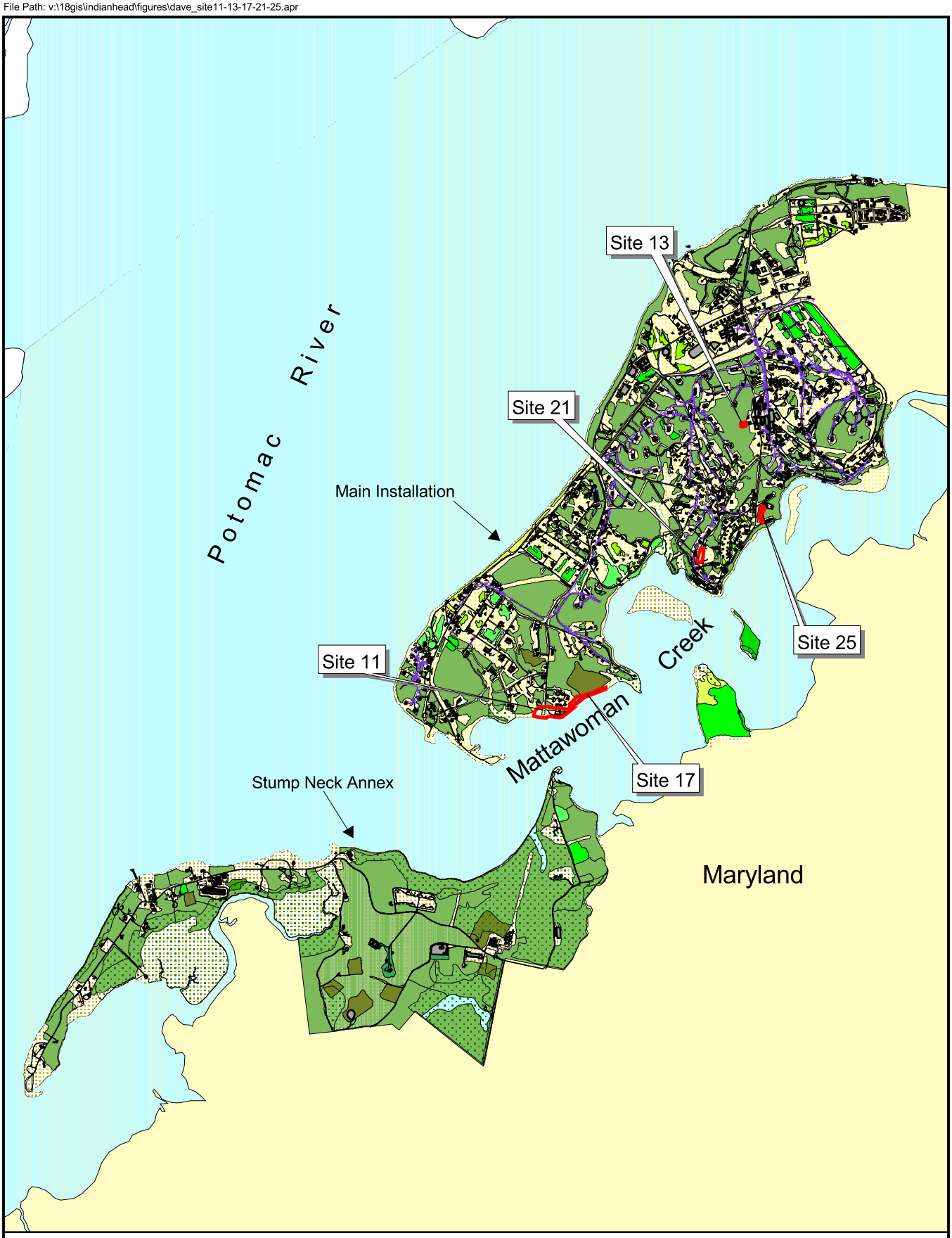

LEGEND

- IR Site Boundary
- Buildings
- Road
- Wooded Area

N

2000 0 2000 4000 Feet

Figure 1-2
Facility Map
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

SECTION 2

Physical Characteristics

Section 2 contains a discussion of the physical characteristics of IHDIV-NSWC. Section 2.1 describes the topography and climate, Section 2.2 describes the soils, Section 2.3 describes the hydrology, Section 2.4 describes the geology, Section 2.5 describes the hydrogeology, and Section 2.6 describes the ecology. Site-specific information on these features is provided in Sections 4 through 8.

2.1 Topography and Climate

NDWIH is situated on a peninsula that separates the Mattawoman Creek from the Potomac River. The terrain is characterized primarily by gently sloping hills and valleys. Elevations range from sea level along the perimeter of the peninsula to approximately 125 ft above msl at bluffs located in the northeastern portion of the facility.

Climate is typical of the humid temperate continental climatic zone the facility lies in. This zone has hot, humid summers and relatively mild winters. Because of its proximity to the Potomac River and its tributaries, NDWIH experiences less extreme temperatures, higher precipitation, and higher humidity than inland areas. The average daily maximum temperature is 67.5°F, and the average daily minimum temperature is 45°F. The warmest part of the year is in late July, and the coldest is in late January and early February. The growing season is approximately 190 days, from mid-April through mid-October (U.S. Department of Agriculture (USDA), 1974).

2.2 Soils

The soils at NDWIH consist of silty and sandy loams with minor amounts of gravel and tend to have low permeability and low shrink-swell potential. Four dominant soil associations are found at Indian Head (USDA, 1974):

- Beltsville-Gravelly Land-Bourne —Level to moderately sloping soils, moderately well-drained and loamy, and moderately deep. They also include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- Beltsville-Exum-Wickham—Level to moderately sloping, moderately well-drained and well-drained loamy soils. Soils within this association are moderately deep, and include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- Evesboro-Keyport-Elkton—Level to moderately sloping, excessively drained, sandy soils and moderately well-drained and poorly drained, level to gently sloping, loamy soils with clayey subsoil.
- Bibb-Tidal Marsh-Swamp—Level or nearly level, poorly drained soils, generally located on floodplains and in miscellaneous unclassified wetlands.

The United States Department of Agriculture (USDA) soil survey identifies 31 soil map units within IHDIV-NSWC's boundaries of. Beltsville silt loam, 2 to 5 percent slope, and Croom gravelly sandy loam, 10 to 15 percent slope, make up just over 50 percent of the soils on IHDIV-NSWC. Beltsville silt loams are moderately well-drained, strongly acidic soils that were formed in silty and moderately sandy materials. Croom gravelly sandy loams are well-drained gravelly soils that were formed in very old fluvial deposits of gravel, which contain varying levels of sand and clay. They are found predominantly in upland areas and, because of their slope, have high erosion potential (Parsons Engineering Science, Inc., 2000).

2.3 Hydrology

Major water bodies at Indian Head include the Potomac River, the Mattawoman Creek, and Chicamuxen Creek. The Potomac River flows almost 400 miles from its headwaters in the Allegheny Mountains of West Virginia. Near Indian Head, the Potomac broadens and becomes saltier from the increasing influence of the Chesapeake Bay. Salinity ranges from 0.01 to 3.0 parts per thousand near IHDIV-NSWC, with the highest salinity values recorded during dry summer months. The Mattawoman and Chicamuxen Creeks are tidal tributaries to the lower Potomac River. Chicamuxen Creek is more saline than the Mattawoman Creek because it is more strongly influenced by the estuarine waters of the lower Potomac River.

The Potomac River bounds Cornwallis Neck to the north and northwest. Because of the peninsula's topography, most of the surface water drainage on Cornwallis Neck flows into the Mattawoman Creek, which forms its southeastern boundary. The Stump Neck peninsula is bounded by the Mattawoman Creek to the north, the Potomac River to the northwest, and partially by Chicamuxen Creek to the southeast.

2.4 Geology

The facility and the sites are in the Atlantic Coastal Plain physiographic province. The province consists of an eastward-thickening wedge of interbedded sand and clay units that were deposited in fluvial and marine environments. The deposits range in age from Cretaceous, consisting of the Potomac Group, to Quaternary, consisting of the Upper Lowland Deposits, and in thickness from 650 ft to 900 ft (Vroblesky and Fleck, 1991).

According to the geologic map provided by Hiortdahl (1997), the site is immediately underlain by Quaternary deposits. Hiortdahl (1997) provides a geologic cross section that indicates that the Quaternary deposits are approximately 100 ft thick in the vicinity of the site. They are of fluvial and estuarine origin as cut-and-fill deposits in paleochannels of the early Potomac River system. They generally consist of medium- to coarse-grained sand and gravel grading upward to silt and clay. Isolated cobbles and boulders may be found near the base of the deposits. The site inspection (SI) (Ensafe/Allen & Hoshall, 1994) reported that the soil profile from the ground surface to a depth of about 8 ft below ground surface (bgs) consisted of well-sorted, medium-grained sand.

Vroblesky and Fleck (1991) reported that the Patapsco Formation, the uppermost unit of the Cretaceous Potomac Group, immediately underlies the Quaternary deposits in the vicinity of the site. The top of the Patapsco is about 45 ft below msl. The Patapsco is characterized by layers of fine- to medium-grained sand and silt separated by thick layers of clay. Typically,

the deposits within the Patapsco Formation grade from coarse-grained at the bottom to finer-grained at the top. The Patapsco was not encountered during the RI drilling.

The Patapsco is immediately underlain by the tough, massive clay of the Arundel Formation, which is then underlain by the medium- to coarse-grained sand of the Patuxent Formation. The Patuxent is subsequently underlain by gneissic, schistosic, and gabbroic bedrock.

2.5 Hydrogeology

The water table is recharged by precipitation that infiltrates the ground surface. Some of the water that runs off the surface of the ground at the sites flows to drainage ditches. These ditches then drain toward the Potomac River or toward the Mattawoman Creek. The Master Work Plan (Brown and Root Environmental, 1997) reports that most natural drainage from the facility is to the Mattawoman Creek.

Hiortdahl (1990) states that, although there are numerous localized water-bearing systems within the Lowland Deposits, these water-bearing units are not used as a potable water source by the facility or on the Indian Head Peninsula. The main aquifer is a series of units within the Potomac Group; the Patapsco unit is nearest the ground surface.

The facility is the largest user of groundwater in the area and withdraws an average of 1 to 2 million gallons per day. Most of the production wells are screened in the Patapsco Formation. A single production well, Well 16A, located near Building 1728, is screened in the Patuxent aquifer. While this well currently is not used for drinking-water supply, future plans call for altering the distribution system at NDWIH so that Well 16A can be used to supply potable water.

Eleven production wells are in use at the facility at present. Hiortdahl (1990) reports that pumping in the Potomac Group aquifers has produced a cone of depression in the potentiometric surface that extends approximately 6 miles to the northeast and southwest and 2 to 3 miles to the northwest and southeast.

2.6 Ecology

2.6.1 Terrestrial Systems

NDWIH comprises approximately 2,000 acres of terrestrial ecological communities on Cornwallis Neck and about 1,000 acres on Stump Neck. Terrestrial habitats in these areas are classified as forested uplands, open uplands, and terrestrial cultural uplands. The forested areas on NDWIH are dominated by oaks (*Quercus* spp.), hickories (*Carya* spp.), tulip trees (*Liriodendron tulipifera*), and pine (*Pinus* spp.). Flowering dogwood (*Cornus florida*), redbud (*Cercis canadensis*), and American holly (*Ilex opaca*) are typical of the upland understory. The forests are heavily fragmented by buildings, roads, and other structures. Terrestrial cultural uplands consist of areas that have been created, maintained, or modified by human activities. These areas are characterized as either mowed grass/landscaped areas, wildlife food plots, or successional fields and roadsides.

2.6.2 Wetland Systems

National Wetland Inventory (NWI) maps identify approximately 290 acres of wetlands on IHDIV-NSWC. Of this acreage, tidal estuarine systems total 234 acres, forested wetlands total 42 acres, emergent marshes and shrub swamps total 5.5 acres, and lacustrine systems make up the remaining acreage. There are also approximately 17 miles of riverine systems in this area.

At Indian Head, the tidal estuarine systems are associated with the Potomac River, the Mattawoman Creek, and Chicamuxen Creek. The Mattawoman Creek marshes are typically dominated by wild rice (*Zizania aquatica*), big cordgrass (*Spartina cynosuriodes*), cattail (*Typha* spp.), rose-mallow (*Hibiscus moscheutos*), tickseed sunflowers (*Bidens* spp.), pickerelweed (*Pontederia cordata*), and arrow arum (*Peltandra virginica*). Intertidal shoreline fringe marshes are extremely rare and are dominated by water willow (*Justica americana*) or American threesquare (*Scirpus pungens*). The broad expansive marsh of Chicamuxen Creek contains an extremely diverse flora. An informal survey of this marsh conducted in 1988 identified more than 80 species of plants (Maryland Department of Natural Resources, 1992).

2.6.3 Fauna

The diverse ecological communities at Indian Head support many wildlife species. Faunal inventories were conducted by Maryland Natural Heritage as part of the 1991–1992 rare, threatened, and endangered species survey. NDWIH natural resources staff has conducted additional waterfowl and amphibian surveys. Currently, an estimated 15 species of damselflies, 26 of dragonflies, 48 of butterflies, 29 of mammals, 23 of reptiles, 20 of amphibians, and 119 of birds utilize the available habitat at NDWIH (MDNR, 1992; Parsons, 2000).

2.6.4 Rare, Threatened, and Endangered Species

A survey of rare, threatened, and endangered species was conducted by the Maryland Natural Heritage Program in 1991–1992. The survey focused on areas with a high potential for supporting rare, threatened, and endangered species. Of the listed species, the bald eagle (*Haliaeetus leucocephalus*) is the only know federally listed threatened species identified on IHDIV-NSWC. The remainder of the species listed includes five state-listed endangered plants, two state-listed threatened plants, one state-listed endangered invertebrate, and 18 species of regional concern.

Three additional rare tree species were identified during the 1995 Urban Tree Inventory: the state-threatened eastern arborvitae (*Thuja occidentalis*), state-rare shingle oak (*Quercus imbricaria*), and potentially state-rare pussy willow (*Salix discolor*).

The 1991-1992 survey also identified 10 areas of ecological significance (totaling 614 acres) that have the potential to support the long-term protection of the rare, threatened, and endangered species. These protection areas are Bullitt Neck Point, Cornwallis Neck Marshes, Hog Island Cove, Thoroughfare Island, Chicamuxen Creek Marsh, Magnolia Seep, Porter Woods, Rum Point, Stump Neck Beaver Marsh, and West Stump Neck Shoreline.

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SECTION 3

Activities, Approaches, and Concepts Common to All Sites

Section 3 provides information on several aspects of the RI common to all five sites. These discussions are presented in Section 3 to avoid repetition in site-specific sections 4, 5, 6, 7, and 8. First, a summary of the RI field activities that were conducted at the five sites is provided. This is followed by discussions of the data quality, methodologies used during the human health and ecological risk assessments, and general concepts of fate and transport.

3.1 Field Activities

The primary fieldwork began in July 2000 and concluded in October 2000. An additional field investigation was conducted between February 2002 and March 2002 in the eastern portion of Site 11. A second round of groundwater samples was collected at Site 25 in February 2002. The field investigations included surface and subsurface soil sampling, a geophysical survey, test-pitting, soil borings, monitoring well installation and sampling, surface water and sediment sampling, and surveying.

In most instances, where analytical samples were collected, a full suite of analyses was performed. The full suite comprises Target Compound List (TCL) volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), Target Analyte List (TAL) inorganics (e.g., metals and cyanide), explosives (which, in addition to the list of analytes included in USEPA SW-846 Method 8330 also includes nitroglycerine (NG), nitroguanadine (NQ), pentaerythritol tetranitrate (PETN), and perchlorate , and total petroleum hydrocarbon (TPH) diesel range organics (DROs) and gasoline range organics (GROs). It is noted in the respective sections where analysis lists differ from those shown above. Sampling parameters for all samples collected are shown in Table 3-1.

For all media, if analysis for VOCs was required, VOC samples were collected first, followed by TPH-GROs, and then the remaining analyses in any order except as noted. For water samples, if dissolved metals were one of the required analyses, dissolved metals samples were collected last.

Health and safety procedures included weekly health and safety meetings, modified level D attire, and continual air monitoring during drilling activities. No elevated breathing-zone readings were encountered during the RI.

3.1.1 Soil Sampling

3.1.1.1 Sampling Methodology

Several soil samples were collected from locations at Sites 11, 13, 17, 21, and 25. At most locations, samples were collected from two intervals: 0.5 to 1.0 ft bgs (surface soil) and 2 to 3

ft bgs (subsurface soil). The depths of subsurface soil samples sometimes deviated from these depths because of site conditions.

The samples were collected using stainless steel bucket augers. Soil from the bucket auger was transferred directly to soil jars using a decontaminated, stainless steel hand trowel for VOC samples. The remainder of the soil was placed in decontaminated, stainless steel bowls and composited for the remaining analyses. Samples were placed in coolers with ice to chill to 4°C. At the end of each day, samples were repacked in a cooler with additional ice. Samples were sent overnight to the analytical laboratory. Decontamination of equipment, quality assurance, and quality control were carried out as specified in the work plan.

3.1.1.2 Sample Nomenclature

Samples collected during the RI field effort were assigned sample identification numbers (IDs) on the basis of where the sample was collected. The locations or stations that the samples were collected at were assigned IDs during the planning phase of the RI. The sample IDs are the same as the station IDs except that the letters SO are replaced by SS or SB depending on whether a soil sample was collected from the surface or subsurface, respectively. Additionally, the sample IDs have the number "0001." For example, the soil samples IS17SS060001 (surface) and IS17SB060001 (subsurface) were collected from Station IS17SO06.

For simplicity, in the following sections, samples and stations will be referred to synonymously by using abbreviated sample IDs. For example, surface soil sample IS17SS060001 will be referred to as IS17SS06 and subsurface soil sample IS17SB060001 will be referred to as IS17SB06.

3.1.2 In Situ Groundwater Sampling

3.1.2.1 Sampling Methodology

Six in situ groundwater samples were collected from locations at Site 11 only. Samples were collected using a direct-push rig fitted with a 4-ft stainless steel sampling screen. The screen was not exposed until the desired depth was reached. Samples were brought to the surface using a peristaltic pump fitted with disposable polyethylene tubing. Water was decanted directly into clean sample bottles, then placed in coolers with ice to chill to 4°C. At the end of each day, samples were repacked in a cooler with additional ice. Samples were sent overnight to the analytical laboratory. Decontamination of equipment, quality assurance, and quality control were carried out as specified in the work plan.

3.1.2.2 Sample Nomenclature

Samples collected during the RI field effort were assigned sample IDs on the basis of where the sample was collected. The locations or stations that the samples were collected at were assigned IDs during the planning phase of the RI. The sample IDs include the designation "GW." Additionally, the sample IDs have the number "0700," indicating that they were collected in July 2000. For example, the in situ sample IS11GW040700 was collected from Station IS11GW04.

For simplicity, in the following sections, samples, and stations will be referred to synonymously by using abbreviated sample IDs. For example, in situ groundwater sample IS11GW040700 will be referred to as IS11GW04.

3.1.3 Monitoring Well Installation

3.1.3.1 Drilling Methodology

Several monitoring wells were installed during the RI. Drilling was performed using hollow stem auger (HSA) drilling methods. HSAs are advanced using down-force and rotation to penetrate the subsurface. Cuttings are brought to the surface by the augers as they rotate. The monitoring wells were drilled using 4.25-in. inside-diameter HSAs. Soil borings advanced to characterize subsurface lithology were also advanced using HSAs.

Two-foot split-spoon samples were collected every 5 ft during drilling. At the appropriate depth, the drill crew placed the split-spoon sampler into the boring connected to steel rods that connected to an up-hole 140-pound pneumatic hammer. The blow counts (i.e., the number of blows the 140-pound hammer required to drive the sampler 6 in.) were recorded in the field logbook. The sampler was brought to the surface for logging after driving it 2 ft or after reaching 50 blows per 6 in. (i.e., considered to be sampler refusal). These samples were monitored for VOCs in the field using a MiniRae® photoionization detector (PID). The lithology was logged using the Unified Soil Classification System (USCS) and a Munsell color chart. Boring logs are presented in Appendix A.

3.1.3.2 Monitoring Well Construction and Development

Monitoring wells were constructed using 2-in., flush-threaded, Schedule 40 polyvinyl chloride (PVC) well riser and 2-in. Schedule 40 PVC with either a 5-ft or a 10-ft, 0.010-in. slotted screen. No. 2 (coarse) Morie sand was installed in the annulus to a height approximately 2 ft above the top of the screen. The No. 2 sand was covered with 1 ft of No. 1 (fine) sand, which isolated the sand filter pack from the overlying bentonite. Three feet of bentonite chips were placed on top of the sand in order to prevent the cement/bentonite grout from penetrating the sand. The bentonite was hydrated with potable water if it was situated above the water table. The bentonite was allowed to hydrate for 30 minutes prior to grouting the annulus to the surface. The overlying grout consisted of one bag of Portland cement and 5 pounds of bentonite per 8 gallons of water. A tremie pipe was employed to install the grout. Wells less than 11 ft deep were completed with reduced thickness of coarse sand, fine sand, or bentonite chips. Wells were finished with a 2- to 3-ft stickup protective casing. Wells completed above grade also were provided with four protective guard posts installed in a concrete pad. Additionally, all new wells were fitted with water-tight well caps and locks, keyed alike. A summary of well construction information is presented in Table 3-2. Well construction diagrams are presented in Appendix B. Note that no wells were required to be installed at Site 13.

Down-hole drilling equipment (e.g., augers, rods, split-spoons, etc.) was decontaminated between borings. Decontamination was performed using a portable high-pressure steam generator. A decontamination pad was constructed in the field to contain decontamination rinsate as it was generated. Split-spoon samplers were decontaminated between use using a tap water rinse, nonphosphate detergent wash, tap water rinse, and air dry.

The new wells were developed to remove sediment from the filter pack and ensure a good hydraulic connection between the well and surrounding formation. Wells were developed using in-line Wale pumps. The screen sections of the wells were surged to mobilize fines trapped in the well pack. Groundwater was then removed from the well until the well yielded water that was free from turbidity.

The wells were surveyed by a Maryland-licensed professional surveyor. The elevation results are provided in Table 3-2 and at the end of Appendix B. The horizontal coordinates are provided at the end of Appendix B.

3.1.4 Monitoring-Well Sampling

3.1.4.1 Sampling Methodology

Monitoring-well sampling was intended to provide data sufficient to characterize the nature and extent of groundwater contamination at the site and to provide for the human health risk assessment.

Depth to water was recorded prior to commencement of well sampling. Purging and sampling were accomplished using a Grundfos RediFlo2® submersible pump. The pump was installed to a depth at which the pump intake was midscreen. A Horiba U-22® with a flow-through cell was employed to monitor geochemical parameters (e.g., temperature, specific conductance, turbidity, dissolved oxygen, pH, and oxidation-reduction potential) during the purge process; the results are provided in Table 3-3. Purging proceeded at a rate at which the water level in the well would not be drawn down during pumping any more than was feasible (i.e., low-flow purging). Because of the low yield of some wells, this method was not practical in every well. For the wells in which low-flow purging was not possible, the well was purged dry and allowed to recover prior to sampling.

In preparation for sampling, the Horiba unit was disconnected, and the flow rate was slowed to approximately 50 mL per minute. Water was decanted directly into clean sample bottles that were then placed in coolers with ice to chill to 4°C. At the end of each day, samples were repacked in a cooler with additional ice. Samples were sent overnight to the analytical laboratory. Decontamination of equipment, quality assurance, and quality control were carried out as specified in the work plan.

3.1.4.2 Sample Nomenclature

Samples collected during the RI field effort were assigned sample IDs based on the monitoring well the sample was collected from. The monitoring wells were assigned IDs during the planning phase of the RI. The sample IDs are the same as the monitoring well IDs with the addition of the month and year the sample was collected. For example, monitoring well sample IS11MW011000 was collected from monitoring well IS11MW01 in October 2000.

For simplicity, in the following sections, monitoring wells and monitoring well samples will be referred to synonymously. For example, monitoring well sample IS11MW011000 will be referred to as IS11MW01.

3.1.5 Surface Water and Sediment Sampling

3.1.5.1 Sampling Methodology

During the RI, surface water samples and sediment samples were collected from locations in the Mattawoman Creek and the unnamed creek west of Site 11. Surface water samples were collected first, followed by sediment samples collected at the same locations. Surface water was collected using a Van Dorn sampler or a Bullet sampler. Sample water was poured directly into clean sample bottles, then placed in coolers with ice to chill to 4°C. Sediment was collected with a Ponar dredge. Sediment from the dredge was transferred directly to soil jars using a decontaminated stainless steel hand trowel for VOC samples. The remainder of the sediment was placed in decontaminated, stainless steel bowls and composited for the remaining analyses. Samples were placed in coolers with ice to chill to 4°C. At the end of each day, samples were repacked in a cooler with additional ice. Samples were sent overnight to the analytical laboratory. Decontamination of equipment, quality assurance, and quality control were carried out as specified in the work plan.

3.1.5.2 Sample Nomenclature

Samples collected during the RI field effort were assigned sample IDs based on the location the sample was collected. The locations or stations that the samples were collected at were assigned IDs during the planning phase of the RI. The sample IDs are the same as the station IDs with the addition of the numbers "0001". For example, surface water sample IS17SW010001 was collected from Station IS17SW01 and the sediment sample IS17SD010001 was collected from Station IS17SD01.

For simplicity, in the following sections, samples, and stations will be referred to synonymously. For example, surface water sample IS17SW010001 will be referred to as IS17SW01 and sediment sample IS17SD010001 will be referred to as IS17SD01.

3.1.6 Test Pits

Test pits were excavated at Site 21 only. Seven pits were excavated. A backhoe was used to excavate soil to depths up to 8 ft bgs. The test pits were intended to confirm the geophysical interpretation of the probable limits of the landfill at Site 21. Test pit logs are presented in Appendix C.

3.1.7 Geophysical Survey

A surface geophysical survey was conducted at Site 21 only. The work, performed on July 18, 19, and 20, 2000, consisted of an electromagnetic (EM) survey and electrical resistivity (ER) survey. The surveys were designed to locate metallic waste buried at the site and to delineate the landfill boundaries. The surveys were performed by Forrest Environmental Services, Inc., of Oak Hill, Virginia.

The EM survey was performed using an EM-31 induction meter. The system consists of two horizontal loops and a data logger. One loop acts as a transmitter and the other as a receiver. The transmitter produces a magnetic field, which is forwarded to the data logger via the receiver. The EM survey covered an area 475 ft by 450 ft. Data were collected at points along 20 survey lines. The lines were spaced 25 ft apart and data were collected at 10-ft centers.

The ER survey was performed using a Sting/Swift R1 earth resistivity meter. The system consists of an array of 30 electrodes and the automatic data collection module. A known current is introduced into the subsurface through electrodes. The resistance is measured by the resistivity meter. The ER survey consisted of two survey lines. Line A-A′, which was oriented north-south, began between monitoring wells IS21MW01 and IS21MW04 and ended at the northern edge of Components Place. Line B-B′, which was oriented east-west, began at the eastern edge of South Bronson Road, south of monitoring well IS21MW01, and ended south of monitoring well IS21MW04. Each line had a total length of 430 ft.

The results of the surveys are discussed in Section 7 and the surveyor's report is provided in Appendix D.

3.1.8 Investigation-Derived Waste (IDW) Handling

IDW was generated during several of the field activities conducted during the RI field activities. IDW was managed as follows:

- **Soil cuttings** generated during monitoring well installation were shoveled into 55-gallon drums during drilling, then transported to the designated staging areas. Following receipt of analytical results, cuttings were disposed of as nonhazardous waste by Industrial Marine Services, Inc., located in Baltimore, Maryland.
- **Decontamination rinsate** generated during down-hole drilling equipment decontamination was transferred from the decontamination pad into 55-gallon drums, then transported to the designated staging areas. Following receipt of analytical results, rinsate was removed as nonhazardous waste by Industrial Marine Services, Inc., located in Baltimore, Maryland.
- **Purged groundwater** generated during monitoring well development and groundwater sampling was contained in 55-gallon drums, then transported to the designated staging areas. Following receipt of analytical results, groundwater was removed as nonhazardous waste by Industrial Marine Services, Inc., located in Baltimore, Maryland.
- **Personal protective equipment (PPE)** used during all phases of the investigation and expendables used during sampling (such as tubing, sample containers, spent PVC, and disposable sampling equipment) were discarded in facility dumpsters after analytical results generated from soil, groundwater, surface water, and sediment indicated that these environmental media were not hazardous.

3.2 Data Quality Assessment

The data quality was evaluated to assess the usability of the analytical results. The analytical data quality is dependent on laboratory performance, matrix interference, ambient laboratory and field conditions, and field sampling technique, and is used to assess whether the project's data quality objectives are met. The data quality assessment comprised reviewing the results of the laboratory quality control (QC) review, the data validation reports, and the data validation qualifiers applied to the data.

3.2.1 Laboratory Quality Control Review

Prior to the release of the analytical results, the laboratory reviewed the sample and QC data to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the results were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Nonconforming results were identified and were discussed in the data package cover letter and associated case narrative.

3.2.2 Data Validation

The data packages were reviewed by an independent data validator based on the validation criteria outlined by USEPA Region III (1993b, 1994a). This data review process was independent of the laboratory review. The review completed by the validator focused on the impact that the laboratory performance and matrix effect had on the analytical results. Areas of review included holding-time compliance, surrogate recovery accuracy, matrix spiked sample precision and accuracy, blank contamination, initial and continuing calibration accuracy and precision, laboratory control sample accuracy, internal standard response and retention time accuracy, instrument tune criteria accuracy, and laboratory and field sample duplicate precision. Additionally, the analytical spectrum and raw data output were reviewed and the laboratory results were recalculated from the raw data.

The following data validation flags were applied to one or more analytical results:

- **U** Not detected. Samples were analyzed for this analyte, but it was not detected above the reporting limit (RL). This flag is not an indicator of a quality control problem.
- **UJ** Detection limit estimated. Samples were analyzed for this analyte, but the results were qualified as not detected. The concentration that the analyte was not detected at is estimated.
- **J** Estimated. The analyte was present but the reported concentration may not be accurate or precise and is considered an estimate.
- **K** The analyte is present. The reported value may be biased high. The actual value is expected to be lower than reported.
- **UL** The analyte was not detected, the reported quantitation limit is probably higher than reported.
- **L** The analyte is present. The reported values may be biased low. The actual value is expected to be higher than reported.
- **B** The analyte was found to be present due to contamination. The concentration of the field result was not substantially detected above the level reported in laboratory or field blanks.
- **R** Rejected. The analytical result is unusable. (*Note*: Analyte/compound may or may not be detected.)

No qualifier Detected. The result for the target parameter is usable at the concentration reported.

3.2.3 Data Quality Evaluation

The data quality evaluation consisted of reviewing the analytical data for systematic errors. These are patterns that are found in the distribution of data qualifiers. The distribution of data qualifiers and systematic errors are discussed below. An evaluation of the data quality is made based on the number of, severity of, and distribution of these data qualifiers. The findings of the data quality evaluation and the overall assessment, discussed in Section 3.2.3.1, are used to make an assessment of their impact on data usability, which is discussed in Section 3.2.3.2.

3.2.3.1 Data Quality Assessment Findings Phase I Investigation

VOCs VOCs were analyzed by USEPA Contract Laboratory Program (CLP) method OLM04.2. Including field quality control samples, 11,501 nonredundant data points were generated. Of these, 2 percent (197 results) were "B" qualified, 2 percent (229 results) were "J" qualified, 10 percent (1,102 results) were "UJ" qualified, and 53 results (0.5 percent) were "R" qualified. Table 3-4 summarizes the distribution of data qualifiers.

The vast majority of the "B" qualifiers were due to acetone and methylene chloride contamination. This is not surprising because these two chemicals are common laboratory contaminants.

The majority of the "J"-qualified results is due to low sample concentrations. The laboratory is required to "J" qualify sample results between the laboratory's method detection limit and the USEPA's contract required reporting limit.

The "UJ" qualifiers were applied for one or more of the following reasons: low internal standard and surrogate recoveries, holding time exceedances, and continuing calibration inaccuracy or imprecision.

The rejected results were limited to 1,2-dibromo-3-chloropropane results, which were caused by low average relative response factors in the initial calibration.

Metals and Cyanide Metals and cyanide were analyzed by USEPA CLP method ILM04.0. Including field quality control samples, 6,456 nonredundant data points were generated. Of these, 8 percent (486 results) were "B" qualified, 28 percent (1811 results) were "J" qualified, 2 percent (112 results) were "K" qualified, 3 percent (210 results) were "L" qualified, 4 percent (233 results) were "UL" qualified, and 2 results (0.03 percent) were "R" qualified. Table 3-4 summarizes the data qualifier distribution.

The majority of the "B"-qualified results was a result of aluminum and/or zinc contamination, 29 percent and 23 percent of the metals respectively.

About half of the "J"-qualified results was due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the USEPA's contract required reporting limit). The remaining "J"-qualified results was due to poor matrix spike recoveries, serial dilutions, and duplicate imprecision. The most common metals to be "J" qualified were potassium, zinc, cobalt, magnesium, and calcium.

Most of the "K"-qualified results was due to high matrix spike recovery of copper and lead.

The "L"- and "UL"-qualified results are due to low matrix spike recovery of antimony, arsenic, cobalt, chromium, mercury, and manganese.

The two rejected results are both due to matrix spike recoveries of antimony that are less than the lowest performance criteria.

Semivolatile Organic Compounds Semivolatile organic compounds were analyzed by USEPA CLP method OLM04.2. Including field quality control samples, 13,456 nonredundant data points were generated. Of these, 76 results (0.5 percent) were "B" qualified, 5 percent (736 results) were "J" qualified, 1 percent (162 results) was "UJ" qualified, 15 results (0.1 percent) were "L" qualified, 2 percent (228 results) were "UL" qualified, and 86 results (0.6 percent) were "R" qualified.

Approximately 90 percent of the "B"-qualified results are due to phthalates. Phthalates are a common laboratory contaminant; this contamination can occur from contact with glass or plastic products.

The majority of the "J"-qualified results is due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the EPA's contract required reporting limit). The remaining "J"- and "UJ"-qualified data are a result of samples being extracted outside of holding times, low surrogate recoveries, or low internal standard recoveries.

Likewise, most of the "UL"- and "L"-qualified results are caused by samples being extracted outside of holding time.

The rejected sample results are 2,4-dinitrophenol and are caused by low average relative response factors in the initial calibration.

Explosives Explosives are analyzed by different methods. Nitroaromatics and nitroamines are analyzed by USEPA's SW-846 method 8330 and CLP method OLM04.2. Nitroglycerine is analyzed by method SW-846 8332, nitroguanidine is analyzed by a modified SW-846 8330, and perchlorate is analyzed by USEPA method 314. Including field quality control samples, 3,035 nonredundant data points were generated. Of these, 3 results (0.1 percent) were "B" qualified, 4 percent (136 results) were "J" qualified, 5 results (0.16 percent) were "K" qualified, 5 results (0.16 percent) were "L" qualified, 26 results (1 percent) were "UL" qualified, 11 results (0.4 percent) were "R" qualified.

Few of the results are qualified; consequently, there are few data trends. As previously discussed, the majority of the "J"-qualified results is due to low sample concentrations (i.e., sample concentrations between the laboratory's method detection limit and the EPA's contract required reporting limit).

The "L"- and "UL"-qualified results are caused by a missed holding time for two samples in one sample delivery group.

The "R"-qualified results are due to a laboratory control sample recovery less than the lowest control limit in sample delivery group G24128.

Total Petroleum Hydrocarbons Samples were analyzed for total petroleum hydrocarbons, both DROs and GROs, by SW-846 method 8015. Including field quality control samples, 191

nonredundant data points were generated. Of these, five results (3 percent) were "B" qualified.

Four of the five "B"-qualified results were for DROs and one was for GROs.

Wet Chemistry Samples were analyzed for hardness by USEPA wastewater method 130.3, percent moisture by ILM04.0, pH by SW-846 9045C, total organic carbon by the Lloyd Kahn method, and percent solids by ASTM method D2216M.

One percent of the moisture results was "J" qualified; all of the other data were not qualified.

3.2.3.2 Impact of Data Quality on Project Data Quality Objectives and Data Usability

The data received were analyzed and reviewed as specified in the work plan:

- The laboratory analyzed the samples in accordance with the USEPA methods as stated in the work plan (B&RE, 1997).
- The data packages were then reviewed by an independent data validator based on the criteria outlined by the USEPA Region III (1993b, 1994a).

The data evaluation showed that the majority of the analytical results (83 percent) were acceptable as reported. Eight percent of the results were qualified "J" as estimated in concentration. The vast majority of these "J" qualifiers are present because the analyte concentration is between the method detection limit and the instrument reporting limit. These "J"-qualified results are acceptable for use as reported. When this is considered, over 90 percent of the results are not qualified and are usable as reported. The number of data qualifiers applied to each sample analysis group is summarized in Table 3-4.

The "J," "JB," "K," "L," "UJ," and "UL" qualifiers indicate that the data values are estimated. These qualifiers can indicate the presence of a quality control problem but not a problem that negatively affects the usability of the data. These data points are considered usable by risk assessors when determining risk to human health and the environment. Data points qualified as such also are considered usable by the project team when assessing impacts to a site.

The sample results qualified with a "B" made up 2 percent of the data. "B" qualifiers indicate contamination that may have come from outside sources that are not attributable to the site. Therefore, in risk assessments, a "B"-qualified result is used only in the statistical evaluation of the sampling event and the result is treated as if not detected. Most of the "B"-qualified results are for methylene chloride, acetone, aluminum, zinc, and the phthalates. These chemicals are common laboratory contaminants, and their results alone should not be used to make project decisions. These results are acceptable to support project decisions (i.e., if a plastic component, such as styrene, is found in an area, then the presence of phthalates makes sense, and the phthalate results should be considered in making project-related decisions).

The "R" qualifier indicates that a sample has been rejected. It is not uncommon that some of the data will be rejected during a large RI. Often the project team can work around rejected data by observing data in previous and future rounds of sampling, or by looking at data at

adjacent sites. During this RI less than 0.5 percent of the data was rejected. The results that are rejected should not be used to make project decisions.

With the exception of the "R"-qualified results (and with caution regarding the "B"-qualified results), the data for CTO 122 at NDWIH are of sufficient quality to support risk and site assessment.

3.2.3.3 Data Quality Assessment Findings Follow-Up Investigations (Sites 11 and 25)

Volatile Organic Compounds Volatile organic compounds were analyzed by USEPA CLP method OLM04.2. Including field quality control samples, 2,393 nonredundant data points were generated. Of these, 1 percent (29 results) were "B" qualified, 2 percent (49 results) were "J" qualified, and 2 results (0.08 percent) were "UJ" qualified. Table 3-4 summarizes the distribution of data qualifiers.

The vast majority of the "B" qualifiers were due to methylene chloride contamination. This is not surprising because methylene chloride is a common laboratory contaminant. The remainder of the "B"-qualified results was due to contamination from the following compounds: bromomethane; 1,2,4-trichlorobenzene; 1,2-dichlorobenzene, and acetone.

The majority of the "J"-qualified results is due to low sample concentrations. The laboratory is required to "J" qualify sample results between the laboratory's method detection limit and the USEPA's contract required reporting limit.

The "UJ" qualifiers were applied for continuing calibration inaccuracy or imprecision.

Metals and Cyanide Metals and cyanide were analyzed by USEPA CLP method ILM04.0. Including field quality control samples, 1,380 nonredundant data points were generated. Of these, 3 percent (44) were "B" qualified, 30 percent (412 results) were "J" qualified, 3 percent (38 results) were "K" qualified, 3 percent (38 results) were "L" qualified, 2 percent (28 results) were "UL" qualified, and 1 percent (16 results) were "R" qualified. Table 3-4 summarizes the data qualifier distribution.

The "B"-qualified results were a result of mercury, magnesium, zinc, and aluminum contamination.

The majority of the "J"-qualified results was due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the USEPA's contract-required reporting limit). The remaining "J"-qualified results were due to inaccuracy or imprecision in the matrix spike recoveries, and poor serial dilution results. The most common metals to be "J"-qualified were nickel, potassium, magnesium, and calcium.

The "K"-qualified results were due to high matrix spike recovery of copper, arsenic, and zinc.

The "L"- and "UL"-qualified results are due to low matrix spike recovery of antimony, manganese, selenium, and thallium.

All rejected results are due to matrix spike recoveries of thallium that are less than the lowest performance criteria.

Semivolatile Organic Compounds SVOCs were analyzed by USEPA CLP method OLM04.2. Including field quality control samples, 2,795 nonredundant data points were generated. Of these, 59 results (2 percent) were "B" qualified, 9 percent (261 results) were "J" qualified, and 13 results (0.45 percent) were "UJ" qualified.

Approximately 56 percent of the "B"-qualified results are due to phthalates. Phthalates are a common laboratory contaminant; this contamination can occur from contact with glass or plastic products. The remainder of the "B"-qualified results are due to acetophenone and benzaldehyde contamination.

The majority of the "J"-qualified results is due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the EPA's contract required reporting limit). The remaining "J"- and "UJ"-qualified data are a result of poor field duplicate reproducibility and/or continuing calibration inaccuracy or imprecision.

Explosives Explosives were analyzed by different methods. Nitroaromatics and nitroamines were analyzed by USEPA's SW-846 method 8330. Nitroglycerine and PETN were analyzed by method SW-846 8332, nitroguanidine by a modified SW-846 8330, and perchlorate by USEPA method 314. Including field quality control samples, 645 nonredundant data points were generated. Of these, 12 results (2 percent) were "UJ" qualified, and 2 results (0.26 percent) were "UL" qualified.

All "UJ"-qualified results are caused by missed holding times for nitroguanidine.

The two "UL"-qualified results are due to low surrogate spike recoveries for nitroglycerin and PETN.

The "R"-qualified results are due to a laboratory control sample recovery less than the lowest control limit in sample delivery group G24128.

Total Petroleum Hydrocarbons Samples were analyzed for TPHs, both DROs and GROs, by SW-846 method 8015. Including field quality control samples, 87 nonredundant data points were generated. Of these, 2 results (2 percent) were "J" qualified.

The "J"-qualified results are due to low sample concentrations.

Wet Chemistry Samples were analyzed for hardness by USEPA wastewater method 130.2, pH by SW-846 9045C, total organic carbon (TOC) by the SW-846 9060, and percent solids by ASTM method D2216M. Including field quality control samples, 39 nonredundant data points were generated. Of these, four results (10 percent) were "J" qualified.

The "J"-qualified results are due to imprecision in matrix spike/matrix spike duplicate results for TOC.

3.2.3.4 Impact of Data Quality on Project Data Quality Objectives and Data Usability

The data received were analyzed and reviewed as specified in the work plan:

- The laboratory analyzed the samples in accordance with the USEPA methods as stated in the work plan (B&RE, 1997).

- The data packages were then reviewed by an independent data validator based on the criteria outlined by the USEPA Region III (1993b, 1994a).

The data evaluation showed that the majority of the analytical results (86 percent) were acceptable as reported. Ten percent of the results were qualified "J" as estimated in concentration. The vast majority of these "J" qualifiers is present because the analyte concentration is between the method detection limit and the instrument reporting limit. These "J"-qualified results are acceptable for use as reported. When this is considered, approximately 96 percent of the results not qualified and are usable. The number of data qualifiers applied to each sample analysis group is summarized in Table 3-4.

The "J," "K," "L," "UJ," and "UL" qualifiers indicate that the data values are estimated. These qualifiers can indicate the presence of a quality control problem, but not a problem that negatively affects the usability of the data. These data points are considered usable by risk assessors when determining risk to human health and the environment. Data points qualified as such also are considered usable by the project team when assessing impacts to a site.

The sample results qualified with a "B," made up 2 percent of the data. "B" qualifiers indicate contamination that may have come from outside sources that are not attributable to the site. Therefore, in risk assessments, a "B"-qualified result is used only in the statistical evaluation of the sampling event and the result is treated as if not detected. Most of the "B"-qualified results are for phthalate, methylene chloride, mercury, magnesium, zinc, and aluminum contamination. Phthalates and methylene chloride are common laboratory contaminants, and their results should not, alone, be used to make project decisions. Trace amounts of metals are also commonly occurring in laboratories. These results are acceptable to support project decisions (i.e., if a plastic component, such as styrene, is found in an area, then the presence of phthalates makes sense and the phthalate results should be considered in making project related decisions).

The "R" qualifier indicates that a sample has been rejected. It is not uncommon that some of the data will be rejected during a large RI. Often the project team can work around rejected data by observing data in previous and future rounds of sampling, or by looking at data at adjacent sites. During this RI approximately 0.2 percent of the data were rejected. The results that are rejected should not be used to make project decisions.

With the exception of the "R"-qualified results, the data for CTO 122 at NDWIH are of sufficient quality to support risk and site assessment.

3.3 Human Health Risk Assessment Methodology

This section describes the methodology used to evaluate the human health risks for Sites 11, 13, 17, 21, and 25. The human health risk assessment (HHRA) was prepared using conservative assumptions. Likely exposure pathways were considered for current and potential future site uses on the basis of current site conditions (without remediation). The risk assessment follows the general methodology described in the *Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual, Part A* (USEPA, 1989) and *RAGS, Volume 1, Human Health Evaluation Manual, Part D* (USEPA, 2001a). *Technical Guidance*

Manuals for Risk Assessment, published by USEPA's Region III, also were followed. The standard tables required for RAGS Part D are included in Appendix G.

The results of the HHRA will be used to document the potential for endangerment to human health, to assist in identifying the exposure media that may need to be addressed through remedial action, and to provide a basis from which to select remediation goals.

The HHRA comprises the following components:

- **Identification of Chemicals of Potential Concern**—Identification of the contaminants found onsite and selection of the chemicals of potential concern (COPCs). COPCs represent the subset of all chemicals detected at the site that provides the largest contribution to total site risks. COPCs are the focus of subsequent evaluation in the risk assessment.
- **Exposure Assessment**—Identification of the potential pathways of human exposure and estimation of the magnitude, frequency, and duration of these exposures.
- **Toxicity Assessment**—Assessment of the potential adverse effects of the COPCs and development of toxicity values used for calculating numerical risk estimates.
- **Risk Characterization**—Integration of the results of the exposure assessment and toxicity assessment to develop numerical estimates of health risk and characterization of the potential health risks associated with exposure to site-related contamination.
- **Uncertainty Assessment**—Identification and discussion of sources of uncertainty in the risk assessment.

These components are described in the following sections. Spreadsheets prepared in accordance with USEPA RAGS Part D were used to identify the COPCs, and to calculate estimated exposures and health risks associated with the COPCs for each site (Appendix G).

3.3.1 Identification of Chemicals of Potential Concern

The identification of COPCs includes data collection, data evaluation, and data-screening steps. The data collection and evaluation steps involve gathering and reviewing the available site data and identifying a set of data that is of acceptable quality for the risk assessment. This data set is then screened against concentrations that are protective of human health to focus on those chemicals and media that need to be evaluated quantitatively in the risk assessment. All of the data used for the quantitative risk analysis were validated.

Sections 4, 5, 6, 7, and 8 identify the data that have been collected at each site and the data sets used for the risk assessment for Sites 11, 13, 17, 21, and 25, respectively. Section 3.3.1.1 discusses how the different data qualifiers and sample types were evaluated in the HHRA. Section 3.3.1.2 discusses the screening methodology used to focus the risk assessment data set on the constituents and media that are of primary concern to human health. The COPCs for Sites 11, 13, 17, 21, and 25 are identified in Sections 4, 5, 6, 7, and 8, respectively.

3.3.1.1 Data Evaluation

Available data for each site were reviewed to determine their reliability for the quantitative risk assessment. The following bullets discuss how validated data with different qualifiers were handled in the HHRA:

- Estimated values flagged with a "J" qualifier were treated as detected concentrations.
- Data qualified with an "R" (rejected) were not used in the risk assessment.
- One-half of the sample quantitation limit (SQL) was used as the sample concentration for samples where no detectable contaminant quantities were found in that sample, but the contaminant was detected in other samples from that medium at the site.
- Data qualified with a "B" (blank contamination) were used in the risk assessment as if they were nondetects. One-half of the SQL was used as the sample concentration.
- For duplicate samples, the higher of the two concentrations was used as the sample concentration.

3.3.1.2 Selection of Chemicals of Potential Concern

All of the constituents detected in the data used for the risk assessment for each site were screened using the method described below. The purpose of the screening was to reduce the list of detected constituents to those constituents of greatest potential concern for human health. The constituents that were selected as COPCs were evaluated quantitatively in the risk assessment. Constituents that were not detected in any of the samples collected from a medium were not retained as COPCs for that medium.

The selection of COPCs was based on the criteria presented in USEPA Region III risk assessment guidelines (USEPA, 1993b) and USEPA's *RAGS Part D* (USEPA, 2001a). The maximum concentration of each detected constituent in each medium at each site was compared to the following criteria to select the COPCs for each medium at each site. If the maximum concentration of a constituent exceeded the criteria, the constituent was selected as a COPC.

Comparison with Risk-based Concentrations The maximum detected chemical concentrations in groundwater, soil, and surface water were compared with the risk-based concentrations (RBCs) in USEPA Region III's Updated Risk-Based Concentration Table (USEPA, 2003).

The RBCs based on noncarcinogenic effects were divided by 10 to reflect a target hazard quotient of 0.1. The RBCs based on carcinogenic endpoints are based on a target cancer risk of 1x10-6 and were not adjusted from the values presented in the RBC table.

Groundwater data were compared to the tap water RBCs.

Soil data were screened against the residential soil ingestion RBCs.

Soil data also were compared to the soil screening levels (SSLs) for groundwater migration using a dilution and attenuation factor (DAF) of 20 (USEPA, 2000a). Constituents whose maximum concentration exceeded the SSLs were discussed qualitatively in the risk assessment.

Air concentrations associated with fugitive and volatile emissions from soil (calculated from soil data) were compared to the ambient air RBCs.

Surface water data were compared to 10 times the tap water RBCs. The use of 10 times the tap water RBC is a conservative estimate assuming that a receptor's contact with surface water is much less than with groundwater (i.e., lower ingestion rate, exposure frequency, and exposure duration).

Comparison with Recommended Dietary Allowances Chemicals that are essential in human nutrition, present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and toxic only at very high doses were eliminated as COPCs. These constituents are calcium, magnesium, potassium, and sodium.

Constituents were considered for inclusion in the risk assessment even if they were eliminated through one of the methods above, based on historical information, exceptional toxicity, mobility, persistence, bioaccumulation, special treatability problems, or Applicable or Relevant and Appropriate Requirements (ARARs) exceedance.

Lead Screening Lead concentrations in soil and sediment were compared to the USEPA residential child soil screening value of 400 parts per million (ppm), as determined by the Integrated Exposure Uptake Biokinetic Model (IEUBK). Lead concentrations in groundwater and surface water were compared to the Safe Drinking Water Act action level of 15 parts per billion (ppb).

Constituents not on USEPA Region III RBC Table A number of detected constituents do not have RBCs listed on the USEPA Region III RBC table because there are no published toxicity values for these constituents. Appropriate surrogate constituents were selected, and their RBCs were used to screen the constituents without available RBCs. These constituents, and the selected surrogate constituents, are indicated on the COPC screening tables (Table 2s) in Appendix G (G.1d, G.2d, G.3d, G.4d, and G.5d, for Sites 11, 13, 17, 21, and 25, respectively).

3.3.2 Exposure Assessment

Exposure assessment evaluates potential human exposure to site-related COPCs present at or migrating from the site. The purpose of exposure assessment is to identify and evaluate the contaminant sources, release mechanisms, exposure pathways, exposure routes, and receptors for the site. Exposure can occur when contaminants migrate from a source to an exposure point, or when a receptor comes into direct contact with contaminated media. A conceptual exposure model showing potential exposure scenarios identified under current and potential future conditions is presented in Sections 4, 5, 6, 7, and 8 for each site.

The following sections discuss the three components of exposure assessment:

- Characterization of exposure setting
- Identification of exposure pathways
- Quantification of exposure

3.3.2.1 Characterization of Exposure Setting

Characterizing an exposure setting consists of two parts: (1) characterization of the site with respect to the physical characteristics, and (2) characterization of the site with respect to human populations at or near the site.

Physical Characteristics Basic site characteristics, such as physical setting, climate, groundwater hydrology, and the presence and location of surface water, are discussed in Section 2.

Potentially Exposed Populations Potentially exposed populations are identified for current and future land use based on their locations relative to the site, their activity patterns, and the presence of potential sensitive subpopulations. Tables 1 in Appendixes G.1d, G.2d, G.3d, G.4d, and G.5d summarize the potentially exposed populations for each site. Sections 4, 5, 6, 7, and 8 discuss the current and future land use for Sites 11, 13, 17, 21, and 25, respectively. Potentially exposed populations considered for evaluation for these sites include current and future industrial site workers, trespassers/visitors, and recreational users, and future residents and construction workers. Although it is unlikely any of the sites will be used for residential development in the future, residential exposure was conservatively evaluated in the HHRA.

3.3.2.2 Identification of Exposure Pathways

Potential exposure pathways need to be identified to evaluate the potential health risks associated with site-related contamination. The exposure pathway describes a mechanism through which a receptor may be exposed to a chemical or physical agent at or originating from the site. An exposure pathway must be complete to contribute to potential human exposure. A complete exposure pathway has five elements:

- A source (e.g., chemical residues in soil)
- A mechanism for release and migration of chemical (e.g., leaching)
- An environmental transport medium (e.g., groundwater)
- A point or site of potential human contact (exposure point, e.g., drinking water)
- A route of intake (e.g., ingestion of groundwater used as a drinking water source)

All five elements must be present for a pathway to be considered complete. If one or more element is not present, then the pathway is incomplete and there is no exposure or health risk. The elements, as they pertain to Sites 11, 13, 17, 21, and 25 at Indian Head, are discussed in Sections 4, 5, 6, 7, and 8, respectively.

3.3.2.3 Quantification of Exposure

Exposure is quantified by estimating the exposure point concentrations and the chemical intakes by the receptor.

Exposure Point Concentrations Exposure point concentrations are estimated chemical concentrations that a receptor may contact and are specific to each exposure medium. Exposure point concentrations may be directly monitored or estimated using environmental fate and transport models. For this assessment, fate and transport modeling was used to estimate constituent concentrations in vapors from groundwater while showering and in vapors volatilized from groundwater from an open excavation. Per discussions with

USEPA, volatilization while showering was estimated using the Foster and Chrostowski shower model (Foster and Chrostowski, 1987). Volatilization from groundwater in an open excavation was estimated using a two-film volatilization model. The model calculations are included in Appendixes G.1d, G.2d, G.3d, G.4d, and G.5d.

The exposure point concentrations for the reasonable maximum exposure (RME) scenario were based on the 95 percent upper confidence limit of the mean (95 percent UCL) or the maximum detected concentration. The exposure point concentrations for the central tendency (CT) exposure scenario were based on the mean or the maximum detected concentration. The 95 percent UCL was calculated for all sites and media in which there were five or more samples. The maximum detected concentration was used as the RME exposure point concentration when the calculated 95 percent UCL was greater than the maximum detected value or there were less than five samples in the data set. There were less than five samples for Site 17, Site 21, and Site 25 shallow groundwater. The Shapiro-Wilks W test, using an alpha value of one percent, was used to determine if the data fit a lognormal or normal distribution. The 95 percent UCL was selected based on the correct distribution, either lognormal or normal. If the W-test was inconclusive, the distribution the data best fit, as indicated by the higher W-test value, was used.

The 95 percent UCL for a lognormal distribution was calculated as follows:

$$95 \text{ percent UCL} = \exp(TM + 0.5*s^2 + (s*H/(n-1)^{0.5}))$$

Where:

Exp = natural exponent
TM = transformed mean
s = standard deviation of the transformed data
H = H-statistic
n = sample size

The 95 percent UCL for a normal distribution was calculated as follows:

$$95 \text{ percent UCL} = NM+(t*s/(n)^{0.5})$$

Where:

NM = normal arithmetic mean
t = t-statistic
s = standard deviation
n = sample size

The filtered metal results were used to evaluate potable use of Site 21 groundwater because there was an order of magnitude difference between the filtered and unfiltered results, following USEPA guidance (USEPA, 1992b). There was no significant difference between filtered and unfiltered results for Sites 11, 17, and 25 groundwater samples; therefore, the unfiltered results were used for these sites. The unfiltered metal results were used for all sites to evaluate groundwater exposure by the construction worker because the construction worker would be directly exposed to the groundwater in the excavation.

Estimation of Chemical Intakes for Individual Pathways Chemical intake is the amount of the chemical contaminant entering the receptor's body. Chemical intakes are generally expressed as follows:

$$I = \frac{C \ x \ CR \ x \ EF \ x \ ED}{BW \ x \ AT} = (mg/kg/day)$$

Where:

I = intake (mg/kg-day)

C = chemical concentration at exposure point (mg/L, mg/kg, mg/m^3)

CR = contact rate, or amount of contaminated medium contacted per unit time or event (L/day, mg/event, m^3/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight of exposed individual (kg)

AT = averaging time, or period over which exposure is averaged (days)

The intake equation requires specific exposure parameters for each exposure pathway. Exposure parameters are often assumed values, and their magnitude influences the estimates of potential exposure and, consequentially, risk. The reliability of the values chosen can also contribute substantially to the uncertainty of the resulting risk estimates. Many of the exposure parameters have default values, which were used for this assessment. These assumptions, based on estimates of body weights, media intake levels, and exposure frequencies and duration are provided by USEPA guidance. Other assumptions required consideration of location-specific information and were determined using professional judgment. Table 4s in Appendixes G.1d, G.2d, G.3d, G.4d, and G.5d present the exposure factors used for the different scenarios at Sites 11, 13, 17, 21, and 25. RME and CT exposure factors are included in these tables. CT intakes were calculated for exposure scenarios with RME cancer risks greater than $1x10^{-4}$ or noncancer hazard greater than 1.

For residential exposure to groundwater and soil, lifetime age-adjusted intakes were calculated for carcinogenic constituents. This involved determining age-adjusted factors for ingestion, dermal contact, and inhalation. These factors were calculated using the equations presented in the USEPA Region III RBC table (USEPA, 2002) for calculating age-adjusted factors.

For dermal exposure to groundwater during construction and bathing, the non-steady state model or pseudo steady-state model was used to estimate the absorbed dose for organic constituents (USEPA, 1992a). If the exposure time was shorter than the lag time (time to reach pseudo steady state), the non-steady state model was used. If the exposure time was greater than the lag time, the pseudo-steady state model was used. These models are shown for the groundwater exposure pathways in the Table 4s in Appendixes G.1, G.2, G.3, G.4, and G.5, for Sites 11, 17, 21, and 25, respectively.

For the dermal contact with soil and sediment scenarios, an absorption factor is required. The absorption factors used for this evaluation are those presented in USEPA's Supplemental Guidance for Dermal Risk Assessment, Exhibit 3-4 (USEPA, 2001b). For the dermal contact with water scenario, skin permeability rates were obtained from the USEPA's *Dermal Exposure Assessment Guidance* (USEPA, 1992a).

3.3.3 Toxicity Assessment

Toxicity assessment weighs the available evidence regarding the potential for a particular chemical to cause adverse effects in exposed individuals and provides a numerical estimate of the relationship between the extent of exposure and possible severity of adverse effects. Toxicity assessment consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to a chemical. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population. From this quantitative dose-response relationship, toxicity values (e.g., reference doses [RfDs] and carcinogenic slope factors [CSFs]) are derived.

USEPA has assessed the toxicity of many chemicals and has published the resulting toxicity information and toxicity values in the Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEAST) databases. IRIS is USEPA's preferred source of toxicity information, and includes only those noncarcinogenic RfDs and CSFs that have been verified by USEPA workgroups. HEAST, which is issued by USEPA's Office of Research and Development, was consulted when data were not available in IRIS. If data were not available from either of these sources, USEPA's National Center for Environmental Assessment (NCEA) data were used.

Health effects are divided into two broad groups: noncarcinogenic and carcinogenic effects. This division is based on the different mechanisms of action currently associated with each category. Chemicals causing noncarcinogenic health effects were evaluated independently from those having carcinogenic effects. Some chemicals may produce both noncarcinogenic and carcinogenic effects, and were evaluated in both groups. This section discusses noncarcinogenic and carcinogenic effects separately, and concludes with a brief discussion of the toxicological properties of selected COPCs.

3.3.3.1 Toxicity Information for Noncarcinogenic Effects

Noncarcinogenic health effects include a variety of toxic effects on body systems, ranging from renal toxicity (toxicity to the kidneys) to central nervous system disorders. Noncarcinogenic health effects are grouped into two basic categories: acute toxicity and chronic toxicity. Acute toxicity can occur after a single exposure (usually at high doses), and the effect is most often seen immediately. Chronic toxicity describes effects that occur after repeated exposure (usually at low doses) and is seen weeks, months, or years after the initial exposure. The toxicity of a chemical is assessed through a review of toxic effects noted in short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

USEPA (USEPA, 1989) defines the chronic RfD as an estimate of a daily exposure to the human population, including sensitive subpopulations, which is likely to be without

appreciable risk of deleterious effects during a lifetime. Chronic RfDs are developed to be protective for long-term exposure to a compound (7 years to a lifetime). Chronic RfDs may be overly protective if used to evaluate the potential for adverse health effects resulting from short-term exposure. NCEA develops subchronic RfDs for short-term exposure (2 weeks to 7 years). Subchronic RfDs have been peer-reviewed by USEPA and outside reviewers, but they have not undergone verification by a USEPA workgroup, and as a result are considered interim rather than verified toxicity values. Chronic and subchronic RfDs are developed for both inhalation and oral exposures. Chronic RfDs were used to evaluate the noncarcinogenic risks to all potential receptors except the construction worker. Subchronic RfDs were used to evaluate the noncarcinogenic risks to the construction worker. If a subchronic RfD was not available, the chronic RfD was used to evaluate noncarcinogenic risks to the construction worker.

In the development of RfDs, all available studies examining the toxicity of a chemical following exposure are considered based on their scientific merit. The lowest dose level at which a toxic effect is observed is identified as the "lowest-observed-adverse-effect-level" (LOAEL) and the dose at which no effect is observed is identified as the "no-observed-adverse-effect-level" (NOAEL). Several uncertainty factors (UFs) are applied to the LOAEL or NOAEL to extrapolate these dose points to humans. These UFs range between 10 and 10,000. Additional modification factors (MFs) also are used based on the professional judgment of the agency.

USEPA-derived oral and inhalation RfDs, and associated UFs and MFs, for the COPCs at Sites 11, 13, 17, 21, and 25, are listed in Tables 5.1 and 5.2 in Appendixes G.1d, G.2d, G.3d, G.4d, and G.5d, respectively.

3.3.3.2 Toxicity Information for Carcinogenic Effects

Potential carcinogenic effects from human exposure to chemicals are estimated quantitatively using oral CSFs, inhalation CSFs, or unit risk factors that convert estimated exposures directly to incremental lifetime cancer risks. CSFs may be derived from the results of chronic animal bioassays, human epidemiological studies, or both. Animal bioassays are usually conducted at dose levels that are much higher than levels likely to be produced by human exposure to environmental media. This extrapolation detects possible adverse effects in the relatively small test populations used in the studies. These high dose levels must be extrapolated to lower doses. A number of mathematical models and procedures have been developed to extrapolate from the high doses used in the studies to the low doses typically associated with environmental exposures.

The USEPA-preferred linearized multistage model (LMS) is usually used to estimate the largest linear slope (within the 95 percent UCL) at low extrapolated doses that is consistent with the data. The 95 percent UCL slope of the dose-response curve is subjected to various adjustments, including an inter-species scaling factor, to derive a CSF or inhalation unit risk factor for humans. It is assumed that if a cancer response occurs at the dose level in the study, there is some probability that a response will occur at all lower exposure levels (i.e., a dose-response relationship with no threshold is assumed). Conservative (e.g., health protective) assumptions are applied and the models are believed to provide rough estimates of the upper limits on potential lifetime risk. The actual risks associated with exposure to a

potential carcinogen that are quantitatively evaluated using the CSF are not likely to exceed the estimated risks, and are probably much lower or may even be zero.

In addition to deriving a quantitative estimate of carcinogenic potency, USEPA also assigns weight-of-evidence classifications to potential carcinogens. Chemicals are classified as Group A, Group B1, Group B2, Group C, Group D, or Group E carcinogens. The classifications are described as follows:

- Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.
- Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.
- Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.
- Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.
- Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.
- Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

USEPA-derived oral and inhalation CSFs, and weight-of-evidence classifications for the COPCs at Sites 11, 13, 17, 21, and 25 are listed in Tables 6.1 and 6.2 included in Appendixes G.1d, G.2d, G.3d, G.4d, and G.5d, respectively.

3.3.3.3 Derivation of Dermal RfDs and CSFs

Oral RfDs and CSFs were converted to dermal RfDs and CSFs using an oral to dermal adjustment factor. This factor is designed to convert the oral administered dose toxicity factors to dermal absorbed dose toxicity factors. The values used for this conversion were obtained from USEPA's Supplemental Guidance for Dermal Risk Assessment (USEPA, 2001b). The oral RfDs were converted to dermal RfDs by multiplying by the absorption efficiency and the oral CSFs were converted to dermal CSFs by dividing by the absorption factor. If a chemical-specific absorption factor was not available, a dermal absorption factor of 100 percent was used.

3.3.3.4 Toxicity Profiles of Selected Chemicals

Below are toxicological profiles of selected constituents, including the main risk drivers at Sites 11, 13, 17, 21, and 25. Toxicological profiles are provided for aluminum, antimony, arsenic, barium, cadmium, chromium, copper, 1,2,-dichloroethene, iron, manganese, thallium, and vinyl chloride. More detailed toxicity information can be found in USEPA's IRIS database, Agency for Toxic and Disease Registry's (ATSDR's) toxicological profiles, and other published literature.

Aluminum Aluminum is not thought to be harmful to humans in the forms normally encountered. However, aluminum is not a necessary substance for humans, and excess exposure may be harmful to certain people. Exposure to high levels of aluminum in air may result in respiratory problems, including coughing and asthma. Mice studies have shown that aluminum at high levels may cause skeletal and neurological development delays in young animals. Aluminum has been linked to Alzheimer's disease because those patients have high levels of aluminum in the brain. However, it is not known whether aluminum causes the disease or whether the buildup of aluminum happens to people who already have the disease.

Aluminum has not been classified for carcinogenicity. Available information has not shown that aluminum is a potential carcinogen.

Antimony Exposure to antimony through inhalation or ingestion may result in pneumoconiosis, altered electrocardiogram (EKG) readings, increased blood pressure, abdominal distress, ulcers, dermatosis, and ocular irritation. No effects were found in humans after dermal exposure to antimony.

Effects to animals exposed through inhalation, ingestion, or dermal contact include fibrosis in the lung, altered EKG readings, myocardial damage, vomiting and diarrhea, parenchymatous degeneration in the liver and kidney, muscle weakness, difficulty moving, developmental effects, and lung cancer.

No information on the carcinogenic potential of antimony in humans was found.

Arsenic Inorganic arsenic has been recognized as a human poison since ancient times, and large oral doses (above 60,000 ppb in food or water) can produce death. If lower levels of inorganic arsenic are ingested (ranging from about 300 to 30,000 ppb in food or water), irritation of the stomach and intestines may be experienced, with symptoms such as pain, nausea, vomiting, and diarrhea. Other effects experienced from ingesting arsenic include decreased production of red and white blood cells, abnormal heart rhythm, blood-vessel damage, and impaired nerve function causing a "pins and needles" sensation in the hands and feet. Ingesting arsenic has also been reported to increase the risk of cancer in the liver, bladder, kidney, and lung. There is no evidence indicating that arsenic can harm pregnant women or their fetuses. However, studies in animals show that maternally toxic doses of arsenic may cause low birth weight, fetal malformations, or even fetal death.

Perhaps the single most characteristic effect of long-term oral exposure to inorganic arsenic is a pattern of skin changes (0.01-0.1 milligrams per kilogram/day [mg/kg/day] for months to years). This includes a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso. While these skin changes are not considered to be a health concern, a small number of the corns may ultimately develop into skin cancer. Direct skin contact with inorganic arsenic compounds may result in irritation with some redness and swelling. However, it does not appear that skin contact is likely to lead to any serious internal effects.

If high levels of inorganic arsenic are inhaled, some of the short-term effects from exposure include a sore throat, irritated lungs or some of the skin effects described above, however these effects are typically not serious. The exposure level that produces these health effects is uncertain, however it is likely to be above 100 micrograms per cubic meter ($\mu g/m^3$).

Inhalation of inorganic arsenic is also known to increase the risk of lung cancer. An increase of lung cancer has been observed in workers exposed to arsenic in or around smelters.

Almost no information is available on the effects of organic arsenic compounds in humans. Studies in animals show that most organic arsenic compounds are less toxic than the inorganic forms.

Barium Exposure to acute levels of barium has caused respiratory, gastrointestinal, cardiovascular, renal, and neurological effects. Respiratory effects of benign pneumonoconiosis have been observed in workers exposed occupationally by inhalation to barium. Acute ingestion of barium has also lead to cardiovascular effects of increased blood pressure, changes in heart rhythm, myocardial damage, changes in heart physiology, changes in metabolism, and gastrointestinal effects of hemorrhaging, pain, vomiting, and diarrhea. Renal effects of degeneration and failure, and neurological effects of numbness, tingling of the mouth, neck, partial and complete paralysis, and brain congestion and edema were reported in human case studies.

Certain subgroups of the population may be more susceptible to barium exposure, including people with cardiovascular problems, those taking certain prescription drugs, children, pregnant women, smokers, and people with lung disease.

Barium has not been evaluated by USEPA for human carcinogenic potential.

Cadmium Exposure to cadmium may affect the gastrointestinal tract and kidneys. Effects such as nausea, vomiting, and abdominal pain have occurred. An interconnection exists between renal effects and musculoskeletal effects when examining cadmium exposure to humans. Evidence in humans and animals suggests that lower level chronic exposure to cadmium causes alterations in renal metabolism of vitamin D, which may then cause mild bone effects. Cadmium exposure may also lead to respiratory effects resulting in the destruction of lung epithelial cells, pulmonary edema, tracheobronchitis, and pneumonitis, and hematological effects causing anemia.

There is strong evidence that inhalation of cadmium can cause lung cancer in rats, and weak evidence of lung cancer in humans. Animal studies have also shown that injection of cadmium into the skin or muscles causes tumors in rats, primarily at the site of injection and in the testes. USEPA has classified cadmium as a probable human carcinogen by ingestion (Group B1), based on the positive response in humans and in rats.

Chromium In nature, chromium (III) predominates over chromium (VI). Little chromium (VI) exists in biological materials, except shortly after exposure, because reduction to chromium (III) occurs rapidly. Chromium (III) is considered a nutritionally essential trace element and is considerably less toxic than chromium (VI). Acute oral exposure of humans to high doses of chromium (VI) induced neurological effects, gastrointestinal hemorrhage and fluid loss, and kidney and liver effects. An NOAEL of 2.5 mg chromium (VI)/kg/day in a one-year drinking water study in rats and an uncertainty factor of 300 was the basis of a verified RfD of 0.003 mg/kg/day for chronic oral exposure. An NOAEL (no effects were observed in rats consuming 5 percent chromium (III)/kg/day in the diet for over two years) of 1,468 mg/kg-day for chromium (III) and an uncertainty factor of 100 was the basis of RfD of 1.5 mg/kg/day for chronic oral exposure.

Occupational (inhalation and dermal) exposure to chromium (III) compounds induced dermatitis. Similar exposure to chromium (VI) induced ulcerative and allergic contact dermatitis, irritation of the upper respiratory tract including ulceration of the mucosa and perforation of the nasal septum, and possible kidney effects.

A target organ was not identified for chromium (III). The kidney appears to be the principal target organ for repeated oral dosing with chromium (VI). Additional target organs for dermal and inhalation exposure include the skin and respiratory tract.

Copper Noncarcinogenic effects observed in humans exposed to copper include gastrointestinal, hepatic, renal, dermal, neurological, and possibly developmental effects. Ingestion of high levels of copper has produce vomiting, nausea, diarrhea, and anoxemia. Centrilobular necrosis of the liver and necrosis and sloughing of tubular cells in the kidney have been observed in people dying from copper poisoning. Dermal exposure to copper has resulted in contact allergic dermatitis in some individuals.

Copper exposure by humans can also lead to Wilson's disease, an autosomal recessive disorder that affects normal copper homeostasis. The systemic manifestation of Wilson's disease is hepatic and renal lesions and hemolytic anemia. The disease also debilitates the central nervous system causing poor coordination, psychological impairment, tremor, disturbed gait, and rigidity.

An elevated incidence of cancer has not been observed in humans or animals exposed to copper via inhalation, oral, or dermal exposure routes.

1,2-Dichloroethene 1,2-Dichloroethene (DCE) is commonly used to produce solvents and is used as an intermediate in chemical synthesis. Low levels of trans-1,2-DCE have been reported to cause neurological effects. Inhalation of high levels (1,700-2,220 ppm for 5 minutes) of trans-1,2-DCE can cause nausea, drowsiness, and fatigue. One human fatality has been reported as a result of inhaling 1,2-DCE; however the level of exposure is unknown. When animals have inhaled high levels (200 ppm) of trans-1,2-DCE for short (8 hours) or long periods of time (8 hours/day, 5 days/week for 8 or 16 weeks), their livers and lungs were damaged. The effects were more severe with longer exposure times. Animals inhaling very high levels (3,000 ppm) of trans-1,2-DCE had damaged hearts. Ingestion of extremely high doses (1,000-4,900 ppm) of cis-or trans-1,2-DCE caused animals to die. Lower oral doses (480 mg/kg/day for 30 days) of cis-1,2-DCE caused decreased numbers of red blood cells. A recent animal study suggests fetuses exposed to 1,2-DCE (12,000 ppm 6 hr/day on days 7-16 of gestations) may not grow as quickly as those that have not been exposed. Exposure to 1,2-DCE has not been shown to affect human or animal fertility. No studies have been conducted to determine whether cancer in humans or animals is caused by exposure to 1,2-DCE.

Iron Iron is an essential human nutrient with a recommended daily dose of 18 mg/day for females. Oral intakes ranging between 20 mg/kg and 60 mg/kg are potentially toxic. Toxicity is likely following an ingestion of 60 mg/kg or greater. Symptoms of acute oral exposure include: vomiting, diarrhea, mild lethargy stupor, shock, acidosis, hematemesis, bloody diarrhea, or coma. With less serious overdoses, the initial gastrointestinal symptoms may be the only findings to develop even without treatment. Although serious iron poisoning in adults is rare, deaths have been reported. Effects from chronic over-exposure to

iron include disturbances in liver function, diabetes, mettitus, possible endocrine disturbances, and cardiovascular effects. These health effects occur when body iron content reaches 20 to 40 grams (g).

Inhalation of iron oxide fumes or dust by workers in metal industries may result in deposition of iron particles in lungs, producing an X-ray appearance resembling silicosis. Inhalation of some iron dusts and fumes can cause siderosis, a type of benign pneumoconiosis. Levels of iron among iron workers developing pneumoconiosis have been reported to exceed 10 mg iron/m^3.

Manganese Manganese is an essential nutrient with a typical intake ranging between 2,000 μg/day to 9,000 μg/day in a normal diet. No cases of illness from eating too little manganese have been reported in humans. In animals, eating too little manganese can interfere with normal growth, bone formation, and reproduction. Manganese miners and steel workers exposed to high levels of manganese dust in air (1,000 to 22,000 μg/m^3) may have mental and emotional disturbances, and their body movements may become slow and clumsy, which is known as manganism. Workers usually do not develop symptoms of manganism unless they have been exposed to manganese dust over a period of many months or years. Inhaling high levels of manganese dust (970 μg/m^3 for 1-19 years) can also cause irritation of the lungs, make breathing difficult, and increases the chance of developing a lung infection, such as pneumonia. However, this can happen from inhaling many different kinds of dust particles, not just those that contain manganese. Impotence is also a common health effect observed in men who are exposed to high levels of manganese dust in air (970 μg/m^3, 1-19 years).

It is uncertain whether ingesting or inhaling high concentrations of manganese can cause manganism. In one report, humans who drank water containing high levels of manganese (14 milligrams per liter [mg/L]) developed symptoms similar to those seen in manganese miners and steel workers, but it is not certain if the effects were caused by manganese alone. Although humans are frequently exposed to significant quantities of manganese compounds in food and water, reports of adverse effects in humans are rare.

There is no information on any human or animal health effects from skin contact with manganese. There is not much information on whether manganese can cause birth defects. One study in humans suggests that high exposures to manganese in the environment might increase the chances of birth defects, but other factors besides manganese might have been responsible. One study in animals shows that exposure of pregnant females to high levels of manganese in air (61 mg/m^3 for 16 weeks prior to gestation) can lead to changes in behavior of the offspring.

Thallium Thallium and its compounds have not been well studied. Little information is available on absorption, distribution, and metabolism. Animal studies suggest that thallium is completely absorbed. It is probably transported in the body in a manner similar to iron. Animal studies indicate that thallium accumulates in the kidney, heart, brain, bone, skin, and blood.

Occupational exposure to thallium has been reported to affect the nervous system. Workers have complained of crawling of the skin, prickling skin, numbness of the extremities, burning feet, and muscle cramps.

No data are available on the carcinogenic response associated with thallium in animals or humans.

Vinyl Chloride Vinyl chloride, a colorless gas, is a halogenated aliphatic hydrocarbon with the empirical formula of C_2H_3CI. It is used primarily as an intermediate in the manufacture of PVC; limited quantities are used as a refrigerant and as an intermediate in the production of chlorinated compounds.

Vinyl chloride is rapidly absorbed from the gastrointestinal tract and lungs. Metabolism of vinyl chloride occurs primarily in the liver via oxidation by hepatic microsomal enzymes to polar compounds that can be conjugated with glutathione and/or cysteine.

In humans and animals, vinyl chloride is a central nervous system (CNS) depressant, inducing narcosis and anesthesia at high concentrations. Nonneoplastic toxic effects observed in workers exposed by inhalation to vinyl chloride include hepatoxicity, acroosteolysis and scleroderma, and Raynaud's syndrome, a vascular disorder of the extremities. Also reported were abnormalities of CNS function, high blood pressure, and occasional pulmonary effects.

For the oral route of exposure, the primary target organ of vinyl chloride toxicity in animals is the liver. In addition to the CNS, target organs for inhalation exposure include the liver, kidneys, lungs, spleen, and testes. Subchronic inhalation studies with rodents documented hepatic effects at concentrations as low as 50 ppm and degenerative changes of the liver and kidneys.

The carcinogenicity of vinyl chloride in humans has been in a number of epidemiological studies and case reports, many of which associated occupational exposure to vinyl chloride to the development of angiosarcomas of the liver. In addition to liver cancer, exposure to vinyl chloride also has been linked to an increased risk of lung, brain, hematopoietic, and digestive tract cancers. Vinyl chloride has been shown to be carcinogenic in numerous animal studies.

3.3.4 Risk Characterization

Risk characterization is the final step in the human health risk assessment. Risk characterization combines the results of the previous elements of the risk assessment to evaluate the potential health risks associated with exposure to COPCs. The risk characterization is then used as an integral component in remedial decision making and selection of potential remedies or actions.

Potential human health risks are discussed independently for carcinogenic and noncarcinogenic contaminants because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. Some chemicals may produce both noncarcinogenic and carcinogenic effects, and were evaluated in both groups. The methodology used to estimate noncarcinogenic hazards and carcinogenic risks are described below.

3.3.4.1 Noncarcinogenic Hazard Estimation

Noncarcinogenic health risks are estimated by comparing calculated exposures to RfDs. The calculated intake divided by the RfD is equal to the hazard quotient (HQ):

Hazard Quotient (HQ) = Intake / RfD

The intake and RfD are expressed in the same units (mg/kg-day) and represent the same exposure period (i.e., chronic or subchronic). The intake and RfD also represent the same exposure route (i.e., oral intakes are divided by oral RfDs). A HQ that exceeds unity (i.e., exposure exceeds the RfD), indicates that there is a potential for adverse health effects associated with exposure to that chemical. To assess the potential for noncarcinogenic health effects posed by exposure to multiple chemicals a "hazard index" approach is used. This approach assumes that noncarcinogenic hazards associated with exposure to more than one chemical are additive. Synergistic or antagonistic interactions between chemicals are not accounted for. The hazard index (HI) may exceed unity even if all of the individual HQs are less than one.

3.3.4.2 Carcinogenic Risk Estimation

The potential for carcinogenic effects due to exposure to site-related contamination is evaluated by estimating the excess lifetime carcinogenic risk (ELCR). ELCR is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer. For example, a $2x10^{-6}$ excess lifetime carcinogenic risk means that for every one million people exposed to the carcinogen throughout their lifetimes, the incidence of cancer may increase by two cases. The background probability of developing cancer, from all known causes, is about one in four (American Cancer Society, 1993).

The carcinogenic risk is calculated by multiplying the intake by the CSF.

Risk = Intake × CSF

The combined risk from exposure to multiple chemicals was evaluated by adding the risks from different chemicals. Risks were also added across the exposure routes if an individual would be exposed through multiple routes. For example, a person contacting soil could be exposed by both oral and dermal exposure routes.

3.3.4.3 Interpretation of Numerical Results

The USEPA considers action to be warranted at a site when cumulative cancer risks exceed 10^{-4}. Action is generally not required for risks falling within $1x10^{-4}$ to $1x10^{-6}$; however, this is judged on a case-by-case basis. Risks less than $1x10^{-6}$ generally are not of concern to regulatory agencies. A HI greater than one indicates that there is some potential for adverse noncarcinogenic health effects associated with exposure to the contaminants of concern, possibly warranting remedial action (USEPA, 1991b). A health risk-based remedial decision can be superseded by the presence of an environmental impact, or an exceedance of a regulatory standard (such as an MCL), which may indicate the need for action at the site.

RME risks were evaluated for all media and exposure scenarios. RME risks were evaluated using upper bound estimates of the exposure parameters and the RME concentration. CT risks were calculated for those scenarios that had an RME HI greater than 1.0 and/or RME carcinogenic risk greater than $1x10^{-4}$. CT risks were evaluated using median estimates of the exposure parameters and the CT exposure point concentration (which is the same as the RME exposure point concentration).

3.3.5 Uncertainty Assessment

The risk measures used in Superfund risk assessments are not fully probabilistic estimates of risk but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus, it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective (USEPA, 1989). A discussion of the uncertainties for Sites 11, 13, 17, 21, and 25 associated with each component of the risk assessment is presented in the following sections.

3.3.5.1 Uncertainty in COPC Selection

The sampling conducted at the sites focused on areas of known or suspected contamination. The uncertainty associated with sampling and the possibility of missing a contaminated location is expected to be minimal based on the methods used to select the sampling locations. The uncertainty associated with the data analysis is minimal because the data were fully validated prior to use in the risk assessment.

The general assumptions used in the COPC selection process were conservative to ensure that true COPCs were not eliminated from the quantitative risk assessment and that the highest possible risk was estimated.

3.3.5.2 Uncertainty Associated with Exposure Assessment

Most of the exposure pathways evaluated at the site were assumed, and the exposure factors used for the quantitation of exposure were conservative and reflect worst-case or upper-bound assumptions on the exposure. The reliability of the values chosen for the exposure factors contributes substantially to the uncertainty of the resulting risk estimates.

It was assumed that all of the sites may be used for residential purposes in the future. Based on the nature of Indian Head, this is not a likely scenario. It is also not likely that the shallow groundwater would ever be used as a potable or industrial water supply due to the availability of better water supplies.

Site-related contamination would be expected to decrease with time. The risk assessment assumed concentrations would remain constant throughout the exposure period. This will result in an over-estimation or risk.

It was assumed that the receptor would be exposed to the most contaminated location at the site for the full exposure duration. This is not likely because the receptors area of activity is larger than this location. Therefore, this will result in an over-estimation of risk. Additionally, the maximum detected concentration was used as the exposure concentration for a number of constituents and media, due to the limited number of samples available. This will lead to an over-estimation of risk.

There is uncertainty associated with the fate a transport modeling conducted for the risk assessment. A two-film volatilization model was applied to determine volatilization from groundwater in an excavation. This model results in a great degree of uncertainty, and it is not known if it would result in an over- or under-estimation of risk.

A statistical comparison to background data was not performed as part of the risk assessment. This may result in an over-estimate of the actual risk because many of the

COPCs evaluated in the risk assessment are inorganic constituents which may not be site-related and therefore may be associated with background conditions.

3.3.5.3 Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the noncarcinogenic toxicity factors are included in Appendix G, Tables 5.1 and 5.2. Several uncertainty factors (UFs) were applied to extrapolate dose points from animal studies to humans. These UFs range between 10 and 10,000. Additional modification factors are also used based on the professional judgment of USEPA. Therefore, there is a high degree of uncertainty in the noncarcinogenic toxicity criteria, based on the available scientific data for each compound. The noncarcinogenic toxicity factors are most likely an overestimate of actual toxicity.

CSFs developed by USEPA represent upper bound estimates. Carcinogenic risks generated in this assessment should be regarded as an upper bound estimate on the potential carcinogenic risks rather than an accurate representation of carcinogenic risk. The true carcinogenic risk is likely to be less than the predicted value (USEPA, 1989).

The uncertainty associated with CSFs are mostly associated with the low dose extrapolation where carcinogenicity at low doses is assumed to be straight line responses. This is a conservative assumption, which introduces a high uncertainty into slope factors that are extrapolated from this area of the dose-response curve. The CSFs are based on assumption that there is no threshold level for carcinogenicity, however, most of the experimental studies indicate existence of a threshold level.

There is a large degree of uncertainty associated with the oral to dermal adjustment factors (based on chemical-specific gastrointestinal absorption factors) used to transform the oral RfDs based on administered doses to dermal RfDs based on absorbed doses. It is not know if the adjustment factor results in an underestimate or overestimate of the actual toxicity associated with dermal exposure.

3.3.5.4 Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals, such as additivity, synergism, potentiation, and susceptibility of exposed receptors. The simple assumption of additivity used for this site may or may not be accurate and may over- or under-estimate risk; however, a better alternative is not available at this time.

3.4 Ecological Risk Assessment Methodology

This section describes the general technical approaches, methodologies, models, and parameter values used to prepare the Screening Ecological Risk Assessment (SERA) [Steps 1 and 2] and the first step (Step 3A) of the Baseline Ecological Risk Assessment (BERA) for Sites 11, 13, 17, 21, and 25. Site-specific modifications to the approach and methodology outlined in this section are described in Sections 4.7, 5.7, 7.7, and 8.7 for Sites 11 and 17, 13, 21, and 25, respectively. The ERAs were conducted in general accordance with Navy (CNO, 1999; NAVFAC, 2001) and USEPA (USEPA, 1997b) ecological risk assessment guidance. For sites with a Step 3A indicating the potential for more than minimal risk, the next step will be

to prepare a revised problem formulation (Step 3B) and work plan (Step 4) for additional risk investigation and evaluation.

3.4.1 Problem Formulation Development

Problem formulation establishes the goals, scope, and focus of the risk assessment. Preliminary conceptual models are developed for each site that describe potential sources, transport pathways, exposure pathways and routes, and potential receptors. Assessment endpoints and measurement endpoints are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. The fate, transport, and toxicological properties of the chemicals present at each site are also considered during this process.

Discussion of the fate and transport of chemicals provides information on how chemicals are transported from sources to receptors. Exposure routes are the specific mechanism by which a chemical contacts or enters the body of a receptor. Exposure routes can include ingestion (of water, soil, sediment or prey with chemical body burdens), inhalation, and dermal absorption. Dermal and inhalation exposures for upper trophic level receptor species are not considered significant relative to ingestion exposures because of the general fate properties (e.g., relatively high adsorption to solids) of the chemicals commonly present at these sites and the protection offered by hair or feathers.

The conclusion of the problem formulation stage includes the selection of preliminary assessment and measurement endpoints, based on the preliminary conceptual model. Endpoints in the SERA define ecological attributes that are to be protected (assessment endpoints) and measurable characteristics of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has occurred or could occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site (USEPA, 1997b). Assessment endpoints contain an entity (e.g., fish-eating birds) and an attribute of that entity (e.g., survival rate).

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, receptor species (e.g., great blue heron) or species groups (e.g., fish) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (guilds; e.g., piscivorous birds) represented in the assessment endpoints (e.g., survival and reproduction of piscivorous birds).

3.4.2 Analysis

3.4.2.1 Ecological Effects Evaluation

The purpose of the effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. Medium-specific screening values for surface water, sediment, and surface soil, and the rationale for their selection, are provided in Appendix H-1.

Ingestion screening values for dietary exposures were derived for each avian/mammalian receptor species and chemical evaluated in the assessment. Toxicological information from

the literature for wildlife species most closely related to the receptor species was used, where available, but was supplemented by laboratory studies of nonwildlife species (e.g., laboratory mice) where necessary. The ingestion screening values are expressed as milligrams of the chemical per kilogram body weight (wet) of the receptor per day (mg/kg-BW/day).

NOAELs from chronic studies with endpoints of growth or reproduction were selected preferentially. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic LOAELs or acute values as follows:

- When values for chronic toxicity were not available, the median lethal dose (LD_{50}) was used. An uncertainty factor of 100 was used to convert the acute LD_{50} to a chronic NOAEL (i.e., the LD_{50} was multiplied by 0.01 to obtain the chronic NOAEL).
- An uncertainty factor of 10 was used to convert a reported chronic LOAEL to a chronic NOAEL.

Ingestion screening values for mammals and birds are summarized in Tables 3-5 and 3-6, respectively.

3.4.2.2 Ecological Exposure Estimation

The assumptions, parameter values, and methods to estimate ecological exposures were as follows:

- Risk estimates were based on maximum concentrations in Step 2 and average concentrations in Step 3A. For upper trophic level receptors, average chemical concentrations provide a more representative estimate of the likely level of chemical exposure because the local population (and in many cases individual organisms for highly mobile species with large home ranges relative to the size of the site) would be expected to occur throughout the site (where suitable habitat is present) and, in many cases, off the site. Mean concentrations (or some other estimate of central tendency) may also be appropriate for evaluating potential risks to populations of lower trophic level terrestrial and aquatic receptors because the members of the population are expected to be found throughout the site (where suitable habitat is present), rather than concentrated in one particular area. While effects on individual organisms might be important for some receptors, such as rare and endangered species, population- and community-level effects are typically more relevant to ecosystems. A discussion of the spatial coverage of soil, sediment, and surface data are included in each of the site-specific assessments. In many cases, the average concentration is a conservative representation of the true site average because samples are generally biased toward areas of known or suspected contamination.
- Bioaccumulation factors (BAFs) and bioconcentration factors (BCFs) were based on, or modeled from, central tendency estimates (e.g., median or mean) from the literature.
- Maximum ingestion rates and minimum body weights were used in Step 2. In Step 3A, central tendency estimates for body weight and ingestion rate were used to develop exposure estimates for upper trophic level receptors. The use of central tendency

exposure parameter estimates is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.

- In addition to the NOAELs, consideration is also given to risk estimates based on LOAELs.
- Chemicals that were not detected in any samples but had reporting limits that exceeded screening values were carried into Step 3A. These nondetected chemicals and chemicals that were detected but lack toxicological information are discussed in the risk calculation and uncertainty sections of each of the site-specific assessments.

Selection Criteria for Analytical Data Available analytical data were selected based on the following criteria:

- Data must have been validated by a qualified data validator using acceptable data validation methods. Rejected ("R") values were not used. Unqualified data and data qualified as "J," "L," or "K" were treated as detected. Data qualified as "U" or "B" were treated as nondetected.
- Surface soil or sediment data collected prior to any major physical disturbance (such as capping or paving) that would result in the elimination of realistic exposure pathways were not used in the assessments. In addition, surface soil samples that were collected under paved surfaces were not used.
- For surface soil, samples collected from depths of 0 in. to 6 in. were used because this depth range represents the most realistic potential exposures for most of the ecological receptors evaluated in terrestrial habitats.
- For sediment, samples from depths of 0 in. to 6 in. were used preferentially because this depth range represents the most realistic exposures for sediment-dwelling species.

Selection of Receptors The upper trophic level receptor species used in the assessments vary for each site, depending on the habitats and exposure media present. Life history information and exposure parameters for the receptors are summarized in the ecological exposure estimation section for each site. Potential risks to amphibians (adults) and reptiles were evaluated using other fauna (birds and mammals) as surrogates, while fish and amphibians (tadpoles) were evaluated through a comparison with surface water and sediment screening values.

Lower trophic level receptor species were evaluated in the assessments based on those taxonomic groupings for which screening values have been developed; these groupings and screening values are used in most ecological risk assessments. As such, specific species of aquatic biota (e.g., macroinvertebrates) were not chosen as receptor species because of the limited information available for specific species and because aquatic biota are dealt with on a community level via a comparison to surface water and sediment screening values. Similarly, terrestrial plants and soil invertebrates (earthworms are the standard surrogate) were evaluated using the lower of the soil screening values developed specifically for these groups.

Exposure Estimation Upper trophic level receptor exposures to chemicals present in surface soil, sediment, and surface water were determined by estimating the concentration of each

chemical in each relevant dietary component. Incidental ingestion of soil or sediment was included when calculating the total exposure. Because receptors (and their prey) are not exposed directly to chemicals in groundwater, food web exposures were not calculated based on groundwater concentrations. Exposure via drinking water was included in the food web for sites with a permanent source of drinking water.

Not all chemicals were evaluated for food web exposures. Only chemicals analyzed for and identified as potential bioaccumulators (USEPA, 2000b) were evaluated.

Dietary items for which tissue concentrations were modeled included terrestrial plants, soil invertebrates (earthworms), small mammals, aquatic plants, aquatic invertebrates, and fish/ frogs. The methodologies used for these tissue calculations are outlined in the following subsection. The uptake of chemicals from the abiotic media into these food items was based (where available) on central tendency estimates (e.g., mean or median) of BCFs or BAFs from the literature. Default factors of 1.0 were used only when data were unavailable for a chemical in the literature. If measured tissue values were available, they were used in place of modeled estimates.

Exposure Point Concentrations Maximum (Step 2) and averages (Step 3A) were used as exposure point concentrations for exposure estimation and food web modeling. Exposure point concentrations for terrestrial and aquatic prey items (plants, soil invertebrates, small mammals, aquatic invertebrates, frogs, and fish) were estimated using bioaccumulation models and measured surface soil or sediment concentrations. The methodology and models used to derive these estimates are described below.

Terrestrial Plants Tissue concentrations in the above-ground vegetative portion of terrestrial plants were estimated by multiplying the surface soil concentration for each chemical by chemical-specific soil-to-plant BCFs obtained from the literature. The BCF values used were based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for terrestrial plants (15 percent; Sample et al., 1997).

For inorganic chemicals without literature based BCFs, a soil-to-plant BCF of 1.0 was assumed. For organic chemicals without literature based BCFs, soil-to-plant BCFs were estimated using the algorithm provided in Travis and Arms (1988):

$$\log B_v = 1.588 - (0.578)(\log K_{ow})$$

where: B_v = Soil-to-plant BCF (unitless; dry weight basis)

K_{ow} = Octanol-water partitioning coefficient (unitless)

The log K_{ow} values used in the calculations were obtained mostly from USEPA (1995b, 1996c) and are listed in Table 3-7. The soil-to-plant BCFs used in this ERA are shown in Table 3-8.

Earthworms Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same chemical in the

surrounding environmental medium (in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Because earthworms consume soil, BAFs are more appropriate values and are used in the food web models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) are given preference over undepurated analyses when selecting BAF values because direct ingestion of soil is accounted for separately in the food web model.

The BCF/BAF values used were based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms (16 percent [USEPA, 1993c]). For chemicals without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed. The soil-to-earthworm BCFs/BAFs used in this ERA are shown in Table 3-8.

Small Mammals Whole-body tissue concentrations in small mammals (shrews, voles, and/or mice) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BAFs, the small mammal tissue concentration was obtained by multiplying the surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BAF obtained from the literature. The BAF values used were based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for small mammals (32 percent; USEPA, 1993c). BAFs for shrews, voles, and mice are those reported in Sample et al. (1998a) for insectivores (or for general small mammals if insectivore values were unavailable), for herbivores, and for omnivores, respectively. The soil-to-small mammal BAFs used in these ERAs are shown in Table 3-9.

For chemicals without soil-to-small mammal BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for these small mammal species is via the diet, it was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a diet to whole-body BAF (wet-weight basis) of one was assumed. The use of a diet to whole-body BAF of one is likely to result in a conservative estimate of chemical concentrations for chemicals that are not known to biomagnify in terrestrial food chains (e.g., polynuclear aromatic hydrocarbons [PAHs]). For chemicals that are known to biomagnify (e.g., polychlorinated biphenyls [PCBs]), a diet to whole-body BAF value of one will likely result in a realistic estimate of tissue concentrations based on reported literature values. For example, a maximum BAF (wet weight) value of 1.0 was reported by Simmons and McKee (1992) for PCBs based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for DDT of 0.3 for voles and 0.2 for short-tailed shrews. Reported BAF (wet-weight) values for dioxin were only slightly above one (1.4) for the deer mouse (USEPA, 1990). Resulting tissue concentrations (wet-weight) were then converted to dry weight using an estimated solids content of 32 percent (see above).

Aquatic Plants Tissue concentrations in the above-ground vegetative portion of aquatic plants were estimated using the same methodologies as described above for terrestrial

plants except that sediment (not soil) concentrations were used in the calculation. The sediment-to-plant BCFs used in the ERA are shown in Table 3-10.

Aquatic Invertebrates Tissue concentrations in aquatic invertebrates were estimated by multiplying the mean measured sediment concentration for each chemical by chemical-specific sediment-to-invertebrate BAFs obtained from the literature. The BAF values used were based on the ratio between dry-weight sediment and dry-weight invertebrate tissue. BAFs based on depurated analyses (sediment was purged from the gut of the organism prior to analysis) were given preference over undepurated analyses when selecting BAF values because direct ingestion of sediment is accounted for separately in the food web model.

Literature values based on the ratio between dry-weight sediment and wet-weight invertebrate tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for aquatic invertebrates (21 percent [0.21]; USEPA, 1993c). For chemicals without literature based sediment-to-invertebrate BAFs, a BAF of 1.0 was assumed. The sediment-to-invertebrate BAFs used in the ERA are shown in Table 3-11.

Fish/Frogs Tissue concentrations in whole-body fish and frogs were estimated by multiplying the sediment concentration for each chemical by chemical-specific sediment-to-fish BAFs (extrapolated to frogs) obtained from the literature. The BAF values used were based on the ratio between dry-weight sediment and dry-weight fish tissue. Literature values based on the ratio between dry-weight sediment and wet-weight fish tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for fish (25 percent [0.25]; USEPA, 1993c). For chemicals without literature based sediment-to-fish BAFs, a BAF of 1.0 was assumed. The sediment-to-frog and sediment-to-fish BAFs used in the ERA are shown in Tables 3-10 and 3-11, respectively.

Dietary Intakes Dietary intakes for each receptor species were calculated using the following formula (modified from USEPA [1993c]):

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

where:

DI_x	=	Dietary intake for chemical *x* (mg chemical/kg body weight/day)
FIR	=	Food ingestion rate (kg/day, dry-weight)
FC_{xi}	=	Concentration of chemical *x* in food item *i* (mg/kg, dry weight)
PDF_i	=	Proportion of diet composed of food item *i* (dry weight basis)
SC_x	=	Concentration of chemical *x* in soil/sediment (mg/kg, dry weight)
PDS	=	Proportion of diet composed of soil/sediment (dry weight basis)
WIR	=	Water ingestion rate (L/day)

WC_x = Concentration of chemical *x* in water (mg/L)

BW = Body weight (kg, wet weight)

3.4.3 Screening-Level Risk Calculation

In the screening-level risk calculation (Step 2), HQs are calculated by dividing the maximum chemical concentration in the medium being evaluated by the corresponding medium-specific screening value, or by dividing the maximum exposure dose by the corresponding ingestion screening value (i.e., NOAEL). Chemicals with HQs greater than or equal to 1.0 are considered preliminary COPCs.

Preliminary COPCs also include chemicals which were not detected but had maximum detection limits in excess of screening values or estimated exposure doses in excess of NOAELs. Chemicals that could not be evaluated due to lack of a media-specific screening value or appropriate NOAEL are also selected as preliminary COPCs. If there are preliminary COPCs, the risk assessment process continues into Step 3A.

3.4.4 Refinement of Exposure Assumptions (Step 3A)

In Step 3A, exposure assumptions are refined and risk estimates (i.e., HQs) are recalculated. As discussed, Step 3A modifications include the use of central tendency estimates for media concentrations and exposure parameters. Risk is again characterized and uncertainties associated with conclusions are described. If re-evaluation of the conservative exposure assumptions supports an acceptable risk determination then the site may exit the ecological risk assessment process (CNO, 1999).

COPCs are selected in Step 3A from the list of preliminary COPCs. The selection process involves consideration of the HQs based on refined exposure assumptions (for food chain modeling, both LOAEL and NOAEL based HQs are considered), patterns in detection, consideration of likely risk from chemicals without screening values, consideration of background concentrations, and consideration of the basis of the direct contact and ingestion-based screening values compared to site conditions. If there are COPCs at the end of Step 3A, the risk assessment process continues to Step 3B (revised problem formulation) and Step 4 (baseline ecological risk assessment work plan).

Uncertainties are also discussed as part of the ERA. Uncertainties are present in all risk assessments because of the limitations of available data and the need to make certain assumptions and extrapolations based on incomplete information. The general uncertainties associated with the assessments are discussed below. Specific uncertainties associated with individual sites are discussed in Sections 4.7, 5.7, 7.7, and 8.7.

- **Detection limits**—Detection limits for some chemicals exceed applicable screening values in some media. When this occurs for chemicals that were not detected in any site samples, the chemical is generally not selected as a COPC because it is highly unlikely that the chemical is present at environmentally significant levels. This introduces some uncertainty in the risk assessment.

- **Ingestion screening values**—Data on the toxicity of many chemicals to the receptor species were sparse or lacking, requiring the extrapolation of data from other wildlife species or from laboratory studies with nonwildlife species. This is a typical limitation

and extrapolation for ecological risk assessments because so few wildlife species have been tested directly for most chemicals. The uncertainties associated with toxicity extrapolation were minimized through the selection of the most appropriate test species for which suitable toxicity data were available. The factors considered in selecting a surrogate species to represent another receptor species or group of species were taxonomic relatedness, trophic level, foraging method, and similarity of diet.

A second uncertainty related to the derivation of ingestion screening values applies to metals. Most of the toxicological studies on which the ingestion screening values for metals were based used forms of the metal (such as salts) that have high water solubility and high bioavailability to receptors. Because the analytical samples on which site-specific exposure estimates were based on measured total metal, regardless of form, and highly bioavailable forms are expected to compose only a fraction of the total metal concentration, this is likely to result in an overestimation of potential risks for these chemicals.

A third source of uncertainty associated with the derivation of ingestion screening values concerns the use of uncertainty factors. For example, NOAELs were extrapolated to LOAELs using an uncertainty factor of ten. This approach is likely to be conservative because Dourson and Stara (1983 *cited in* USEPA, 1997b) determined that 96 percent of the chemicals included in a data review had LOAEL/NOAEL ratios of five or less. The use of an uncertainty factor of 10, although potentially conservative, also serves to counter some of the uncertainty associated with interspecies extrapolations, for which a specific uncertainty factor was not used.

- **Chemical mixtures**—Information on the ecotoxicological effects of chemical interactions is generally lacking. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).

- **Receptor species selection**—Reptiles and amphibians were evaluated for risk using other fauna as surrogates. This represents an uncertainty in the risk assessment. In addition, there is some uncertainty associated with the use of specific receptor species to represent larger groups of organisms (e.g., guilds).

- **Food web exposure modeling**—In some cases, chemical concentrations in terrestrial and aquatic food items (e.g., plants, earthworms, and fish) were modeled from measured media concentrations and were not directly measured. The use of generic, literature-derived exposure models and bioaccumulation factors introduces some uncertainty into the resulting estimates. However, the values selected and methodology employed were intended to provide a conservative (Step 2) or more realistic (Step 3A) estimate of potential food web exposure concentrations.

  Another source of uncertainty is the use of default assumptions for exposure parameters such as BCFs and BAFs. Although BCFs or BAFs for many bioaccumulative chemicals were readily available from the literature and were used in the BERA, the use of a default factor of 1.0 to estimate the concentration of some chemicals in receptor prey items is a source of uncertainty.

3.5 General Concepts of Fate and Transport

The following discussion presents general concepts of fate and transport. These concepts are presented here to avoid repetition in the following chapters. Site specific discussions are presented in Sections 4 through 8.

3.5.1 Contaminant Mobility and Persistence

The behavior of contaminants in the surface and subsurface environments are determined by their physical, chemical, and biological interaction with the environment. The mobility and persistence of the chemicals in the environment are two key characteristics in predicting behavior. Mobility is the potential for a chemical to migrate through a medium (e.g. soil or groundwater) and persistence is a measure of how long a chemical will remain in the environment. Mobility and persistence of chemicals depend on the physical and chemical characteristics of the contaminants and those of the medium. Some of the environmental factors that affect the mobility and persistence of contaminants include: pH, concentration of other chemicals in the media, soil moisture, oxidation-reduction potential, water chemistry, organic-matter content, and the presence and types of microorganisms in the subsurface.

The following sections identify the contaminant groups of interest at Sites 11, 13, 17, 21, and 25 and the physical and chemical properties of those contaminants.

3.5.1.1 Contaminant Groups

Many organic and inorganic constituents were detected in environmental media at IHDIV-NSWC. The nature and extent of these chemicals at the various sites are discussed in detail in Sections 4 through 8. Discussing the fate and transport of all of the identified chemicals would be cumbersome and repetitive. Instead, the chemicals are discussed as groups (i.e., SVOCs, TPH, explosives, and inorganics), with only occasional reference to particular chemicals where the chemical-specific properties differ significantly from the generalities discussed.

Certain chemicals were selected to represent the range of chemicals found at IHDIV-NSWC. The representative chemicals were selected on the basis of high concentrations, frequency of occurrence, occurrence in several media, variable migration potential, and likely contribution to overall risk to human health and the environment.

3.5.1.2 Physical and Chemical Properties

Various basic physical and chemical properties affect the transport of chemicals in the environment. The following are considered to be the most important properties:

- Sorption
- Volatilization
- Degradation
- Transformation
- Bioaccumulation

Sorption Sorption is the tendency for chemicals to adsorb to and desorb from materials in the media through which the contaminants are being transported. The subsurface materials likely to sorb chemicals typically are clays and organic material, both of which are present in

the subsurface. In addition, inorganic chemicals adsorb onto iron, manganese, and aluminum oxyhydroxide or oxide coatings on soil and sediment grains. Adsorption of metals can be irreversible because of the process of fixation.

The conventional measure of sorption is the distribution coefficient (K_d) of soil and geologic material for the chemical. The K_d for organic chemicals is calculated as the product of a partition coefficient (K_{oc}) and the fraction of organic carbon (f_{oc}). In general, chemicals with a K_{oc} greater than 10,000 milliliters per gram (ml/g) (e.g. many SVOCs) have high degrees of adsorption and consequently low mobility, whereas chemicals with a K_{oc} lower than 1,000 ml/g (e.g., many VOCs) have lower degrees of adsorption and consequently higher mobility. The K_d for inorganic chemicals is a complex function of pH, organic content, oxide coatings, and other factors; therefore, K_d is not easily estimated for metals by methods other than site-specific testing.

The migration rates of dissolved contaminants range widely between different chemicals because of their degree of adsorption. As a first estimate, they will move at the rate of groundwater flow, or by advection. Typically, however, contaminants will not move as rapidly as the groundwater because of adsorption of the contaminant on the geologic media.

Volatilization Volatilization is the tendency for some chemicals, particularly VOCs, to change from a liquid or adsorbed state to a gas. A conventional measure of volatility is Henry's Law Constant (K_h). Compounds with K_h values higher than 10^{-3} atmosphere-cubic meter per mole (atm-m^3/M) (e.g., all site-related chlorinated VOCs) are expected to volatilize readily from water to air, whereas those with K_h values lower than 10^{-5} atm-m^3/M (e.g., SVOCs) are relatively nonvolatile.

Degradation Degradation is the transformation of one chemical to another by such processes as hydrolysis, photolysis, and biodegradation. Hydrolysis is the reaction of a chemical with water and photolysis is the result of exposing the chemical to light. Biodegradation occurs when microorganisms convert one chemical to another as part of their respiration process.

Degradation is commonly expressed as a half-life that composites the degradation by whatever processes may be operating.

Transformation Transformation occurs when metals are increased or reduced in valence state by oxidation or reduction, respectively. Transformation may have a significant effect on the mobility of a metal, either increasing or decreasing it. Transformation can be caused by Eh and pH changes and by microbial or nonmicrobial (abiotic) processes.

Bioaccumulation Bioaccumulation is the process of chemicals adsorbing to and accumulating in plants and the organ tissue of animals. Chlorinated VOCs tend to have low K_{oc} values, indicating that these compounds tend to remain in the aqueous phase and are not readily bioaccumulated.

3.5.2 Representative Chemicals

The following general and chemical-specific profiles briefly describe how the chemical and physical properties of representative constituents affect their mobility and persistence in the environment. The chemical and physical properties of these and other selected contam

inants are presented in Table 3-12. It should be noted that inorganics were not included in the table because the specific form of the analytes is not known. Similarly, TPH was not included because TPH is a solution of over 100 chemicals, as discussed below.

3.5.2.1 Vinyl chloride

Vinyl chloride has a low K_{oc} value indicating high mobility in soil with very little partitioning from water to soil. The low K_{ow} and the high solubility (1,100 mg/L) indicate that vinyl chloride tends to remain in the aqueous phase and is not readily bioaccumulated.

Vinyl chloride has a very high vapor pressure and a high K_h, which allow it to volatilize rapidly from soil and surface water. Once vinyl chloride is in the atmosphere, photo-oxidation reduces it to hydrogen chloride and carbon monoxide.

Within both saturated and unsaturated soil, vinyl chloride can form by the biodegradation of tetrachloroethene (PCE), trichloroethene (TCE), and 1,2-DCE. Further biodegradation of vinyl chloride to carbon dioxide has been documented under laboratory conditions, but it may not be as important a factor in natural environments. Half-lives for vinyl chloride in groundwater range from 8 weeks to almost 8 years while half-lives in soil range from 4 weeks to about 6 months.

3.5.2.2 Benzo(a)pyrene

Benzo(a)pyrene is characterized by very low vapor pressure and solubility in water, and high K_{oc} and K_d values, indicating a tendency to sorb to organic matter in soil. Volatilization is an insignificant transport mechanism. Transport by groundwater is generally limited because of the low solubility and its preference for adsorbing to organic material in soil.

PAHs such as benzo(a)pyrene do not contain functional groups that are susceptible to hydrolytic reactions. Therefore, hydrolysis is not a significant degradation process for this compound. Biodegradation of PAHs is well-documented and likely is the ultimate fate of benzo(a)pyrene. Limited nutrient and oxygen availability and the presence of such potential microbe inhibitors as arsenic could limit the effectiveness of biodegradation.

Most aquatic organisms rapidly metabolize and excrete PAHs and typically exhibit only short-term bioaccumulation. Therefore, this is not an important process.

3.5.2.3 Arsenic

The predominant form of arsenic in oxidizing environments is arsenate (As[VI]). Under slightly reducing and acidic conditions, such as temporary flooding, the more toxic and mobile arsenite (As[III]) form dominates. Arsenite and methylated arsine predominate in moderately reducing soil, such as tidal marshes and consistently flooded soil.

Transport and partitioning of arsenic in water depend on the oxidation state of the arsenic and on interactions with other materials present. Organic matter, divalent metals, and dissolved sulfide enhance the reduction of the arsenic valence state to a more mobile form. Soluble forms move with water, but arsenic may be adsorbed from water onto sediment or soil, especially clays, iron oxyhydroxides and oxides, aluminum hydroxides, manganese compounds, and organic material. Adsorption to oxyhydroxides is the most important

natural adsorption process. Microbes are capable of methylating arsenic to trimethylarsine gas, which is a more volatile and mobile form than inorganic arsenic.

Bioaccumulation of arsenic occurs in aquatic organisms, particularly algae and lower invertebrates. Although some fish and invertebrates may contain high levels of arsenic compounds, the predominant arsenic form, arsenobetaine, is relatively inert. Biomagnification in aquatic food chains does not appear to be significant.

3.5.2.4 Lead

The dominant species of lead in the aqueous solution is Pb(II) under acidic conditions and Pb(II)-carbonate complexes under alkaline conditions. Adsorption and precipitation increase with increasing pH, with most lead precipitating out at pH greater than 6. In oxidizing systems, the least soluble common forms of lead are the carbonate, hydroxide, and hydroxycarbonate. In reducing conditions where sulfur is present, lead sulfide is the stable solid.

Lead is an extremely stable metal, although it dissolves in acid. Due to its very low vapor pressure, volatilization of lead from the soil and water is negligible, although benthic microbes may convert methylated lead to tetramethyl lead, which tends to volatilize to the atmosphere. Lead complexes with organic matter and clay minerals that limit its mobility. Only a small fraction of lead in soil will be in a water-soluble form.

Lead is effectively removed from water to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (especially as lead sulfide), and the reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates as the process for removing lead from solution. If released into the water, metallic lead will sink into the sediment.

Lead may bioconcentrate in fish or other biota.

3.5.2.5 Perchlorate

Perchlorate is highly mobile in the aqueous environment, with a solubility of 24.9 percent by weight or approximately 226,000 mg/L. Its density is nearly twice that of water, so it will tend to sink in water when present as a free phase. Perchlorate is nonvolatile, although a specific K_h and vapor pressure were not available from the literature. Perchlorate is a kinetically stable ion and reductive dechlorination does not occur without an input of energy (heat or light) or the presence of a catalyst. Perchlorate adsorbs only weakly to most soil minerals.

3.5.2.6 Total Petroleum Hydrocarbons

TPH refers to nonhalogenated petroleum products such as gasoline, light fuel oils, heavy fuel oils, motor oil, and crude oil.

Unlike the chemicals discussed in sections 3.5.2.1 through 3.5.2.5, TPH is not a specific single compound with standard properties. Instead, TPH compounds are complex mixtures of typically more than 100 compounds, each with its own unique properties, whose ratios will change with time depending upon the conditions to which they are exposed. For example, when a petroleum product is released to the ground surface, some compounds in the

mixture will volatilize while others will adhere to the soil and still other will tend to dissolve into surface runoff or infiltrate to the groundwater. Compounds that volatilize or degrade quickly will disappear, leaving the more persistent compounds behind in the soil or water. As a result, the fate and transport properties of the mixtures are variable and change with product and time.

Gasoline Range Organics The primary product that falls within the definition of GRO is automotive gasoline. Typical gasoline is a mixture of more than 150 chemicals. The types and ratios of these chemicals depend on the source of the crude oil and the process under which it is made. An example composite of gasoline by weight is 50 percent alkanes and alkenes, primarily in the C-5 to C-6 range (short chain), 5 percent cycloalkanes, 30 percent aromatics (i.e. benzene, toluene, xylenes, ethylbenzene, and others) and 15 percent other additives (e.g., methyl-tertiary-butyl-ether, ethanol, methanol, and acids).

Most of the chemicals in gasoline are highly volatile (short chain alkanes and alkenes and aromatics) and will quickly be released to the atmosphere after a spill. The higher weight compounds will adsorb to soil to some extent. Adsorption is greatest for alkenes followed by aromatics, cycloalkanes and the alkanes.

Gasoline mixtures are lighter than water and as a result, tend to float on top of the water table or surface water in a nonaqueous phase when released to the groundwater or surface water. However, some of the compounds that make up gasoline (particularly the aromatics) are easily dissolved in water, leaving the remainder in a separate phase.

Diesel Range Organics The products that fall under this definition are complex mixtures of straight-chain (aliphatic) cyclic, and aromatic hydrocarbons. They may also contain small amounts of nitrogen, sulfur, and other substances. Examples of products that would fall under this category from lightest to heaviest are kerosene, diesel fuel No. 1, home heating oil, heavy residential fuel oil No. 4, and No. 6 heating oil.

In general, DRO mixtures have a lesser volatile fraction and a greater adsorption potential than GRO. They are slightly heavier mixtures than GRO, yet are still lighter than water. The solubility of DRO mixtures has been estimated to be approximately 5 mg/L.

3.5.3 Physical Processes Affecting Contaminant Migration

Various physical processes affect contaminant migration depending on the medium in which the contaminant is detected. The most common processes are discussed below.

3.5.3.1 Releases from Soil to the Atmosphere

Wind erosion and vehicular traffic are typically the primary mechanisms for the release of surface soil or exposed subsurface soil to the air. A contaminant associated with the entrained soil particles will be transported away from the contaminant source. Inorganics and many SVOCs tend to bind strongly to the soil, particularly the fine particulates that are more readily suspended by wind or vehicular traffic. Vegetation and the leaf litter present at a site inhibit wind erosion by protecting the soil form the affects of wind or vehicles. Particularly grasses hold soil in place with their roots.

Volatilization (as discussed above) is the primary mechanism for the transfer of volatile contaminants from soil to the atmosphere.

3.5.3.2 Transport from Surface Soil to Subsurface Soil or From One Area to Another

During storm events and in the spring during snowmelt, contaminants associated with the surface soil may dissolve into the surrounding soil water and be transported away from the source. This may occur vertically from surface soil to subsurface soil or areally via overland flow (runoff). VOCs may be transported vertically in this manner; however, this is not a significant process for the transport via runoff of due to VOCs high volatility. Due to their tendency to sorb to particulate matter, SVOCs are not transported to a large extent in this manner. Inorganics vary with solubility and mobility.

Additionally, during precipitation events, finer particles from the soil will be suspended and transported with the runoff downgrade until the particles are deposited. Any contaminants, organic or inorganic, associated with the eroded soil will be transported in this manner, in particular, SVOCs, because of their tendency to sorb to particulate matter. Less mobile inorganics, such as iron in its oxidized form, may also be transported with the eroded soil.

3.5.3.3 Releases from Soil to Surface Water and Sediment

The release of contaminants from soil to surface water and sediment is much the same as discussed in Section 3.5.3.2. During storm events and in the spring during snowmelt, contaminants associated with the surface soil may dissolve into the surrounding soil water and be transported away from the source in runoff. This is not a significant process for the transport of VOCs due to their high volatility. It is also not a significant process for the transport of SVOCs due to their tendency to sorb to particulate matter. The more mobile inorganics, however, such as arsenic, may be transported in this manner.

Additionally, during precipitation events, finer particles from the soil will be suspended and transported with the runoff downgrade until the particles settle out of solution. Any contaminants, organic or inorganic, associated with the eroded soil will be transported in this manner, in particular, SVOCs, such as pyrene and benzo(a)pyrene, because of their tendency to sorb to particulate matter. Less mobile inorganics, such as iron in its oxidized form, may also be transported with the eroded soil.

Once the eroded soil has been deposited as sediment, it becomes a potential source for the desorption of organic contaminants and the dissolution of inorganic contaminants into surface water.

3.5.3.4 Releases from Soil to Groundwater

The percolation of rainfall and snowmelt through unsaturated soil can dissolve contaminants from the soil, and then transport them to the underlying groundwater. Both surface and subsurface soil can serve as sources of contaminants for deeper soil horizons and groundwater.

3.5.3.5 Physical Processes Within the Subsurface

Advection, dispersion, and dilution are considered to be the most important physical processes affecting the fate and transport of contaminants dissolved in groundwater during migration. Advection is the transport of dissolved contaminants by the bulk motion of flowing groundwater. It is the primary transport mechanism for dissolved contamination

along the hydraulic gradient. Advection controls the rate and direction of contaminant migration.

Dispersion is the spreading of dissolved contaminants from the path they would be expected to follow during advection. It results from the spatial variation in hydraulic conductivity, fluid mixing, and molecular diffusion. Dispersion primarily controls the concentration of the contaminant at any point in the flow system. Dispersion occurs in groundwater because of local variations in flow velocities caused by the variability of the hydraulic conductivity of the porous media. Typically, the degree of dispersion is greater in the direction of water flow than in directions perpendicular to it. The concentrations of the chemicals at the center of the contaminant plume will decrease as dispersion dilutes the contaminant mass. Some contaminants will migrate more rapidly than the center of mass of the concentration and some will migrate more slowly.

Dilution reduces contaminant concentrations by adding clean water to the contaminant plume. This can occur at the water table when water infiltrates the subsurface during a precipitation event and mixes with shallow groundwater.

3.5.3.6 Groundwater Discharge to Surface Water

Ultimately, groundwater discharges to surface water, unless it has been intercepted by wells or other means of groundwater removal. Natural discharge to surface water typically occurs at local and regional topographic lows into streams, lakes, rivers, or the ocean.

When the surface water is under tidal conditions, the normal hydraulic gradient toward the surface water body in the discharge area may vary, being reduced or even reversed at high tide and increased at low tide. This variation in the gradient may causes surface water to flow into the groundwater system for short periods of time during high tide. It also likely causes a variation in the dispersion of any contaminants from a typical plume configuration. Therefore, the distribution of contaminants in groundwater near tidal discharges can be complicated and difficult to adequately define.

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Table 3-1
Sampling Parameters
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

				Analysis (Method)															
Site	**Station ID**	**Sample ID**	**Media**	**TCL VOA (OLM03)**	**TCL SVOA (OLM03)**	**TAL Metals (ILM03/ILM04)**	**Filtered Metals (ILM04)**	**TPH-GRO (8015B)**	**TPH-DRO (8015B)**	**Cyanide (ILM04)**	**Nitroglycerin (SW 8332)**	**Explosives (SW 846-8330)**	**Ammonium Perchlorate (314)**	**TOC (415.1)**	**pH (SW 846 9045C)**	**Nitroguanidine (SW 846 8330)**	**PETN (SWDFT 8330)**	**Filtered Cyanide (ILM04)**	**Hardness (MCAWW 130.2)**
Site 11	IS11GW01	IS11GW010700	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11GW02	IS11GW020700	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11GW03	IS11GW030700	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11GW04	IS11GW040700	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11GW05	IS11GW050700	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11GW06	IS11GW060700	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11MW01	IS11MW010900	water	X	X	X	X	X	X	X	X	X	X			X	X		
	IS11MW02	IS11MW020900	water	X		X	X	X	X	X									
	IS11MW03	IS11MW030900	water	X	X	X	X	X	X	X	X	X	X			X	X		
	IS11MW04	IS11MW040900	water	X	X	X	X	X	X	X	X	X	X			X	X		
	IS11MW05	IS11MW050900	water	X	X	X	X	X	X	X	X	X	X			X	X		
	IS11MW06	IS11MW060302	water	X	X	X	X	X	X		X	X				X	X		
	IS11MW06	IS11MW060302P	water	X	X	X	X	X	X		X	X				X	X		
	IS11MW07	IS11MW070302	water	X	X	X	X	X	X		X	X				X	X		
	IS11MW08	IS11MW080302	water	X	X	X	X	X	X		X	X				X	X		
	IS11SD01	IS11SD010001	sed	X	X	X		X	X	X	X	X	X			X	X		
	IS11SD02	IS11SD020001	sed	X	X	X		X	X	X	X	X	X			X	X		
	IS11SD03	IS11SD030001	sed	X	X	X		X	X	X	X	X	X			X	X		
	IS11SD04	IS11SD040001	sed	X	X	X		X	X	X	X	X	X			X	X		
	IS11SD05	IS11SD050001	sed	X	X	X		X	X	X	X	X	X			X	X		
	IS11SD06	IS11SD060001	sed	X	X	X		X	X	X	X	X	X			X	X		
	IS11SD07	IS11SD070001	sed	X	X	X		X	X	X	X	X	X			X	X		
	IS11SD08	IS11SD08	sed	X	X	X		X	X		X	X		X	X	X	X		
	IS11SO06	IS11SS060001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO10	IS11SS100001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO13	IS11SS130001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO14	IS11SS140001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO15	IS11SS150001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO16	IS11SS160001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO17	IS11SS170001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO18	IS11SS180001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO19	IS11SS190001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO20	IS11SS200001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO20	IS11SB120103	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO21	IS11SS210001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO21	IS11SB090102	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO22	IS11SS220001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO23	IS11SS230001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO24	IS11SS240001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO24	IS11SS240001P	soil	X	X	X		X	X	X	X	X	X						
	IS11SO25	IS11SS250001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO25	IS11SB250203	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO26	IS11SS260001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO27	IS11SS270001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO27	IS11SS270001P	soil	X	X	X		X	X	X	X	X	X						
	IS11SO28	IS11SS280001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO29	IS11SS290001	soil	X	X	X		X	X	X	X	X	X						

VOA-Volatile
SVOA-Semi-Volatile
TPH- Total petroleum Hydrocarbon
DRO-Diesel range
GRO-Gasoline range

TAL-Target Analyte List
TCL-Target Compound List
PETN- Pentaerythritol Tetranitrate
TOC- Total organic carbon

Table 3-1
Sampling Parameters
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

				Analysis (Method)																
Site	Station ID	Sample ID	Media	TCL VOA (OLM03)	TCL SVOA (OLM03)	TAL Metals (ILM03/ILM04)	Filtered Metals (ILM04)	TPH-GRO (8015B)	TPH-DRO (8015B)	Cyanide (ILM04)	Nitroglycerin (SW 8332)	Explosives (SW 846-8330)	Ammonium Perchlorate (314)	TOC (415.1)	pH (SW 846 9045C)	Nitroguanidine (SW 846 8330)	PETN (SWDFT 8330)	Filtered Cyanide (ILM04)	Hardness (MCAWW 130.2)
Site 11	IS11SO30	IS11SS300001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO31	IS11SS310001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO32	IS11SS320001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO33	IS11SS330001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO33	IS11SS330001P	soil	X	X	X		X	X	X	X	X	X						
	IS11SO34	IS11SS340001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO35	IS11SS350001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO36	IS11SS360001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO37	IS11SS370001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO38	IS11SS380001	soil	X	X	X		X	X	X	X	X	X						
	IS11SO39	IS11SB230203	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO39	IS11SS390001	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO40	IS11SB240203	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO40	IS11SS400001	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO43	IS11SS430001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO44	IS11SS440001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO44	IS11SS440001P	soil	X	X	X		X	X		X	X				X	X		
	IS11SO45	IS11SB440002	soil	X	X	X		X	X		X	X				X	X		
	IS11SO45	IS11SS450001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO46	IS11SS460001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO46	IS11SB460002	soil	X	X	X		X	X		X	X				X	X		
	IS11SO47	IS11SS470001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO47	IS11SS470001P	soil	X	X	X		X	X		X	X				X	X		
	IS11SO47	IS11SB470204	soil	X	X	X		X	X		X	X				X	X		
	IS11SO48	IS11SS480001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO48	IS11SB480002	soil	X	X	X		X	X		X	X				X	X		
	IS11SO49	IS11SS490001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO49	IS11SB490002	soil	X	X	X		X	X		X	X				X	X		
	IS11SO49	IS11SB490002P	soil	X	X	X		X	X		X	X				X	X		
	IS11SO50	IS11SS500001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO50	IS11SB500608	soil	X	X	X		X	X		X	X				X	X		
	IS11SO51	IS11SS510001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO51	IS11SB510002	soil	X	X	X		X	X		X	X				X	X		
	IS11SO52	IS11SS520001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO52	IS11SB520406	soil	X	X	X		X	X		X	X				X	X		
	IS11SO53	IS11SS530001	soil	X	X	X		X	X		X	X				X	X		
	IS11SO53	IS11SB530002	soil	X	X	X		X	X		X	X				X	X		
	IS11SO41	IS11SS410001	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO41	IS11SS410001	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO42	IS11SB260203	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SO42	IS11SS420001	soil	X	X	X		X	X	X	X	X	X	X	X	X	X		
	IS11SO43	IS11SB040608	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11SW01	IS11SW010001	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11SW02	IS11SW020001	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11SW03	IS11SW030001	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11SW04	IS11SW040001	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11SW05	IS11SW050001	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11SW06	IS11SW060001	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11SW07	IS11SW070001	water	X	X	X	X	X	X	X	X	X	X			X	X	X	
	IS11SW08	IS11SW08	water	X	X	X	X	X	X		X	X			X	X	X		X
	IS11SW09	IS11SW09	water	X	X	X	X	X	X		X	X			X	X	X		X
	IS11SW09	IS11SW09P	water	X	X	X	X	X	X		X	X			X	X	X		X
	IS11SW10	IS11SW10	water	X	X	X	X	X	X		X	X			X	X	X		X
	IS11WS01	IS11WS010204	soil	X	X	X		X	X	X	X	X	X			X	X		
	IS11WS02	IS11WS020204	soil	X	X	X		X	X	X	X	X	X			X	X		

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Site 13	IS13SO01	IS13SB011920	soil	X	X	X		X	X	X				X	X				
	IS13SO01	IS13SS010001	soil	X	X	X		X	X	X				X	X				
	IS13SO01	IS13SS010001P	soil	X	X	X		X	X	X				X	X				
	IS13SO02	IS13SS020001	soil	X	X	X		X	X	X				X	X				
	IS13SO02	IS13SB021719	soil	X	X	X		X	X										
	IS13SO03	IS13SS030001	soil	X	X	X		X	X	X				X	X				
	IS13SO03	IS13SB032527	soil	X	X	X		X	X										
	IS13SO04	IS13SB042830	soil	X	X	X		X	X										
	IS13SO04	IS13SS040001	soil	X	X	X		X	X					X	X				
	IS13SO05	IS13SB052425	soil	X	X	X		X	X										
	IS13SO05	IS13SS050001	soil	X	X	X		X	X					X	X				
	IS13SO05	IS13SS050001P	soil	X	X	X		X	X					X	X				
	IS13SO06	IS13SS060001	soil	X	X	X		X	X	X				X	X				
	IS13SO07	IS13SS070001	soil	X	X	X		X	X	X				X	X				
	IS13SO08	IS13SS080001	soil	X	X	X		X	X	X				X	X				
	IS13SO09	IS13SS090001	soil	X	X	X		X	X	X				X	X				
	IS13SO10	IS13SS1000001	soil	X	X	X		X	X	X				X	X				

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Sites 11,13,17,21, and 25 RI Report
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Site 17	IS17MW01	IS17MW011000	water	X	X	X	X			X	X	X	X			X	X		
	IS17MW01	IS17MW011000P	water	X	X	X	X			X	X	X	X			X	X		
	IS17MW02	IS17MW021000	water	X	X	X	X			X	X	X	X			X	X		
	IS17MW03	IS17MW031000	water	X	X	X	X			X	X	X	X			X	X		
	IS17S011	IS17SB110203	soil	X	X	X				X	X	X	X			X	X		
	IS17SD01	IS17SD010001	sed			X				X	X	X	X	X	X	X	X		
	IS17SD02	IS17SD020001	sed			X				X	X	X	X	X	X	X	X		
	IS17SD03	IS17SD030001	sed			X				X	X	X	X	X	X	X	X		
	IS17SD04	IS17SD040001	sed			X				X	X	X	X	X	X	X	X		
	IS17SD05	IS17SD050001	sed			X				X	X	X	X	X	X	X	X		
	IS17SD06	IS17SD060001	sed			X				X	X	X	X	X	X	X	X		
	IS17SO01	IS17SB010203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO01	IS17SB010203P	soil	X	X	X				X	X	X	X			X	X		
	IS17SO01	IS17SS010001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO02	IS17SB020203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO02	IS17SS020001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO03	IS17SB030203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO03	IS17SS030001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO03	IS17SS030001P	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO04	IS17SB040203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO04	IS17SS040001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO05	IS17SB050203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO05	IS17SS050001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO06	IS17SB060203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO06	IS17SS060001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO07	IS17SB070203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO07	IS17SS070001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO08	IS17SB080203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO08	IS17SS080001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO09	IS17SS090001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO09	IS17SB090203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO10	IS17SS100001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS17SO10	IS17SB100203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO11	IS17SS110001	soil	X	X	X				X	X	X	X			X	X		
	IS17SO12	IS17SB120203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO12	IS17SS120001	soil	X	X	X				X	X	X	X			X	X		
	IS17SO13	IS17SB130203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO13	IS17SS130001	soil	X	X	X				X	X	X	X			X	X		
	IS17SO14	IS17SB140203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO14	IS17SS140001	soil	X	X	X				X	X	X	X			X	X		
	IS17SO15	IS17SB150203	soil	X	X	X				X	X	X	X			X	X		
	IS17SO15	IS17SS150001	soil	X	X	X				X	X	X	X			X	X		
	IS17SO15	IS17SS150001P	soil	X	X	X				X	X	X	X			X	X		
	IS17SW01	IS17SW010001	water			X	X			X	X	X	X			X	X	X	X
	IS17SW02	IS17SW020001	water			X	X			X	X	X	X			X	X	X	X
	IS17SW03	IS17SW030001	water			X	X			X	X	X	X			X	X	X	X
	IS17SW04	IS17SW040001	water			X	X			X	X	X	X			X	X	X	X
	IS17SW05	IS17SW050001	water			X	X			X	X	X	X			X	X	X	X
	IS17SW06	IS17SW060001	water			X	X			X	X	X	X			X	X	X	X

VOA-Volatile
SVOA-Semi-Volatile
TPH- Total petroleum Hydrocarbon
DRO-Diesel range
GRO-Gasoline range

TAL-Target Analyte List
TCL-Target Compound List
PETN- Pentaerythritol Tetranitrate
TOC- Total organic carbon

Table 3-1
Sampling Parameters
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

				Analysis (Method)															
Site	**Station ID**	**Sample ID**	**Media**	**TCL VOA (OLM03)**	**TCL SVOA (OLMO3)**	**TAL Metals (ILM03/ILM04)**	**Filtered Metals (ILM04)**	**TPH-GRO (8015B)**	**TPH-DRO (8015B)**	**Cyanide (ILM04)**	**Nitroglycerin (SW 8332)**	**Explosives (SW 846-8330)**	**Ammonium Perchlorate (314)**	**TOC (415.1)**	**pH (SW 846 9045C)**	**Nitroguanidine (SW 846 8330)**	**PETN (SWDFT 8330)**	**Filtered Cyanide (ILM04)**	**Hardness (MCAWW 130.2)**
Site 21	IS21MW01	IS21MW010900	water	X	X	X	X			X	X	X	X			X	X		
	IS21MW02	IS21MW020900	water	X	X	X	X			X	X	X	X			X	X		
	IS21MW03	IS21MW030900	water	X	X	X	X			X	X	X	X			X	X		
	IS21MW04	IS21MW040900	water	X	X	X	X			X	X	X	X			X	X		
	IS21SO01	IS21SS010001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO02	IS21SS020001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO03	IS21SS030001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO04	IS21SS040001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO05	IS21SS050001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO06	IS21SS060001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO07	IS21SS070001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO08	IS21SS080001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO09	IS21SS090001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO10	IS21SS100001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO11	IS21SS110001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO12	IS21SS120001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO13	IS21SS130001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO13	IS21SS130001P	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO14	IS21SS140001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO15	IS21SS150001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO15	IS21SS150001P	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO16	IS21SS160001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO17	IS21SS170001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO18	IS21SS180001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO19	IS21SS190001	soil	X	X	X				X	X	X	X	X	X	X	X		
	IS21SO20	IS21SS200001	soil	X	X	X				X	X	X	X	X	X	X	X		

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TOC- Total organic carbon

Table 3-1
Sampling Parameters
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

				Analysis (Method)															
Site	**Station ID**	**Sample ID**	**Media**	**TCL VOA (OLM03)**	**TCL SVOA (OLMO3)**	**TAL Metals (ILM03/ILM04)**	**Filtered Metals (ILM04)**	**TPH-GRO (8015B)**	**TPH-DRO (8015B)**	**Cyanide (ILM04)**	**Nitroglycerin (SW 8332)**	**Explosives (SW 846-8330)**	**Ammonium Perchlorate (314)**	**TOC (415.1)**	**pH (SW 846 9045C)**	**Nitroguanidine (SW 846 8330)**	**PETN (SWDFT 8330)**	**Filtered Cyanide (ILM04)**	**Hardness (MCAWW 130.2)**
Site 25	IS25MW01	IS25MW011000	water	X	X	X	X			X	X								
	IS25MW02	IS25MW021000	water	X	X	X	X			X	X								
	IS25SO01	IS25SS010001	soil	X	X	X				X	X			X	X				
	IS25SO01	IS25SS010001P	soil	X	X	X				X	X			X	X				
	IS25SO01	IS25SB010203	soil	X	X	X				X	X								
	IS25SO02	IS25SS020001	soil	X	X	X				X	X			X	X				
	IS25SO03	IS25SS030001	soil	X	X	X				X	X			X	X				
	IS25SO04	IS25SS040001	soil	X	X	X				X	X			X	X				
	IS25SO04	IS25SB040203	soil	X	X	X				X	X								
	IS25SO05	IS25SS050001	soil	X	X	X				X	X			X	X				
	IS25SO06	IS25SS060001	soil	X	X	X				X	X			X	X				
	IS25SO07	IS25SS070001	soil	X	X	X				X	X			X	X				
	IS25SO07	IS25SB070203	soil	X	X	X				X	X								
	IS25SO08	IS25SS080001	soil	X	X	X				X	X			X	X				
	IS25SO09	IS25SS090001	soil	X	X	X				X	X			X	X				
	IS25SO10	IS25SS100001	soil	X	X	X				X	X			X	X				
	IS25SO11	IS25SS110001	soil	X	X	X				X	X			X	X				
	IS25SO12	IS25SS120001	soil	X	X	X				X	X			X	X				
	IS25SO13	IS25SS130001	soil	X	X	X				X	X			X	X				
	IS25SO14	IS25SS140001	soil	X	X	X				X	X			X	X				
	IS25SO14	IS25SS140001P	soil	X	X	X				X	X			X	X				
	IS25SO15	IS25SS150001	soil	X	X	X				X	X			X	X				
	IS25SO16	IS25SS160001	soil	X	X	X				X	X			X	X				
	IS25SO17	IS25SS170001	soil	X	X	X				X	X			X	X				
	IS25SO18	IS25SS180001	soil	X	X	X					X			X	X				
	IS25SO19	IS25SS190001	soil	X	X	X					X			X	X				
	IS25SO20	IS25SB200203	soil	X	X	X				X	X								
	IS25SO20	IS25SB200203P	soil	X	X	X				X	X								
	IS25SO20	IS25SS200001	soil	X	X	X				X	X								
	IS25SO21	IS25SB180203	soil	X	X	X				X	X								
	IS25SO21	IS25SS1800012	soil	X	X	X				X	X								
	IS25SO22	IS25SB190203	soil	X	X	X				X	X								
	IS25SO22	IS25SS1900012	soil	X	X	X				X	X								

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TCL-Target Compound List
PETN- Pentaerythritol Tetranitrate
TOC- Total organic carbon

Table 3-2
Monitoring Well Construction Details
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

Site	Well Designation	Elevation at Top of Casing (ft msl)	Elevation at Ground Surface (ft msl)	Bottom of Screen		Top of Screen	
				Depth (ft bgs)	Elevation (ft msl)	Depth (ft bgs)	Elevation (ft msl)
Site 11	IS11MW01	5.36	2.61	8	-5.39	3	-0.39
	IS11MW02	7.77	4.86	8	-3.14	3	1.86
	IS11MW03	6.56	3.75	8	-4.25	3	0.75
	IS11MW04	18.44	15.69	18	-2.31	13	2.69
	IS11MW05	23.98	22.08	29	-6.92	22	0.08
	IS11MW06	6.28	2.70	11	-8.30	1	1.70
	IS11MW07	6.20	2.90	11	-8.10	1	1.90
	IS11MW08	7.89	4.50	13	-8.50	3	1.50
Site 17	IS17MW01	6.67	3.98	13	-8.52	7.5	-3.52
	IS17MW02	6.98	4.43	12	-7.57	7	-2.57
	IS17MW03	15.41	13.01	19	-5.99	9	4.01
Site 21	IS21MW01	36.81	34.14	18	16.14	13	21.14
	IS21MW02	46.16	43.65	20	23.65	15	28.65
	IS21MW03	37.46	35.51	18	17.51	13	22.51
	IS21MW04	79.27	76.59	48	29.09	42	34.59
Site 25	IS25MW01	14.68	12.40	13	-0.60	5	7.40
	IS25MW02	15.48	12.87	24	-11.13	14	-1.13

Notes:
ft msl = feet above mean sea level
ft bgs = feet below ground surface

Table 3-3
Field Parameter Results
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Site	Monitoring Well	Dissolved Oxygen (mg/l)	Specific Conductivity (ms/cm)	pH	Temperature (^{o}C)	Turbidity (NTUs)	Oxidation Reduction Potetial (mV)	Date Sampled
Site 11	IS11MW01	0.2	0.1	6.9	19.6	170	-145	09/11/2000
	IS11MW02	0.6	0.1	7.0	21.4	190	-157	09/11/2000
	IS11MW03	0.2	0.1	5.7	20.8	110	-40	09/11/2000
	IS11MW04	2.0	32	4.4	17.2	420	298	09/11/2000
	IS11MW05	3.9	18	5.1	19.4	990	185	09/08/2000
Site 17	IS17MW01	NC	0.8	6.6	18.7	94	NC	10/24/2000
	IS17MW02	NC	0.8	6.6	20.0	11	NC	10/24/2000
	IS17MW03	NC	NC	NC	NC	NC	NC	10/20/2000
Site 21	IS21MW01	2.9	9	3.9	20.5	49	338	09/07/2000
	IS21MW02	4.1	40	6.0	21.3	690	64	09/11/2000
	IS21MW03	5.3	82	4.3	23.7	150	315	09/08/2000
	IS21MW04	0.4	44	5.3	19.5	130	134	09/08/2000
Site 25	IS25MW01	NC	10	4.2	17.8	3	NC	10/24/2000
	IS25MW02	NC	3	6.5	23.9	5	NC	10/24/2000

Note:
mg/l = milligrams per liter
ms/cm = millisiemens per centimeter
^{o}C = degrees celcius
NTUs = nephelometric turbidity units
mV = millivolts
NC = Not collected

Table 3-4
Distribution of Data Qualifiers
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH - Indian Head, Maryland

Phase I Investigation								
Sample Analysis		***Percent Occurrence of Data Qualifiers***						
Type	**Total Records**	**%B**	**%J**	**%K**	**%L**	**%R**	**%UJ**	**%UL**
Explosives	3,035	0.10	4.48	0.16	0.16	0.36	0.00	0.86
Metals	6,426	7.56	28.18	1.74	3.27	0.03	0.00	3.63
SVOAs	13,456	0.56	5.46	0.00	0.11	0.64	1.20	1.69
TPH	191	2.62	0.00	0.00	0.00	0.00	0.00	0.00
VOAs	11,501	1.71	1.97	0.00	0.00	0.46	9.58	0.00
Wet Chem	397	0.00	0.25	0.00	0.00	0.00	0.00	0.00
TOTALS	35,006	2.19	8.32	0.33	0.66	0.43	3.61	1.39
Sample Analysis		***Total Number of Data Qualifiers***						
Type	**Total Records**	**#B**	**#J**	**#K**	**#L**	**#R**	**#UJ**	**#UL**
Explosives	3,035	3	136	5	5	11	0	26
Metals	6,426	486	1,811	112	210	2	0	233
SVOAs	13,456	76	736	0	15	86	162	228
TPH	191	5	0	0	0	0	0	0
VOAs	11,501	197	229	0	0	53	1102	0
Wet Chem	397	0	1	0	0	0	0	0
TOTALS	35,006	767	2,913	117	230	152	1,264	487
Phase II Investigation								
Sample Analysis		***Percent Occurrence of Data Qualifiers***						
Type	**Total Records**	**%B**	**%J**	**%K**	**%L**	**%R**	**%UJ**	**%UL**
Explosives	645	0.00	0.00	0.00	0.00	0.00	1.55	0.26
Metals	1,380	3.19	29.85	2.75	2.75	1.16	0.00	2.03
SVOAs	2,795	2.11	9.34	0.00	0.00	0.00	0.47	0.00
TPH	87	0.00	2.30	0.00	0.00	0.00	0.00	0.00
VOAs	2,393	1.21	2.05	0.00	0.00	0.00	0.08	0.00
Wet Chem	39	0.00	10.26	0.00	0.00	0.00	0.00	0.00
TOTALS	7,339	1.80	9.92	0.52	0.52	0.22	0.37	0.42
Sample Analysis		***Total Number of Data Qualifiers***						
Type	**Total Records**	**#B**	**#J**	**#K**	**#L**	**#R**	**#UJ**	**#UL**
Explosives	645	0	0	0	0	0	12	2
Metals	1,380	44	412	38	38	16	0	29
SVOAs	2,795	59	261	0	0	0	13	0
TPH	87	0	2	0	0	0	0	0
VOAs	2,393	29	49	0	0	0	2	0
Wet Chem	39	0	4	0	0	0	0	0
TOTALS	7,339	132	728	38	38	16	27	31

Note: Only rejected data which created gaps in the database were counted, data rejected due to eliminate duplicate results were not counted.

B – Blank contamination
J – Estimated Value
L – Biased low
R – Rejected. The analytical result is unusable.
K – Biased high
UL – Not detected. The reported quantitation limit is higher than reported
UJ – Detection limit estimated

Table 3-5
Ingestion Screening Values for Mammals
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Antimony	mouse	0.03	lifetime	oral in water	lifespan/longevity	1.25	0.125	Sample et al. 1996
Arsenic	mouse	0.03	3 generations	oral in water	reproduction	1.26	0.126	Sample et al. 1996
Cadmium	rat	0.303	6 weeks	oral (gavage)	reproduction	10	1	Sample et al. 1996
Cadmium	dog	10	3 months	oral	reproduction	7.5	0.75	ATSDR 1993
Chromium	rat	0.35	3 months	oral in water	mortality	131.4	13.14	Sample et al. 1996
Copper	mink	1	357 days	oral in diet	reproduction	15.14	11.7	Sample et al. 1996
Cyanide*	rat	0.273	gestation/lactation	oral in diet	reproduction	687	68.7	Sample et al. 1996
Lead	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Mercury	rat	0.35	3 generations	oral in diet	reproduction	0.16	0.032	Sample et al. 1996
Mercury	mink	1	93 days	oral in diet	mortality/weight loss	0.25	0.15	Sample et al. 1996
Nickel	rat	0.35	3 generations	oral in diet	reproduction	80	40	Sample et al. 1996
Selenium	rat	0.35	1 year	oral in water	reproduction	0.33	0.2	Sample et al. 1996
Silver	rat	0.35	2 weeks	oral in water	mortality	181	18.1	ATSDR 1990
Zinc	rat	0.35	GD 1-16	oral in diet	reproduction	320	160	Sample et al. 1996
Zinc	mink	1	25 weeks	oral	reproduction	208	20.8	ATSDR 1992
Semivolatile Organics								
1,2,4-Trichlorobenzene	rat	0.35	3 generations	oral in water	reproduction	106	53	Coulston and Kolbye 1994
1,2-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,3-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,4-Dichlorobenzene	rat	0.35	GD 6-15	oral (gavage)	reproduction	500	250	Coulston and Kolbye 1994
2,2'-Oxybis(1-Chloropropane)*	--	--	--	--	--	NA	NA	--
4,6-Dinitro-2-Methylphenol*	--	--	--	--	--	NA	NA	--
4-Bromophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Chloroaniline*	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-Phenylethe	--	--	--	--	--	NA	NA	--
4-Methylphenol*	--	--	--	--	--	NA	NA	--
4-Nitroanaline*	--	--	--	--	--	NA	NA	--
4-Nitrophenol*	--	--	--	--	--	NA	NA	--
Acenaphthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	3500	350	ATSDR 1995
Acenaphthylene	mouse	0.03	13 weeks	oral (gavage)	reproduction	3500	350	ATSDR 1995
Anthracene	mouse	0.03	13 weeks	oral (gavage)	reproduction	10000	1000	ATSDR 1995
Benzo(a)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(a)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(b)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(g,h,i)perylene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Benzo(k)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Bis-(2-Chloroethoxy)methane*	--	--	--	--	--	NA	NA	--
Bis-(2-Chloroethyl)ether*	--	--	--	--	--	NA	NA	--
Chrysene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Dibenz(a,h)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Fluoranthene	mouse	0.03	13 weeks	oral (gavage)	hepatic	1250	125	ATSDR 1995
Fluorene	mouse	0.03	13 weeks	oral (gavage)	hematological	1250	125	ATSDR 1995
Hexachloro-1,3-butadiene	rat	0.35	90 days +	oral	reproduction	20	2	IPCS 1994
Hexachlorobenzene	rat	0.35	2 years	oral	reproduction	16	1.6	ATSDR 1989
Hexachlorocyclopentadiene	rat	0.35	GD 6-15	oral	reproduction	30	10	USEPA 1984
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Isophorone*	--	--	--	--	--	NA	NA	--
Pentachloropheno	rat	0.35	up to 24 months	oral in diet	reproduction	30	3	Coulston and Kolbye 1994
Phenanthrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Phenol*	--	--	--	--	--	NA	NA	--
Pyrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995

Table 3-6
Ingestion Screening Values for Birds
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	brown-headed cowbird	0.049	7 months	oral in diet	mortality	7.38	2.46	Sample et al. 1996
Arsenic	mallard	1	128 days	oral in diet	mortality	12.84	5.14	Sample et al. 1996
Cadmium	mallard	1.153	90 days	oral in diet	reproduction	20	1.45	Sample et al. 1996
Chromium	American black duck	1.25	10 months	oral in diet	reproduction	5	1	Sample et al. 1996
Cyanide*	--	--	--	--	--	NA	NA	--
Lead	Japanese quail	0.15	12 weeks	oral in diet	reproduction	11.3	1.13	Sample et al. 1996
Lead	American kestrel	0.13	7 months	oral in diet	reproduction	38.5	3.85	Sample et al. 1996
Mercury	Japanese quail	0.15	1 year	oral in diet	reproduction	0.9	0.45	Sample et al. 1996
Mercury	mallard	1	3 generations	oral in diet	reproduction	0.064	0.0064	Sample et al. 1996
Nickel	mallard	0.782	90 days	oral in diet	growth/mortality	107	77.4	Sample et al. 1996
Selenium	mallard	1	100 days	oral in diet	reproduction	0.8	0.4	Sample et al. 1996
Selenium	screech owl	0.2	13.7 weeks	oral in diet	reproduction	1.5	0.44	Sample et al. 1996
Silver	--	--	--	--	--	NA	NA	--
Zinc	chicken	1.935	44 weeks	oral in diet	reproduction	131	14.5	Sample et al. 1996
Semivolatile Organics								
1,2,4-Trichlorobenzene	--	--	--	--	--	NA	NA	--
1,2-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
1,3-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
4,6-Dinitro-2-Methylphenol*	--	--	--	--	--	NA	NA	--
4-Chloroaniline*	--	--	--	--	--	NA	NA	--
4-Nitrophenol*	--	--	--	--	--	NA	NA	--
Acenaphthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Acenaphthylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Anthracene	mallard	1.043	7 months	oral in diet	hepatic	228	22.8	Patton and Dieter 1980
Benzo(a)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(a)pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(b)fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(g,h,i)perylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Bis-(2-Chloroethyl)ether*	--	--	--	--	--	NA	NA	--
Chrysene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Dibenz(a,h)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Fluorene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Hexachloro-1,3-butadiene	Japanese quail	0.19	90 days	oral	reproduction	8	2.5	Coulston and Kolbye 1994; IPCS 1994
Hexachlorobenzene	Japanese quail	0.19	?	oral	reproduction	0.8	0.08	Coulston and Kolbye 1994
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--
Hexachloroethane	--	--	--	--	--	NA	NA	--
Isophorone*	--	--	--	--	--	NA	NA	--
Pentachlorophenol	chicken	1.5	8 weeks	oral	growth	200	100	Eisler 1989
Phenol*	--	--	--	--	--	NA	NA	--
Pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963

Table 3-7
Bioaccumulative Chemicals List and Log Kow Values
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference
Semivolatile Organics			
1,2,4-Trichlorobenzene	3.89 to 4.23	4.01	USEPA 1995
1,2-Dichlorobenzene	3.20 to 3.61	3.43	USEPA 1995
1,3-Dichlorobenzene	Not reported	3.50	USEPA 1996
1,4-Dichlorobenzene	3.26 to 3.78	3.42	USEPA 1995
4-Bromophenyl-Phenylether	4.89 to 5.24	5.00	USEPA 1995
4-Chloro-3-Methylphenol	Not reported	3.10	USEPA 1996
Acenaphthene	3.77 to 4.49	3.92	USEPA 1995
Acenaphthylene	Not reported	4.10	USEPA 1996
Anthracene	3.45 to 4.80	4.55	USEPA 1995
Benzo(a)anthracene	4.00 to 5.79	5.70	USEPA 1995
Benzo(a)pyrene	5.98 to 6.42	6.11	USEPA 1995
Benzo(b)fluoranthene	5.79 to 6.40	6.20	USEPA 1995
Benzo(g,h,i)perylene	6.63 to 7.05	6.70	USEPA 1995
Benzo(k)fluoranthene	6.12 to 6.27	6.20	USEPA 1995
Chrysene	5.41 to 5.79	5.70	USEPA 1995
Dibenz(a,h)anthracene	6.50 to 6.88	6.69	USEPA 1995
Fluoranthene	4.31 to 5.39	5.12	USEPA 1995
Fluorene	4.04 to 4.40	4.21	USEPA 1995
Hexachloro-1,3-butadiene	4.74 to 5.16	4.81	USEPA 1995
Hexachlorobenzene	5.00 to 7.42	5.89	USEPA 1995
Hexachlorocyclopentadiene	5.04 to 5.51	5.39	USEPA 1995
Hexachloroethane	3.82 to 4.14	4.00	USEPA 1995
Indeno(1,2,3-cd)pyrene	6.58 to 6.72	6.65	USEPA 1995
Pentachlorophenol	3.29 to 5.24	5.09	USEPA 1995
Phenanthrene	4.28 to 4.57	4.55	USEPA 1995
Pyrene	4.76 to 5.52	5.11	USEPA 1995

Table 3-8
Soil Bioconcentration Factors Used For Plants and Soil Invertebrates
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.0371	Bechtel Jacobs 1998	0.258	Sample et al. 1998
Cadmium	0.514	Bechtel Jacobs 1998	7.66	Sample et al. 1998
Chromium	0.0075	Baes et al. 1984	0.32	Sample et al. 1998
Copper	0.123	Bechtel Jacobs 1998	0.468	Sample et al. 1998
Lead	0.0377	Bechtel Jacobs 1998	0.307	Sample et al. 1998
Mercury	0.344	Bechtel Jacobs 1998	1.186	Sample et al. 1998
Nickel	0.034	Bechtel Jacobs 1998	1.656	Sample et al. 1998
Selenium	0.567	Bechtel Jacobs 1998	0.982	Sample et al. 1998
Silver	0.4	Baes et al. 1984	1	--
Zinc	0.358	Bechtel Jacobs 1998	2.482	Sample et al. 1998
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.0499	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.0533	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	0.3	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.0908	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0197	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0114	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Chrysene	0.0197	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Fluoranthene	0.0425	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1428	Travis and Arms 1988	0.2	Beyer and Stafford 1993
Hexachloro-1,3-butadiene	0.0642	Travis and Arms 1988	1	--
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1	--
Hexachloroethane	0.1888	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Pentachlorophenol	0.0443	Travis and Arms 1988	5.18	van Gestel and Ma 1988
Phenanthrene	0.0908	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0431	Travis and Arms 1988	0.39	Beyer and Stafford 1993

Table 3-9
Soil Bioaccumulation Factors Used For Small Mammals
Sites 11, 13, 17, 21 and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.0033	Sample et al. 1998	0.0054	Sample et al. 1998	0.0039	Sample et al. 1998
Cadmium	0.144	Sample et al. 1998	0.134	Sample et al. 1998	2.212	Sample et al. 1998
Chromium	0.092	Sample et al. 1998	0.1249	Sample et al. 1998	0.0939	Sample et al. 1998
Copper	0.1107	Sample et al. 1998	0.109	Sample et al. 1998	0.5017	Sample et al. 1998
Lead	0.0548	Sample et al. 1998	0.0406	Sample et al. 1998	0.1478	Sample et al. 1998
Mercury	0.0731	Sample et al. 1998	0.0672	Sample et al. 1998	0.0672	Sample et al. 1998
Nickel	0.2587	Sample et al. 1998	0.2631	Sample et al. 1998	0.3487	Sample et al. 1998
Selenium	0.2579	Sample et al. 1998	0.0221	Sample et al. 1998	0.273	Sample et al. 1998
Silver	--	see text	--	see text	--	see text
Zinc	0.5092	Sample et al. 1998	0.2929	Sample et al. 1998	0.862	Sample et al. 1998
Semivolatile Organics						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
4-Bromophenyl-Phenylether	--	see text	--	see text	--	see text
4-Chlorophenyl-Phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text
Hexachloro-1,3-butadiene	--	see text	--	see text	--	see text
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text

Table 3-10
Sediment Bioaccumulation Factors Used For Aquatic Plants and Frogs
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Sediment-Plant BCF (dry weight)		Sediment-Frog BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.0371	Bechtel Jacobs 1998	0.126	Pascoe et al. 1996
Cadmium	0.514	Bechtel Jacobs 1998	0.164	Pascoe et al. 1996
Chromium	0.0075	Baes et al. 1984	0.038	Krantzberg and Boyd 1992
Copper	0.123	Bechtel Jacobs 1998	0.1	Krantzberg and Boyd 1992
Lead	0.0377	Bechtel Jacobs 1998	0.07	Krantzberg and Boyd 1992
Mercury	0.344	Bechtel Jacobs 1998	3.25	Cope et al. 1990
Nickel	0.034	Bechtel Jacobs 1998	1	--
Selenium	0.567	Bechtel Jacobs 1998	1	--
Silver	0.4	Baes et al. 1984	1	--
Zinc	0.358	Bechtel Jacobs 1998	0.147	Pascoe et al. 1996
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	1	--
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.0499	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.0533	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	1	--
Acenaphthylene	0.1653	Travis and Arms 1988	1	--
Anthracene	0.0908	Travis and Arms 1988	1	--
Benzo(a)anthracene	0.0197	Travis and Arms 1988	1	--
Benzo(a)pyrene	0.0114	Travis and Arms 1988	1	--
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	1	--
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	1	--
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	1	--
Chrysene	0.0197	Travis and Arms 1988	1	--
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	1	--
Fluoranthene	0.0425	Travis and Arms 1988	1	--
Fluorene	0.1428	Travis and Arms 1988	1	--
Hexachloro-1,3-butadiene	0.0642	Travis and Arms 1988	1	--
Hexachlorobenzene	0.0153	Travis and Arms 1988	1	--
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1	--
Hexachloroethane	0.1888	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	1	--
Pentachlorophenol	0.0443	Travis and Arms 1988	1	--
Phenanthrene	0.0908	Travis and Arms 1988	1	--
Pyrene	0.0431	Travis and Arms 1988	1	--

Table 3-11
Sediment Bioaccumulation Factors Used For Aquatic Invertebrates and Fish
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.437	Bechtel Jacobs 1998	0.126	Pascoe et al. 1996
Cadmium	0.679	Bechtel Jacobs 1998	0.164	Pascoe et al. 1996
Chromium	0.09	Bechtel Jacobs 1998	0.038	Krantzberg and Boyd 1992
Copper	0.919	Bechtel Jacobs 1998	0.1	Krantzberg and Boyd 1992
Lead	0.129	Bechtel Jacobs 1998	0.07	Krantzberg and Boyd 1992
Mercury	1.022	Bechtel Jacobs 1998	3.25	Cope et al. 1990
Nickel	0.129	Bechtel Jacobs 1998	1	--
Selenium	1	--	1	--
Silver	0.18	Hirsch 1998	1	--
Zinc	0.954	Bechtel Jacobs 1998	0.147	Pascoe et al. 1996
Semivolatile Organics				
1,2,4-Trichlorobenzene	1	--	1	--
1,2-Dichlorobenzene	1	--	1	--
1,3-Dichlorobenzene	1	--	1	--
1,4-Dichlorobenzene	1	--	1	--
4-Bromophenyl-Phenylether	1	--	1	--
4-Chlorophenyl-Phenylether	1	--	1	--
Acenaphthene	2.04	Maruya et al. 1997	1	--
Acenaphthylene	1	--	1	--
Anthracene	0.191	Maruya et al. 1997	1	--
Benzo(a)anthracene	0.358	Maruya et al. 1997	1	--
Benzo(a)pyrene	0.127	Maruya et al. 1997	1	--
Benzo(b)fluoranthene	0.15	Maruya et al. 1997	1	--
Benzo(g,h,i)perylene	0.215	Maruya et al. 1997	1	--
Benzo(k)fluoranthene	0.232	Maruya et al. 1997	1	--
Chrysene	0.198	Maruya et al. 1997	1	--
Dibenz(a,h)anthracene	1	--	1	--
Fluoranthene	0.212	Maruya et al. 1997	1	--
Fluorene	0.481	Maruya et al. 1997	1	--
Hexachloro-1,3-butadiene	1	--	1	--
Hexachlorobenzene	1	--	1	--
Hexachlorocyclopentadiene	1	--	1	--
Hexachloroethane	1	--	1	--
Indeno(1,2,3-cd)pyrene	0.173	Maruya et al. 1997	1	--
Pentachlorophenol	1	--	1	--
Phenanthrene	0.294	Maruya et al. 1997	1	--
Pyrene	0.435	Maruya et al. 1997	1	--

SECTION 4

Site 11 Caffee Road Landfill

An initial RI was conducted at Site 11, Caffee Road Landfill (Area A; Figure 4-1) between July 20 and August 9, 2000. The investigation focused on the western and central portions of the site (the landfill). The objectives of the RI were to (1) determine the lateral extent and depth of waste disposed of at the site; (2) determine whether or not the waste is a source of contamination to the underlying soils or the groundwater at the site; (3) determine whether or not surface soils have been impacted by past activities; and (4) determine whether or not the wastes have impacted creeks adjacent to the site via surface runoff or by leaching to groundwater and then discharging to the creeks. The objectives of the RI were met by the activities performed, as discussed in this chapter.

A follow up investigation was conducted at Site 11 (Area B; Figure 4-1), between February 25 and March 26, 2002. The investigation focused on the eastern portion of the site (the burning grounds). The objectives of the second RI investigation were to (1) determine what impacts to soil, groundwater, surface water, and sediment may have occurred from the four former open burning pits; (2) determine if waste is present in the area east of Building 1607; (3) determine the extent and thickness of waste, if present, in the area east of Building 1607; and (4) determine what impacts to soil and groundwater may have occurred from past land use in the area between Building 1607 and the former burning pits. The objectives of the RI were met by the activities performed, as discussed in this chapter.

Note that because the land use activities in the central and western portions of the site differed from those in the eastern portion, activities and data pertaining to the initial RI investigation will be referred to as Area A whereas activities and data pertaining to the additional RI investigation will be referred to as Area B in Sections 4.1 *Investigation Activities* and 4.4 *Nature and Extent of Contamination*. The discussions of geology, hydrogeology, fate and transport, and the risk assessments will refer to Site 11 in its entirety.

4.1 Investigation Activities

The specific activities undertaken in each area to achieve the stated objectives of the investigations are discussed below. The work comprised:

Area A

- Surface soil sampling
- Subsurface soil sampling
- Waste sampling
- *In situ* groundwater sampling
- Monitoring well installation
- Groundwater sampling
- Surface water sampling
- Sediment sampling

Area B

- Surface soil sampling
- Subsurface soil sampling
- Monitoring well installation
- Groundwater sampling
- Surface water sampling
- Sediment sampling

Sampling locations are shown in Figure 4-2.

4.1.1 Surface Soil Sampling

4.1.1.1 Area A

Up to 42 surface soil samples (IS11SS01 through IS11SS42) were proposed in the work plan. During field activities, however, it was determined that only 32 samples (plus duplicate samples) would be sufficient to meet the objectives stated in the work plan because the landfill area was adequately covered with this number of samples.

The samples were collected between July 18 and August 4, 2000, at the locations described below and shown in Figure 4-2. Samples were analyzed for a full suite of parameters (VOCs, SVOCs, TAL inorganics, explosives, and TPH) because historical information indicates a wide variety of materials may have been disposed of at Site 11 and no previous analytical data were available. It should be noted that in the months following the collection of the Area A surface soil samples, this area was regraded which most likely caused some homogenization of the surface soil.

- **IS11SS06 and IS11SS10—**collected at predetermined locations east of the expected landfill area.
- **IS11SS13 through IS11SS18—**collected at regular intervals immediately surrounding Buildings 24 and 24A.
- **IS11SS19 through IS11SS35—**collected on a predetermined grid pattern over the expected landfill area.
- **IS11SS36 through IS11SS38—**collected along a drainageway trending north to south along the west side of Buildings 24 and 24A.
- **IS11SS39 through IS11SS42—**(background samples) collected in areas upslope of the landfill.

4.1.1.2 Area B

Eleven surface soil samples (IS11SS43 through IS11SS53) were collected between February 25 and March 5, 2002, at the locations described below and shown in Figure 4-2. Because historical information (Draft Caffee Road Landfill Literature Search, James E. Dolph) indicates a wide variety of materials may have been burned in the pits and because there is little information pertaining to the former land uses in the area between Building 1607 and the former pits, samples were analyzed for the full suite of parameters (VOCs, SVOCs, TAL

inorganics, explosives, and TPH). Additionally, surface soil samples were analyzed for grain size and TOC.

IS11SS43 through IS11SS46—collected at the approximate locations of the former burning pits.

IS11SS47 through IS11SS53—collected on a predetermined grid pattern over the eastern portion of Site 11.

4.1.2 Subsurface Soil Sampling

4.1.2.1 Area A

Up to 29 subsurface soil samples (IS11SB01 through IS11SB29) were proposed in the work plan. It was proposed that the subsurface soil samples will be collected at every borehole location where soil exists above the water table and beneath the waste layer to determine whether contaminants have leached from the waste into underlying soils. It was also proposed that samples will be collected from four background locations. During the field effort, it was determined that only seven of 29 subsurface samples could be collected to characterize the nature and extent of contamination within subsurface soil due to the water table elevation at the site. The locations that met sampling conditions were: the four background locations (IS11SB23 through IS11SB26) , two upslope locations (IS11SB09 and IS11SB12), and only one location on the lower elevations of the landfill (IS11SB04)

The samples were collected between July 26 and August 4, 2000, at the locations described below and shown in Figure 4-2. Because historical information indicates a wide variety of materials may have been disposed of at Site 11 and no previous analytical data were available, samples were analyzed for a full suite of parameters.

- **IS11SB04, IS11SB09, and IS11SB12—**collected at locations within the area of the landfill.
- **IS11SB23 through IS11SB26—**(background samples) collected in areas upslope of the site.

Lithologic logs of the soil borings are provided in Appendix A.

4.1.2.2 Area B

Eleven subsurface soil samples (IS11SB43 through IS11SB53) were proposed in the work plan. However, only 9 samples (IS11SB44 and IS11SB46 through IS11SB53) could be collected. Samples IS11SB43 and IS11SB45 could not be collected because the water table was encountered just below the ground surface.

The samples were collected between February 25 and February 28, 2002 at the locations described below and shown in Figure 4-2. Because historical information indicates a wide variety of materials may have been burned in the pits and because there is little information pertaining to the former land uses in the area between Building 1607 and the former pits, samples were analyzed for the full suite of parameters. Additionally, subsurface soil samples were analyzed for grain size.

IS11SB44 and IS11SS46—collected at the approximate locations of two of the former burning pits.

IS11SS47 through IS11SS53—collected on a predetermined grid pattern over the eastern portion of Site 11.

4.1.3 Waste Sampling

4.1.3.1 Area A

Two waste samples (IS11WS01 and IS11WS02) were collected on August 9, 2000, at the locations described below and shown in Figure 4-2. Because historical information indicates a wide variety of materials may have been disposed of at Site 11 and no previous analytical data were available, samples collected were analyzed for the full suite of parameters.

- **IS11WS01—**collected from IS11SB10 at a depth of 2 ft to 4 ft bgs, the depth of a very high PID reading.
- **IS11WS02—**collected from IS11SB15, at a depth of 2 to 4 ft bgs, due to its proximity to the center of the burn area.

4.1.3.2 Area B

One waste sample (IS11WS03) was proposed in the work plan, if waste were encountered. Waste was not encountered at any of the soil sampling locations; therefore, no sample was collected.

4.1.4 In Situ Groundwater Sampling

4.1.4.1 Area A

Six *in situ* groundwater samples (IS11GW01 through IS11GW06) were collected from soil borings on July 24 and 25, 2000 at locations shown in Figure 4-2 and described below. Because historical information indicates a wide variety of materials may have been disposed of at Site 11 and no previous analytical data were available, samples were analyzed for a full suite of parameters.

- **IS11GW01 through IS11GW04—**collected from soil borings IS11SB01 through IS11SB04 installed at the southern edge of the site, along the Mattawoman Creek.
- **IS11GW05—**collected from soil boring IS11SB05 installed at the southwestern edge of the site near the confluence of the Mattawoman Creek and the unnamed creek.
- **IS11GW06—**collected from soil boring IS11SB06 installed at the western edge of the site along the unnamed creek.

Lithologic logs for borings IS11SB01 through IS11SB06 are presented in Appendix A.

4.1.4.2 Area B

In situ groundwater sampling was neither proposed nor performed within Area B.

4.1.5 Monitoring Well Installation

4.1.5.1 Area A

Five shallow groundwater monitoring wells (IS11MW01 through IS11MW05) were installed on August 7- 9, 2000 at the locations shown in Figure 4-2 and described below:

- **IS11MW01—**installed along the downgradient edge of the west side of the landfill (total depth 8 ft bgs).
- **IS11MW02—**installed along the downgradient edge of the south side of the landfill (total depth 8 ft bgs).
- **IS11MW03—**installed along the downgradient edge of the south side of the landfill (total depth 8 ft bgs).
- **IS11MW04—**installed in a likely TPH source area (total depth of 18 ft bgs).
- **IS11MW05—**installed upgradient of the landfill (total depth of 29 ft bgs).

Lithologic logs are presented in Appendix A and well-construction diagrams are presented in Appendix B.

4.1.5.2 Area B

Three shallow groundwater monitoring wells (IS11MW06 through IS11MW08) were installed on February 26 and February 27, 2002 at the locations shown in Figure 4-2 and described below:

- **IS11MW06—**installed at the eastern edge of the site, along the Mattawoman Creek (total depth 11 ft bgs).
- **IS11MW07—**installed at the eastern edge of the site, along the Mattawoman Creek (total depth 11 ft bgs).
- **IS11MW08—**installed at the southeastern edge of the site, along the Mattawoman Creek (total depth 13 ft bgs).

Lithologic logs are presented in Appendix A and well-construction diagrams are presented in Appendix B.

4.1.6 Monitoring Well Sampling

4.1.6.1 Area A

Monitoring well samples IS11MW01 through IS11MW05 were collected from the newly installed wells on August 24 and 25, 2000. Because historical information indicates that a wide variety of materials may have been disposed of at Site 11 and no previous analytical data were available, samples were analyzed for a full suite of parameters (VOCs, SVOCs, TAL inorganics, explosives, and TPH).

4.1.6.2 Area B

Monitoring well samples IS11MW06 through IS11MW08 were collected from the newly installed wells on March 26, 2002. Because historical information indicates a wide variety of materials may have been burned in the pits and because there is little information pertaining to the former land uses in the area between Building 1607 and the former pits, samples were analyzed for the full suite of parameters.

4.1.7 Surface Water Sampling

4.1.7.1 Area A

Seven surface water samples (IS11SW01 through IS11SW07) were collected on July 20, 2000, at locations where concentrated surface flow discharges from the site to the adjacent creeks. Sampling locations are shown in Figure 4-2 and described below. Because historical information indicates a wide variety of materials may have been disposed of at Site 11 and no previous analytical data were available, samples collected were analyzed for a full suite of parameters.

- **IS11SW01 through IS11SW04**—collected 5 ft from the bank of the Mattawoman Creek. IS11SW01 was collected at the most upstream location and IS11SW04 was collected at the most downstream location.
- **IS11SW05 through IS11SW07**—collected 5 ft from the bank of the unnamed creek. IS11SW05 was collected at the most downstream location and IS11SW07 was collected at the most upstream location.

4.1.7.2 Area B

Three surface water samples (IS11SW08 through IS11SW10) were collected on March 5 and 6, 2002, along the site's eastern shore of the Mattawoman Creek near the approximate locations of the three most southerly burning pits. Sampling locations are shown in Figure 4-2 and described below. Because historical information indicates a wide variety of materials may have been burned in the pits and because there is little information pertaining to the former land uses in the area between Building 1607 and the former pits, samples were analyzed for the full suite of parameters.

- **IS11SW08 through IS11SW10**—collected 5 ft from the bank of the Mattawoman Creek. IS11SW08 was collected at the most upstream location and IS11SW10 was collected at the most downstream location.

4.1.8 Sediment Sampling

4.1.8.1 Area A

Seven sediment samples (IS11SD01 through IS11SD07) were collected on July 20, 2000. Four samples were collected along the shore of the Mattawoman Creek and three samples were collected from the unnamed creek west of Site 11. Sampling locations are shown in Figure 4-2 and described below. Because historical information indicates a wide variety of materials may have been disposed of at Site 11 and no previous analytical data were available, samples were analyzed for a full suite of parameters.

- **IS11SD01 through IS11SD04**—collected from the bank of the Mattawoman Creek. IS11SD01 was collected at the most upstream location and IS11SD04 was collected at the most downstream location.
- **IS11SD05 through IS11SD07**—collected from the bank of the unnamed creek. IS11SD05 was collected at the most downstream location and IS11SD07 was collected at the most upstream location.

4.1.8.2 Area B

Three sediment samples (IS11SD08 through IS11SD10) were proposed in the work plan. Due to the nature of the sediment (primarily cobbles) encountered at the site, however, only one sediment sample (IS11SD08) could be collected.

The one sample was collected March 5, 2002, at the location described below and as show in Figure 4-2. Because historical information indicates a wide variety of materials may have been burned in the pits and because there is little information pertaining to the former land uses in the area between Building 1607 and the former pits, the sample was analyzed for the full suite of parameters. Additionally, the sediment sample was analyzed for pH, TOC, and grain size.

- **IS11SD08**—collected from the bank of the Mattawoman Creek.

4.2 Geology

Several soil borings were advanced during the initial and follow-up RI to obtain geologic information. The majority of borings were advanced to 15 ft bgs or less; however, due to its location in an area of higher elevation, soil boring IS11MW05 was advanced to 32 ft bgs. Eight of the boreholes were converted to monitoring wells. Boring logs are presented in Appendix A and monitoring well construction diagrams are presented in Appendix B.

Most of the soil borings in the central and western portion of the site (Area A) encountered waste in the shallow subsurface. Waste was encountered to depths greater than 10 ft bgs in the center of the landfill (Figure 4-3). The waste appears to be bounded to the east approximately 50 ft west of Building 1607, to the west approximately 75 ft east of the unnamed creek located west of the site, to the north at the northern boundary of the site (although there is a small area with a thickness greater than 5 ft located northwest of the site at location IS11SB20), and to the south approximately 20 ft north of the Mattawoman Creek. The waste is characterized by clayey sands and gravels containing wood fragments, glass, and brick. The approximate extent of the waste is shown in Figure 4-3.

The waste is underlain by Quaternary deposits characterized by sandy and clayey silts with thin clay lenses. At the bottom of soil boring IS11MW05 a clay layer greater than 5 ft thick was encountered.

East of the landfill (Area B) shallow soils are characterized by sandy, silty clay with organic matter (e.g. roots). The sand ranges from fine to medium grained.

4.3 Hydrogeology

The water table was encountered at the site at elevations ranging from 0.99 ft above msl at IS11MW06, located along the shoreline, to 11.27 ft above msl at IS11MW05, located upgradient of Site 11 (Figure 4-4). Groundwater flow is generally from north to south and groundwater appears to discharge to the Mattawoman Creek and perhaps to the unnamed creek. Based on the water levels observed at the site, the depth of fill, and the general elevation of the ground surface, the waste is below the water table over most of the landfill portion of the site.

It should be noted that the Mattawoman Creek is influenced by the tides and, in turn, it is likely that the water table, at least near the creek, is as well. Typically, when an aquifer is influenced by tidal cycles, the water table or potentiometric surface will fluctuate in a harmonic motion. The amplitude (or height) of the fluctuation will decrease with increasing distance from the shoreline. The time between high tide and water level high also will increase with increasing distance from the shore. Tests were not performed to quantify the effects of the tidal cycle on the water table at Site 11. However, the assumption is that the tide would only affect the hydraulic gradient near the shoreline and that the general direction of groundwater flow at the site would not vary greatly from that shown in Figure 4-4.

No tests were performed to estimate the hydraulic conductivity of the natural subsurface materials. However, Domenico and Schwartz (1998) provide a range of hydraulic conductivities for fine- and medium-grained sand from about 0.05 ft per day (ft/day) to about 140 ft/day.

4.4 Nature and Extent of Contamination

This section discusses the nature and extent of contamination found in soil, groundwater, surface water, and sediment at Site 11. Detected analytical results for all samples analyzed are presented in tables throughout the section. Complete analytical results for all media are provided on the accompanying compact disks (CDs) (Appendix I).

The discussion presented below focuses on the contaminants that are most prevalent at Site 11 Areas A and B. Some contaminants from each contaminant group (i.e., VOCs, SVOCs, metals, etc.) are discussed. Contaminants were selected based on frequency of detection.

The focus on this “short list” of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus the discussion. The baseline HHRA and ERA presented in Sections 4.6 and 4.7, respectively, of this chapter formally screen and evaluate all chemicals analyzed for in the various media Site 11 in accordance with established EPA Region III guidance.

In order to identify metals that may be of potential concern at Site 11, the data for inorganic analytes were compared to data presented in the Draft Background Investigation Report (BIR) prepared by Brown and Root Environmental (B&RE, 1997). The BIR was conducted to establish a facilitywide background database to be used for current and future investigations. Samples were collected for the various media from areas outside the sites

known to be impacted from facility operations. The facilitywide background statistics for each media are presented in Appendix E.

In some instances, where an inorganic analyte is discussed in one medium (e.g., surface soil), the analyte may be discussed in another medium (e.g., subsurface soil) even if the concentrations in the second medium do not exceed background. This is to allow a more complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

It should be noted that the groundwater background data set is based on unfiltered metals concentrations. Further, based on comparison of the groundwater data set to a subset reported as "nonturbid" in the BIR, four groundwater samples were excluded from the background data set due to elevated turbidity levels. The comparisons presented in this discussion are also based on unfiltered metals concentrations. Additionally, applying a similar rationale as that used in the BIR, the analytical data generated from *in situ* sampling are excluded from the discussion because of the turbidity associated with *in situ* samples.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a compound in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used; (2) if a compound was detected in a sample and a corresponding duplicate, the higher of the two values was used; and (3) samples collected upslope or upgradient for the purpose of evaluating site-specific background conditions are excluded from the descriptive statistics and following discussion except with respect to whether or not the observed concentrations of certain analytes may be site-related.

Background surface water samples were not collected as part of the background investigation and, therefore, are unavailable for comparison.

4.4.1 Surface Soil

4.4.1.1 General Description

Area A Surface soil sampling activities conducted within Site 11 Area A consisted of collecting 32 samples (IS11SS06, IS11SS10, and IS11SS13 through IS11SS42). Note that the samples that were collected within the defined limits of the site (i.e., the red line in the figures) were collected only in the western and central parts of Site 11 because historical information indicated this was the extent of landfilling. Other samples were collected upslope from the site and around Building 24 and 24A. The results of Area A surface soil sampling are presented in Table 4-1 and selected results are presented in Figure 4-5. It should be noted that following the completion of surface soil sampling activities, much of the landfill was regraded as part of the storm water run-off management.

Area B Surface soil sampling activities conducted within Site 11 Area B consisted of collecting 11 samples (IS11SS43 through IS11SS53). The samples that were collected on the eastern part of Site 11 were collected to investigate former burning pits and the entire area east of Building 1607. The results of Area B surface soil sampling are presented in Table 4-2 and selected results are presented in Figure 4-5.

4.4.1.2 VOCs and SVOCs

Area A VOCs were detected in 14 surface soil samples, not including the four samples collected from locations upslope of the site as site-specific background locations (samples IS11SS39 through IS11SS42 in Table 4-1). Most detected concentrations were low and do not warrant further discussion. It should be noted, however, that only the four site-specific background samples contained petroleum constituents (toluene, ethylbenzene, and xylenes), with the exception of a low detection of toluene in IS11SS28. Also, the highest concentrations of methyl acetate (a solvent commonly used in paint thinners) and styrene (a chemical associated with synthetic rubber and protective coatings) were detected near Building 24.

SVOCs were detected in all of the surface soil samples except site-specific background samples IS11SS39, IS11SS41, and IS11SS42 (Table 4-1). This discussion focuses on benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene (Figure 4-5) because of the high concentrations detected and the frequencies of the detections. Benzo(a)anthracene was detected in 20 surface soil samples at concentrations that ranged from 66 µg/kg to 3,300 µg/kg. Benzo(a)pyrene was detected in 16 surface soil samples; concentrations ranged from 47 µg/kg to 860 µg/kg. Benzo(b)fluoranthene was detected in 20 surface soil samples at concentrations that ranged from 160 µg/kg to 4,300 µg/kg. The highest concentration of benzo(a)anthracene was detected in sample IS11SS10 and the highest concentrations of benzo(a)pyrene and benzo(b)fluoranthene were detected in sample IS11SS31.

The distributions of these three SVOCs reflect the fact that no distinct spatial pattern is apparent in the SVOC data. In most cases, where one SVOC is detected, several SVOCs are detected. It should be noted that SVOCs occur widely across the area sampled. Even the highest detections of all SVOCs occur in only a few samples (e.g., IS11SS10, IS11SS23, IS11SS29, and IS11SS31) but these samples were widely distributed across the site and its vicinity. Outside of the site itself, one of the samples with some of the highest concentrations of SVOCs (IS11SS35) was collected northwest of the site and not far from Building 24. It should be noted that only low levels of three SVOCs were detected in any of the site-background samples (and those only in sample IS11SS40, located near Building 24), so the assumption is that the SVOCs detected in surface soil at and near the site are related to operations at or in the vicinity of the site (e.g., Building 24). The presence of SVOCs at the site are probably due to remnants of the treatment that took place on top of the landfill and Building 24, which was an incinerator for the Base's trash at one time. The lack of a spatial pattern of the SVOCs is probably due to bulldozing, a typical activity at a landfill. Additionally, atmospheric deposition of PAHs from the smoke of the incinerated material could cause widespread distribution of contaminates.

Area B Five VOCs were detected in eight of the eleven surface soil samples at Area B (Table 4-2). Most samples contained only one VOC and concentrations do not exceed 5 µg/kg in any sample. There does not appear to any general trend observable in the data.

At least one SVOC was detected in each of the surface soil samples (Table 4-2). The most detections occur in samples IS11SS43 through IS11SS45, IS11SS48, IS11SS49 and IS11SS51. Each sample contained 13 or more SVOCs.

This discussion focuses on benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene because of the high concentrations detected and the frequencies of the detections (Figure 4-5). Benzo(a)anthracene was detected in 5 surface soil samples at concentrations that ranged from 69 µg/kg to 500 µg/kg. Benzo(a)pyrene was detected in 7 surface soil samples; concentrations that ranged from 56 µg/kg to 460 µg/kg. Benzo(b)fluoranthene was detected in 7 samples at concentrations that ranged from 90 µg/kg to 640 µg/kg. The highest concentrations of SVOCs were detected in IS11SS45 located at one of the former burning pits. It should be noted, however, that in general the distribution of SVOCs does not coincide with the location of the former burning pits.

4.4.1.3 TAL Inorganics

Area A Twenty-four inorganic analytes were detected in surface soil samples collected at Area A (Table 4-1). Several inorganic analytes were detected above the facilitywide background 95 percent UCL in surface soil samples, including in the four site-specific background samples (Table F-1 in Appendix F). This discussion focuses on arsenic, iron, and lead (Figure 4-6) because of the frequency of their detections, the extent to which they exceeded the background concentrations, and the general health risks associated with them.

Arsenic was detected in all surface soil samples. Concentrations ranged from 1.7 mg/kg to 42.7 mg/kg. The mean concentration is 9.9 mg/kg, above the background mean of 2.2 mg/kg. Additionally, 28 of the 32 samples (which includes four duplicate samples) contained concentrations greater than or equal to the background 95 percent UCL of 2.6 mg/kg. Concentrations of arsenic in the samples collected from areas upslope of Site 11, supposedly in background locations with respect to the site, ranged from 2.2 mg/kg to 7.1 mg/kg.

Most elevated concentrations of arsenic appear in the western part of the sampled area at the site, including the highest concentration (in sample IS11SS26). However, as noted above, concentrations above both facilitywide and site-specific background are present across the site and its vicinity, suggesting that many of the arsenic detections are related to activities near and at the site.

Iron was detected in all surface soil samples at concentrations ranging from 5,770 mg/kg to 263,000 mg/kg. The mean concentration of 44,789 mg/kg is more than four times the background average of 10,290 mg/kg. Twenty of the 32 samples contained concentrations exceeding the background 95 percent UCL of 15,533 mg/kg. Additionally, four samples (IS11SS10, IS11SS24, IS11SS26, and IS11SS27) contained concentrations exceeding 100,000 mg/kg. It should be noted, however, that 2 (IS11SS39 and IS11SS41) of the 20 samples that contained concentrations above the 95 percent UCL were collected in areas upslope of the site, supposedly in background locations.

As with arsenic, elevated concentrations of iron with respect to both facilitywide and site-specific background are present across the site and its vicinity. The assumption, then, is that many of the iron detections are related to activities near and at the site.

Lead was detected in all surface soil samples. Concentrations ranged from 2.6 mg/kg to 132,000 mg/kg. The mean of 4,777 mg/kg, although highly skewed by seven samples containing concentrations in excess of 1,000 mg/kg (including the maximum detected concentration), is almost 240 times the background mean of 20 mg/kg. Note, however, that

the seven high detections that appear to skew the results for lead were detected at several locations at Building 24 and across the sampled area of the site. Additionally, 16 samples contained concentrations in excess of the background 95 percent UCL of 149 mg/kg. Concentrations of lead in the samples collected from areas upslope of Site 11 ranged from 12.5 mg/kg to 29.4 mg/kg, supposedly in background areas.

As with arsenic and iron, elevated concentrations of lead with respect to both facilitywide and site-specific background are present across the site. A very high concentration also was detected in a sample from near Building 24. The assumption is that many of the lead detections are related to activities near and at the site.

With metals in general, the highest concentrations and the largest number of detections were encountered in samples collected around Building 24 (e.g., IS11SS15, IS11SS16, and IS11SS17) and in the western and central parts of the sampled area at the site (e.g., IS11SS23, IS11SS26, IS11SS27, and IS11SS31). Samples collected along the northwest and north of the site and in the eastern part of the sampled area of the site had among the lowest concentrations of metals, except for the high detection of iron along the eastern edge of the sampled area at the site.

Area B Twenty-three inorganic analytes were detected in surface soil samples collected at Area B (Table 4-2). This discussion focuses on arsenic, iron, and lead (Figure 4-6) because of the frequency of their detections, the extent to which they exceeded the background concentrations, and the general health risks associated with them.

Arsenic was detected in all surface soil samples except for IS11SS50. Concentrations ranged from 1.4 mg/kg to 25.5 mg/kg. The mean concentration is 12.03 mg/kg, above the background mean of 2.2 mg/kg. Additionally, 10 of the 13 samples (which includes 2 duplicate samples) contained concentrations greater than or equal to the background 95 percent UCL of 2.6 mg/kg. No spatial trend is apparent.

Iron was detected in all surface soil samples at concentrations ranging from 14,500 mg/kg to 130,000 mg/kg. The mean concentration is 33,069 mg/kg, above the background average of 10,290 mg/kg. Nine of the 13 samples contained concentrations exceeding the background 95 percent UCL of 15,533 mg/kg. Additionally, one sample (IS11SS51), located in the center of Area B, contained a concentration exceeding 100,000 mg/kg.

Most elevated concentrations of iron appear in the central part of the sampled area. However, as with arsenic, elevated concentrations of iron with respect to both facilitywide and site-specific background are present across the site and its vicinity. The assumption, then, is that many of the iron detections are related to activities near and at the site.

Lead was detected in all surface soil samples. Concentrations ranged from 9.7 mg/kg to 1,240 mg/kg. The mean concentration of 371 mg/kg, is above the background mean of 20 mg/kg. Additionally, 6 samples contained concentrations in excess of the background 95 percent UCL of 149 mg/kg.

As with iron, elevated concentrations of lead appear in the central part of the sampled area. However, elevated concentrations of lead with respect to both facilitywide and site-specific background are present across the site. The assumption is that many of the lead detections are related to activities near and at the site.

With metals in general, the highest concentrations and the largest number of detections were encountered in samples located from directly north of Building 1607 to Mattowoman Creek on the eastern side of the sampled area (IS11SS44, IS11SS48, and IS11SS51).

4.4.1.4 Explosives

Area A Several explosives were detected in surface soil samples; however, detections were limited to only a few samples (Table 4-1). Additionally, with the exception of samples IS11SS26 and IS11SS27, the number of detections per sample was limited to one or two. Surface soil sample IS11SS26 contained seven explosives, including perchlorate at a concentration of 480,000 µg/kg, while sample IS11SS27 contained three to four explosives. These two samples are close to one another in the sampled area at the site.

Area B Two explosives were detected in surface soil samples, as shown in Table 4-2. Surface soil sample IS11SS44 contained NG at a concentration of 27,000 µg/kg and sample IS11SS47 contained perchlorate at a concentration of 1,400 µg/kg.

4.4.1.5 Total Petroleum Hydrocarbons

Area A TPH-GRO were detected in surface soil samples IS11SS17 through IS11SS19, IS11SS41, and IS11SS42 (Table 4-1). Concentrations ranged from 0.17 µg/kg to 3.9 µg/kg. TPH-DRO were detected in every surface soil sample except site-specific background sample IS11SS39. Concentrations ranged from 3.8 mg/kg to 400 mg/kg (Figure 4-5).

The highest concentrations occur in the western part of the sampled area at the site and generally are from samples containing the highest concentrations of metals. However, as noted above, TPH were observed in samples collected from across the site, including in three of the four site-specific background samples.

Area B TPH-DRO were not detected in Area B surface soil samples

4.4.2 Subsurface Soil

4.4.2.1 General Description

Area A Subsurface soil sampling activities conducted within Area A consisted of collecting seven samples (IS11SB04, IS11SB09, IS11SB12, and IS11SB23 through IS11SB26). Only one of these (sample IS11SB04) was collected within the defined area of the site. This is because subsurface soil samples were only proposed at locations where soil existed below the waste and above the water table. Samples IS11SB23 through IS11SB26 were collected at locations that supposedly provide site-specific background data. The results of the Area A subsurface soil sampling are presented in Table 4-3.

Area B Subsurface soil sampling activities conducted within Site 11 Area B consisted of collecting nine samples (IS11SB44 and IS11SB46 through IS11SB53). The samples that were collected on the eastern part of Site 11 were collected to investigate former burning pits and the entire area east of Building 1607. The results of the Area B subsurface soil sampling are presented in Table 4-4.

4.4.2.2 VOCs and SVOCs

Area A Low concentrations of VOCs were observed in all of the subsurface soil samples except site-specific background sample IS11SB25 (Table 4-3). However, none of the samples contained VOCs at concentrations that warrant further discussion.

SVOCs were detected in three subsurface soil samples (Table 4-3). The highest concentrations and largest number of detections were seen in sample IS11SB04, located near the center of the site. The other detections were not high enough to warrant further discussion.. Given the absence of SVOCs in the background samples, the assumption is that the SVOCs detected elsewhere at the site and in its vicinity are site-related, particularly the large number of detections in sample IS11SB04.

Area B Low concentrations of VOCs were observed in many of the Area B subsurface soil samples (Table 4-4). Four samples (IS11SB44, IS11SB49, IS11SB51, and IS11SB53) contained concentrations of acetone ranging from 13 µg/kg to 48 µg/kg.

SVOCs were detected in all of the subsurface soil samples (Table 4-4) except in IS11SB50. This discussion focuses on benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene (Figure 4-5) because of the high concentrations detected and the frequencies of the detections. Benzo(a)anthracene was detected in 6 subsurface soil samples at concentrations that ranged from 21 µg/kg and 1,400 µg/kg. Benzo(a)pyrene was detected in 7 subsurface soil sample at concentrations that ranged from 21 µg/kg to 1,100 µg/kg. Benzo(b)fluoranthene was detected in 7 subsurface soil samples at concentrations of 18 µg/kg to 1,500 µg/kg.

The highest concentrations of these three SVOCs are concentrated on the eastern side of Area B (near the burning pads) and decrease in the samples collected further from this area.

4.4.2.3 TAL Inorganics

Area A Twenty-three inorganic analytes were detected in subsurface soil samples (Table 4-3). Ten analytes were detected at concentrations above the facilitywide background 95 percent UCL (Table F-1 in Appendix F). This discussion focuses on arsenic, iron, and lead (Figure 4-7) because of the frequency of their detections and the general health risks associated with them.

Arsenic was detected in all subsurface soil samples. Concentrations ranged from 1.7 mg/kg to 6.8 mg/kg. The mean concentration is 4.1 mg/kg, below the background mean of 4.8 mg/kg. All detected concentrations were below the background 95 percent UCL of 7.6 mg/kg. Note these statistics include the samples collected in areas upslope of the site because of the uniformity of concentrations across the site. Given the concentrations of arsenic in the site-specific background samples, the arsenic in the subsurface soil appears not to be site-related.

Iron was detected in all subsurface soil samples. Concentrations ranged from 7,850 mg/kg to 36,800 mg/kg. The mean concentration is 21,636 mg/kg, below the background mean of 24,192 mg/kg. Additionally, all detected concentrations were below the background 95 percent UCL of 44,744 mg/kg. Note that these statistics include the samples collected in areas upslope of the site because of the uniformity of concentrations across the site. As with

arsenic, given the concentrations of iron in the site-specific background samples, the iron in the subsurface soil appears not to be site-related.

Lead was detected in all subsurface soil samples. Concentrations ranged from 5.5 mg/kg to 58.1 mg/kg. The mean concentration of the three is 26.5 mg/kg, above the background mean of 8.6 mg/kg. Two samples contained concentrations above the 95 percent UCL of 12.8 mg/kg. Concentrations of samples collected in areas upslope of the site ranged from 5.5 mg/kg to 13.7 mg/kg.

Due to the limited number of lead samples, spatial trends cannot be defined. It should be noted, however, that sample IS11SB04, collected in the central part of the sampled area at the site, contained a very-high lead concentration (i.e., 58.1 mg/kg), compared to other subsurface soil samples. It appears that the subsurface soil at least at this one location has been affected by site operations.

The highest concentrations of most metals were detected in sample IS11SB04, collected near the center of the site. This is the same sample that contained the highest concentrations and most detections of SVOCs.

Area B Twenty-two inorganic analytes were detected in subsurface soil samples (Table 4-4). Fifteen analytes were detected at concentrations above the facilitywide background 95 percent UCL (Table F-1 in Appendix F). This discussion focuses on arsenic, iron, and lead (Figure 4-7) because of the frequency of their detections and the general health risks associated with them.

Arsenic was detected in all subsurface soil samples. Concentrations ranged from 2.4 mg/kg to 21.1 mg/kg. The mean concentration is 9.52 mg/kg, above the background mean of 4.8 mg/kg. Additionally, 4 of the 10 (which includes 1 duplicate sample) contained concentrations greater than the background 95 percent UCL of 7.6 mg/kg. Concentrations above both facilitywide and site-specific background are present across the site, suggesting that many of the arsenic detections are related to activities near and at the site.

Iron was detected in all subsurface soil samples at concentrations ranging from 7,190 mg/kg to 27,300 mg/kg. The mean concentration of 16,568 mg/kg, is below the background mean of 24,192 mg/kg. Additionally, all detected concentrations were below the background 95 percent UCL of 44,744 mg/kg. Given the concentrations of iron in the site-specific background samples, the iron in the subsurface soil appears not to be site-related.

Lead was detected in all subsurface soil samples. Concentrations ranged from 9.3 mg/kg to 742 mg/kg. The mean concentration of 312.5 mg/kg, is more than 36 times greater than the background mean of 8.6 mg/kg. Eight samples contained concentrations above the 95 percent UCL of 12.8 mg/kg. These elevated concentrations with respect to both facilitywide and site-specific background suggests that the lead detections are related to site activities.

The highest concentrations of most metals were detected in sample IS11SB44, collected at the location of a former burning pit. This is the same sample that contained the highest concentrations of SVOCs.

4.4.2.4 Explosives

Area A Detectable concentrations of 1,3-dinitrobenzene (1,3-DNB) were observed in samples IS11SB12 and IS11SB26 (Table 4-3). However, neither of the samples contained 1,3-DNB at a concentration that warrants further discussion.

Area B Explosives were not detected in any of the subsurface soil samples.

4.4.2.5 Total Petroleum Hydrocarbons

Area A TPH-GRO were not detected in subsurface soil samples at or above laboratory detection limits.

TPH-DRO were detected in subsurface soil sample IS11SB04 at a concentration 31 mg/kg (Table 4-3). The location of this sample is shown in Figure 4-8. This is the same sample that contained the highest concentrations and most detections of SVOCs and metals.

Area B TPH-DRO were detected in subsurface soil samples IS11SB44, IS11SB48, IS11SB49, and IS11SB51 at a concentration ranging from 5.6 mg/kg to 51 mg/kg. There does not appear to be a discernable pattern in the data.

4.4.3 Waste Samples

Area A Waste sampling activities conducted within Site 11 consisted of two samples IS11WS01 and IS11WS02. The results of waste sampling are presented in Table 4-5.

Area B Waste sampling was proposed only if waste was encountered. None was encountered; therefore, no samples were collected.

4.4.3.1 VOCs and SVOCs: Area A

Eleven VOCs were detected in waste sample IS11WS02 (Table 4-5). The sample contained TCE at a concentration of 24 µg/kg, cis-1,2-DCE at a concentration of 35 µg/kg, and vinyl chloride at a concentration of 7.3 µg/kg. Other compounds detected include benzene, toluene, ethylbenzene, and xylenes.

Several SVOCs were detected in both waste samples. Of note, benzo(a)anthracene and benzo(b)fluoranthene were detected in both waste samples and benzo(a)pyrene was detected in IS11WS02. Observed concentrations of these two SVOCs were as high as 570 µg/kg.

Given the absence of most of these VOCs and all of these SVOCs in the background subsurface soil samples, the assumption is that the results from the waste samples do not represent background conditions. There were no subsurface soil samples collected from immediately below waste samples. Therefore, it is difficult to be certain if the waste is affecting the subsurface soil. However, it is reasonable to assume that subsurface soil sample IS11SB04 has been affected by the waste because of the variety of SVOCs detected in the sample.

4.4.3.2 TAL Inorganics: Area A

Twenty-four inorganic analytes were detected in waste samples (Table 4-5), which were collected above the water table. Eighteen of these were at concentrations in one or more of

the waste samples above the facilitywide background 95 percent UCL (Appendix F). This discussion focuses on arsenic, iron, and lead (Figure 4-7) because of the frequency of their detections, the degree to which their concentrations exceed the background, and the general health risks associated with them. Note that the site-specific background results provided in Table F-1 are for subsurface soil, not for waste, which has no background concentrations.

Arsenic was detected in both waste samples. Detected concentrations in IS11WS01 and IS11WS02 were 3 mg/kg and 17.1 mg/kg, respectively. Both detections were above the subsurface soil background 95 percent UCL of 7.6 mg/kg and one detection was above the highest site-specific subsurface soil value of 6.8 mg/kg.

Iron was detected in both waste samples. Detected concentrations in IS11WS01 and IS11WS02 were 6,530 mg/kg and 76,000 mg/kg, respectively. Sample IS11WS02 was above the subsurface soil background 95 percent UCL of 44,744 mg/kg and its detection also was above the highest site-specific subsurface soil value of 36,800 mg/kg.

Lead was detected in both waste samples. Detected concentrations in IS11WS01 and IS11WS02 were 79.2 mg/kg and 4,200 mg/kg, respectively. The sample IS11WS02 was above the subsurface soil background 95 percent UCL of 12.8 mg/kg and both detection were above the highest site-specific subsurface soil value of 13.7 mg/kg.

Sample IS11WS02 contained the most detections and most of the highest inorganic concentrations of the two waste samples. Exceptions are cyanide and mercury, which were higher in sample IS11WS01.

There were no subsurface soil samples collected from immediately below waste samples. Therefore, it is difficult to be certain if the waste is affecting the subsurface soil. However, it is reasonable to assume that subsurface soil sample IS11SB04 has been affected by the waste because of the high concentration of lead detected in the sample.

4.4.3.3 Explosives: Area A

HMX and 2,6-DNT were detected in both waste samples (Table 4-5). Additionally, perchlorate was detected in IS11WS01 and RDX was detected in IS11WS02. All detected concentrations were in the hundreds of micrograms per kilogram with the exception of perchlorate, which was detected at 1,200 µg/kg.

4.4.3.4 Total Petroleum Hydrocarbons: Area A

TPH-GRO were detected in both waste samples (Table 4-5). Detected concentrations were very low and do not warrant further discussion. TPH-DRO were also detected in waste samples IS11WS01 and IS11WS02 (Table 4-5), at concentrations of 92 mg/kg and 450 mg/kg, respectively (Figure 4-8).

The concentrations in the samples, collected within in the site, are higher than the one detection of TPH-DRO in background subsurface soil of 31 mg/kg. The concentrations also are consistent with many of the concentrations detected in surface soil, suggesting that the source of the TPH-DRO in the waste samples is the same as that which caused the surface soil contamination. Fifteen gallons of diesel fuel are reported to have been poured over the waste as fuel source.

4.4.4 Groundwater

4.4.4.1 General Description

Area A Groundwater sampling activities conducted within Area A consisted of collecting five monitoring well samples (IS11MW01 through IS11MW05), as well as six *in situ* samples (IS11GW01 through IS11GW06) collected from soil borings installed at locations within Site 11. The results of *in situ* groundwater sampling are presented in Table 4-6. The results of monitoring well sampling are presented in Table 4-7.

Area B Groundwater sampling activities conducted within Area B consisted of collecting three monitoring well samples (IS11MW06 through IS11MW08). The results of monitoring wells sampling are presented in Table 4-8.

4.4.4.2 VOCs and SVOCs

Area A Only very low concentrations of VOCs were detected in *in situ* groundwater samples IS11GW01, IS11GW02, and IS11GW05 (Table 4-6). Similarly, only very low concentrations of VOCs were detected in the samples collected from monitoring wells IS11MW01, IS11MW03, and IS11MW04 (Table 4-7). The only detections of toluene were in IS11MW03, located along the shore near the center of the site. No VOCs were detected in the other groundwater samples.

Very low concentrations of SVOCs were detected in all of the *in situ* groundwater samples except for IS11GW04, which contained none (Table 4-6). Similarly, only very low concentrations of SVOCs were detected in the sample collected from monitoring well IS11MW03 (Table 4-7). No SVOCs were detected in the other monitoring well groundwater samples.

There were no VOCs or SVOCs detected in background monitoring well IS11MW05, suggesting that the VOCs and SVOCs detected in the site wells come from operations at the site or in the vicinity.

The highest concentrations of organics in *in situ* samples were measured in IS11GW05 and IS11GW06, both located along the western margin of the site. Again, the only well containing SVOCs was IS11MW03, located along the shore near the center of the site. Therefore, there is little correlation between *in situ* and monitoring well results for organics.

Area B Low concentrations of VOCs were observed in all three of the groundwater samples (Table 4-8). The three samples contained concentrations of acetone ranging from 9 μg/L to 11 μg/L.

Low concentrations of SVOCs were detected in all of the groundwater samples (Table 4-8). One SVOC, 4-methylphenol, was detected in each of the groundwater samples with concentrations ranging from 0.8 μg/L to 5 μg/L. Acenaphthene and acetophenone were detected in IS11MW06.

4.4.4.3 TAL Inorganics

Area A Twenty-two inorganic analytes were detected in groundwater analyzed for total inorganics in both *in situ* and monitoring well samples. Total concentrations of 20 of these were detected in monitoring wells at concentrations above the facilitywide background 95 percent UCL (Table F-1 in Appendix F). This discussion focuses on total arsenic, total iron,

and total lead (Figure 4-9) detected in monitoring wells because of their occurrence in soil, frequency of their detections, the extent to which they exceeded the background concentrations, and the general health risks associated with them.

Arsenic was detected in monitoring wells IS11MW01, IS11MW02, and IS11MW04. Total concentrations ranged from 4 µg/L to 8.2 µg/L. Arsenic was not detected in the Site 11 background data set. The highest detection of arsenic was observed in upgradient well IS11MW04, while the two downgradient wells (IS11MW01 and IS11MW02) contained lower concentrations. However, the third downgradient well, IS11MW03, did not contain arsenic.

Note in Table 4-7 that no arsenic was detected in most of the dissolved samples from the monitoring wells, suggesting that turbidity in the samples contained much of the arsenic in an adsorbed form. The one exception is the IS11MW02 samples, which exhibited a slight increase in arsenic concentration between total and dissolved samples. Also, note in Table 4-6 that there were significant declines in arsenic concentrations between *in situ* and monitoring well samples, again suggesting that much of the arsenic detected is adsorbed to sediment in the samples.

Total iron was detected in all five samples collected from Area A monitoring wells. Concentrations ranged from 8,590 µg/L to 51,000 µg/L. The calculated mean concentration of 25,398 µg/L is greater than 2.5 times the background mean of 9,847 µg/L. Additionally, two of the five samples contained concentrations in excess of the 95 percent UCL of 19,900 µg/L. No spatial trend is apparent in the data, although, as with arsenic, the highest concentration was in upgradient well IS11MW04.

Table 4-7 generally does not show a decline in iron concentrations between total and dissolved samples obtained from monitoring wells. An exception is in well IS11MW04, which had no detectable iron in the filtered sample. This suggests that iron is, for the most part, not absorbed to sediment. This is not true for the *in situ* samples (Table 4-6), which exhibited significant declines in iron with filtering.

Total lead was detected in all five site monitoring wells. Concentrations ranged from 3.5 µg/L to 78.6 µg/L. Lead was not detected in the background data set.

No spatial trend is apparent in these data. However, the maximum detected concentration in groundwater was observed in IS11MW01, located in the southwestern part of the site. Surface soil samples collected in this area contained concentrations of lead exceeding 500 mg/kg (Figure 4-6).

Note that no lead was detected in dissolved samples from monitoring wells (Table 4-7) and in most dissolved *in situ* samples (Table 4-6). This strongly suggests that lead is adsorbed to sediment rather than being dissolved in the groundwater.

It does not appear that arsenic in the groundwater is associated with site operations because concentrations, particularly in filtered samples, are low. Iron in groundwater is most likely derived to some degree from site operations. This is reasonable, given the high concentrations of iron detected in soil and waste samples. Lead from the site does not appear to affect groundwater quality in the dissolved form; the high lead detection in well IS11MW01 was in an unfiltered sample, and lead occurs at concentrations above background in the subsurface soil and waste.

Area B Nineteen inorganic analytes were detected in groundwater analyzed for total inorganics in monitoring well samples (Table 4-8). Total concentrations of 13 of these were detected in monitoring wells at concentrations above the facilitywide background 95 percentUCL (Table F-1 in Appendix F). This discussion focuses on total arsenic, iron, and lead (Figure 4-9) detected in monitoring wells because of their occurrence in soil and the general health risks associated with them.

Total arsenic was detected in monitoring well IS11MW06 at a concentration of 2.9 µg/L. The dissolved sample for this well also detected arsenic with a concentration of 3.3 µg/L.

Iron was detected in all three samples collected at the monitoring wells. Samples collected from IS11MW06, IS11MW07, and IS11MW08 contained concentrations of 42,100 µg/L, 31,300, and 44,700 µg/L, respectively; in excess of the 95 percent UCL.

There was only a very slight decline in iron concentrations between total and dissolved samples obtained from monitoring wells. This suggest that iron is, for the most part, not adsorbed to sediment.

Total lead was detected in all three monitoring wells. Concentrations ranged from 1.9 µg/L to 32.8 µg/L. The maximum detected concentration was observed in IS11MW08, located in the southern part of the sampled area at the site.

4.4.4.4 Explosives

Area A Very low concentrations of explosives were detected in each of the *in situ* groundwater samples (Table 4-6). The highest concentrations of explosives in *in situ* samples were detected in sample IS11GW02, collected from near the center of the site. Similarly, very low concentrations of explosives were detected in the samples collected from monitoring wells IS11MW01, IS11MW03, IS11MW04, and IS11MW05 (Table 4-7). None of the samples contained explosives at concentrations that warrant further discussion.

Area B Explosives were not detected in any of the monitoring well samples.

4.4.4.5 Total Petroleum Hydrocarbons

Area A TPH-GRO were not detected in any of the groundwater samples. TPH-DRO were detected in each of the *in situ* groundwater samples (Table 4-6), with the highest concentrations detected in the western part of the sampled area at the site. These presumably were derived from site operations.

Neither TPH-GRO nor TPH-DRO were detected in monitoring well samples.

Area B TPH-DRO was detected in monitoring well IS11MW06 at a concentration of 500 µg/L (Table 4-8).

TPH-GRO were not detected in any of the monitoring wells samples.

4.4.5 Surface Water

4.4.5.1 General Description

Area A Surface water sampling activities conducted within Site 11 Area A consisted of seven samples collected from locations in the Mattawoman Creek (IS11SW01 through IS11SW04) and the unnamed creek located west of Area A (IS11SW05 through IS11SW07). The results of the surface water sampling are presented in Table 4-9.

Area B Surface water sampling activities conducted within Area B consisted of three samples collected from locations in the Mattawoman Creek (IS11SW08 through IS11SW10). The results of the surface water sampling are presented in Table 4-10.

4.4.5.2 VOCs and SVOCs

Area A One VOC, methyl-tertiary-butyl-ether (MTBE), was detected in surface water sample IS11SW01 at a concentration of 1 µg/L (Table 4-9). No other VOCs were detected in surface water samples.

One SVOC, bis(2-ethylhexyl)phthalate, was detected in surface water sample IS11SW01 at a concentration of 1 µg/L (Table 4-9). No other SVOCs were detected in surface water samples.

Area B Neither VOCs nor SVOCs were detected any of the surface water samples.

4.4.5.3 TAL Inorganics

Area A Eleven inorganic analytes were detected in surface water samples (Table 4-9). This discussion focuses on total lead (Figure 4-9) because of its high concentration in some groundwater (unfiltered only) and surface soil samples.

Total lead was detected in all seven surface water samples. Concentrations ranged from 1.3 µg/L in IS11SW03 to 38.4 µg/L in IS11SW01 (the most upstream location). No clear trend is observed in the data generated from the samples collected from the Mattawoman Creek. A possible trend is observed in the samples collected from the unnamed creek located west of Site 11: concentrations increase in the downstream direction. However, the trend is not definitive because of the limited number of samples and the increases observed from sample to sample are small. Lead was removed from most surface water samples by filtering.

Note that no arsenic was detected in any of the surface water samples. Note, also, that the highest concentrations of total iron and the highest concentrations of dissolved barium, copper, iron, and manganese were collected in the unnamed creek.

Area B Twenty-one inorganic analytes were detected in surface water samples. Lead was observed in each of the three surface water samples. Concentrations ranged from 3.4 µg/L to 9.7 µg/L. The results of surface water sampling are presented in Table 4-10.

4.4.5.4 Explosives

Area A Only very low concentrations of explosives were detected in each of the surface water samples, and no explosives were detected in IS11SW07 (Table 4-9). None of the samples contained explosives at concentrations that warrant further discussion.

Area B Explosives were not detected in any of the surface water samples.

4.4.5.5 Total Petroleum Hydrocarbons

Area A TPH-GRO were not detected in any of the surface water samples. Low concentrations of TPH-DRO were detected in surface water samples IS11SW01 through IS11SW04 (Table 4-9), all collected from the Mattawoman Creek. None of the samples contained TPH at concentrations that warrant further discussion.

Area B TPH-DRO and TPH-GRO were not detected in any of the surface water samples.

4.4.6 Sediment

4.4.6.1 General Description

Area A Sediment sampling activities conducted within Area A consisted of seven samples (IS11SD01 through IS11SD07) collected at the same locations as the surface water samples. The results of Area A sediment sampling are presented in Table 4-11.

Area B Sediment sampling activities conducted within Area B consisted of 1 sample (IS11SD08) collected at the same location as the surface water sample IS11SW08. The results of Area B sediment sampling are presented in Table 4-12.

4.4.6.2 VOCs and SVOCs

Area A Low concentrations of VOCs were detected in sediment samples IS11SD01, IS11SD05, IS11SD06, and IS11SD07 (Table 4-11), most located in the unnamed creek. Of note, acetone was detected in samples IS11SD05, IS11SD06, and IS11SD07 at concentrations ranging from 82 µg/kg to 130 µg/kg. Although 2-butanone, acetone, and toluene often contaminate samples in the analytical laboratory, the detections were not rejected during validated, so the assumption is that they are related to activities at the site or in the vicinity.

Low concentrations of SVOCs were detected in most sediment samples (Table 4-12). Of note, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene were detected in IS11SD02 at concentrations of 250 µg/kg, 77 µg/kg, and 400 µg/kg, respectively (Figure 4-5). The highest concentrations and the most detections of SVOCs were in this sample.

Area B One VOC, 2-butanone, was detected in the sample IS11SD08 (Table 4-12) at a concentration of 3 µg/kg.

Several SVOCs were detected in the sediment sample. Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene were detected at concentrations of 900 µg/kg, 790 µg/kg, and 1,100 µg/kg.

No pattern was observed in the data due to the limited number of samples.

4.4.6.3 TAL Inorganics

Area A Twenty-two inorganic analytes were detected in sediment samples (Table 4-11). This discussion focuses on arsenic, iron, and lead (Figure 4-6) because of their frequency of detection in sediment and occurrence in surface soil at the site.

Arsenic was detected in all of the sediment samples. Concentrations ranged from 6.5 mg/kg to 24.5 mg/kg.

A general trend is observed in the data generated from the samples collected from the Mattawoman Creek: concentrations are higher in downstream locations. This trend, however, is not observed from sample to sample. No spatial trend is observed in the data generated from the samples collected from the unnamed creek west of Site 11.

Iron was detected in all of the sediment samples. Concentrations ranged from 8,360 mg/kg to 134,000 mg/kg

There may be a trend in the data generated from the samples collected from the Mattawoman Creek: concentrations are most elevated in the center of the line of sampling (i.e., samples IS11SD03 and IS11SD04). No spatial trend is observed in the data generated from the samples collected from the unnamed creek west of Site 11.

Lead was detected in all of the sediment samples. Concentrations ranged from 53.2 mg/kg to 76,400 mg/kg. No clear spatial trends are observed in the lead data generated from the samples collected from the Mattawoman Creek or the unnamed creek west of Site 11. The most upstream sample collected from the Mattawoman Creek was the most elevated of that data set, whereas the most downstream sample collected from the unnamed creek west of Site 11 was the most elevated of that data set.

In general, the sediment samples from the Mattawoman Creek contained the highest concentrations and most detections of inorganics.

Area B Twenty-two inorganic analytes were detected in the sediment sample (Table 4-12). This discussion focuses on arsenic, iron, and lead (Figure 4-6) because of the general health risks associated with them.

Arsenic was detected in the sediment sample at a concentration of 10.3 mg/kg. Iron was detected in the sediment sample at a concentration 51,600 mg/kg.

Lead was detected in the sediment sample at a concentration of 335 mg/kg.

No spatial trend is observed because there is only one data point.

4.4.6.4 Explosives

Area A Only very low concentrations of 3-nitrobenzene and 4-nitrobenzene were detected in sediment samples IS11SD01, IS11SD04, and IS11SD06 (Table 4-11). None of the samples contained explosives at concentrations that warrant further discussion.

Area B Explosives were not detected in the sediment sample.

4.4.6.5 Total Petroleum Hydrocarbons

Area A TPH-GRO were not detected in any of the sediment samples at or above laboratory detection limits.

TPH-DRO were detected in sediment samples IS11SD02 through IS11SD07 (Table 4-11 and Figure 4-5). Concentration ranged from 11 mg/kg to 69 mg/kg.

No clear spatial trends are observed in the TPH data generated from the samples collected from the Mattawoman Creek or the unnamed creek west of Site 11.

Area B TPH-DRO and TPH-GRO were not detected in the sediment sample.

4.5 Fate and Transport

The fate and transport of chemicals in soil and groundwater within Site 11 and how the chemicals may interrelate with the surface water and sediment in the Mattawoman Creek and the unnamed creek are discussed in this section. The fate and transport are described to support the HHRA and ERA, and to aid in defining remedial alternatives. At the end of the subsection is a summary of the conceptual model of fate and transport at Site 11.

4.5.1 Contaminant Fate

Analytes will adsorb onto and desorb from solid material at the site. This includes soil that is in contact with infiltrating water and sediment deposited in the Mattawoman Creek and the unnamed creek. Such sorption will be a function of the partitioning coefficient of the analyte and will be greater for most SVOCs and many metals than for VOCs and some SVOCs and metals. Most of the commonly occurring contaminants at Site 11 are SVOCs and metals; therefore, adsorption is expected to be a significant fate process at the site. Analytes, particularly metals, also may be dissolved from the solids while they are in contact with water. As a result, contaminants could transfer from creek sediment to surface water.

Few VOCs were detected at the site. Therefore, volatilization is not expected to play a significant role in contaminant fate at the site.

Some of the organic compounds may degrade through microbial activity, although the lack of vegetation and other sources of organic material reduces the likelihood of active microbial communities in the surface soil. The majority of the SVOCs observed at Site 11, such as benzo(a)pyrene, are recalcitrant to microbial activity and would be transformed only at a slow rate. Due to the nature of the organic compounds detected at Site 11, microbial degradation is unlikely to play an important role in their fate.

Some of the metals at the site could vary in their migration behavior with change in valence state. This is particularly true for arsenic, which will become more mobile in its lower valence state.

Bioaccumulation is the process by which contaminants are ingested by ecological receptors and concentrated within the tissues of those receptors. Because of the exposed nature of the site, it is unlikely that ecological receptors (e.g., mammals) visit the area on a regular basis. Such receptors as may forage at the site may ingest contaminated surface soil. Those compounds with a tendency to associate with the soil, such as SVOCs (e.g., benzo[a]pyrene)

and inorganics (e.g., arsenic and lead) may accumulate in these ecological receptors over time.

4.5.2 Contaminant Migration

This section discusses the possible source area and potential mechanisms and pathways for contaminant release and migration from the source area within the Site 11. The discussion is organized by media within Site 11 that may experience contaminant transport.

Fundamental to describing fate and transport at the site are the concepts of contaminant mobility and persistence and the physical properties of the subsurface, which were described in Section 3.5, and the site hydrogeology, which was described in Section 4.3.

4.5.2.1 Source Areas

Source areas at the site are assumed to comprise both original and current sources associated with site operations and current sources such as contaminated soil that may serve as a source for contaminating other media.

The assumption is that the buried waste is the primary source of contaminants at the site. The waste samples contained high concentrations of SVOCs, metals, and explosives. In addition, the surface soil appears to contain SVOCs, metals, and TPH at sufficient concentration to serve as sources of further contamination.

Specific source areas were not identified because elevated levels of contamination are so widespread at the site. These contaminants are elevated in concentration with respect to both facility background and site-specific background, indicating that they are site-related.

4.5.2.2 Releases from Soil to the Atmosphere

Wind erosion and vehicular traffic are typically the primary mechanisms for the release of soil contaminants to the atmosphere. A considerable portion of Site 11 is bare ground, and vehicular traffic occurs at times. VOCs were detected only at low concentrations in soil at Site 11. Therefore, volatilization, the primary mechanism for the release of VOCs from soil to the atmosphere, is likely not a significant process at Site 11. There is a potential, however, for contaminated soil to be entrained by wind, at which time it would be spread out into the Mattawoman Creek and possibly into the unnamed creek but only at low concentrations because they would be distributed widely.

4.5.2.3 Transport from Surface Soil to Subsurface Soil or from One Area to Another

The primary mechanisms for the release of contaminants from surface soil to subsurface soil or from one area to another are infiltration, runoff, and soil erosion caused by runoff.

There is a potential for infiltrating water to transport contaminants from surface soil to subsurface soil. Although the site generally is unvegetated, which encourages runoff rather than infiltration, there are flat areas at the site in which surface water pools, and the berm around the site could restrict runoff further. The data show that contaminant levels in subsurface soil typically are less than those in surface soil (e.g., for lead, as shown in Figures 4-5 and 4-6), suggesting that there is only limited migration along this pathway due to the tendency for the site contaminants to adsorb. However, there likely is transport by

this process to some degree, particularly for the TPH that appears in groundwater and occurs commonly in surface soil.

The unvegetated terrain at the site promotes erosion. When erosion occurs, the eroded surface soil tends to be deposited along the flat portions of the site. Any adsorbed contaminants associated with the eroded soil will be transported in this manner. Because contaminants tend to associate with finer particulates, and because finer particulates are more easily suspended and transported, this transport process could be a means of contaminant movement around the site. In particular, SVOCs, because of their tendency to sorb, could be transported in this manner. Some inorganics such as lead also may be transported in this manner.

4.5.2.4 Releases from Soil to Sediment and Surface Water

The primary mechanism for the release of contaminants from soil to sediment and surface water is runoff, with possibly some movement in the dissolved phase. Because Site 11 is unvegetated in many areas and the ground has been compacted by vehicular traffic, the surface soil likely has a high tendency for soil erosion. Releases from soil to sediment and surface water via erosion are likely the most significant processes affecting contaminant migration at Site 11. This is supported by the analytical data. For example, lead, the primary contaminant at Site 11, was detected at high concentrations both in surface soil and sediment (Figure 4-6) but generally at lower concentrations in subsurface soil. This suggests that lead primarily is moving directly from soil to sediment, with more-limited migration to groundwater indicated by only occasional high concentrations in groundwater, and those only in unfiltered samples. The low solubility of SVOCs and most metals suggest that movement in the dissolved phase is an unlikely mode of transport at Site 11.

Lead probably was not detected in surface water at significant concentrations due to its low solubility in water. This would be true for most SVOCs and many other metals.

4.5.2.5 Releases from Soil or Waste to Groundwater

Limited releases of VOCs and SVOCs from soil likely have occurred in the past; however, it appears that the potential for future migration from soil to groundwater is low. The reasons for this are twofold. First, VOCs, which are somewhat mobile in the environment, were detected only in low concentrations in soil at Site 11, and were rarely detected in groundwater. Second, SVOCs, while detected across the site and in some instances at high concentrations, have very low mobility in soil because of their low solubilities in water, and generally were not detected in groundwater.

Releases of inorganics to groundwater likely are occurring. Total arsenic, total iron, and total lead were detected in soil, waste, and groundwater at levels that were elevated relative to background. However, most of the metals were greatly reduced in concentration or even eliminated in filtered samples, indicating that they typically are adsorbed to the subsurface materials and not particularly mobile. However, based on the analytical data, groundwater appears to be a primary transport mechanism for such inorganics as iron and manganese, which occurred on the site at levels well above site-specific background, even in filtered samples.

Releases of explosives from soil likely have occurred in the past because explosives were detected in groundwater at the central and western area of the site. High concentrations of explosives were detected in waste samples, and these explosives likely will contained to leach into the groundwater. However, the concentrations or explosives are very low, and do not appear to be a significant source of contamination to groundwater.

TPH likely will continue to be released to groundwater because of their widespread nature. However, no TPH were detected in monitoring well samples except TPH-DRO detected in well IS11MW06, indicating that TPH have limited mobility in the environment. The higher sediment associated with *in situ* samples may have caused the TPH DRO to be detected.

4.5.2.6 Migration of Contaminants in Groundwater

Although transport through groundwater is not considered the primary mechanism for the transport of contaminants because of the low mobility of most site-related chemicals, this section addresses the migration of contaminants within the groundwater and any potential migration to the Mattawoman Creek.

Groundwater generally flows from the north to south beneath the site. Monitoring well IS11MW05, located north of Site 11, is the site-specific background monitoring location. The sample collected from IS11MW05 during the RI contained no detectable VOCs or SVOCs. Trace concentrations of two explosives (1,3-DNB and 2-NT) were detected. Additionally, inorganics concentrations were comparable to facilitywide background.

Total arsenic, total iron, and total lead were detected at elevated concentrations relative to background at Site 11, as were the concentrations of several other inorganics. Arsenic was removed by filtering to concentrations below laboratory detection limits in two of the four groundwater samples containing arsenic, indicating low mobility in groundwater. Lead was removed from all filtered samples collected from Site 11 monitoring wells. Concentrations of other metals such as chromium, copper, nickel, and zinc also experienced significant declines between unfiltered and filtered samples. These declines suggest limited mobility in the groundwater by arsenic and lead but not by iron. Iron was detected in most filtered samples at concentrations that were comparable to unfiltered samples in six of eight samples. Both iron and manganese appear to be relatively mobile compared to other metals.

At present, it appears that TPH DRO are not a concern in groundwater. TPH DRO was detected in each *in situ* sample in concentrations as high as 1,400 µg/L but not in any of the monitoring well samples. This may indicate that TPH in the subsurface is relatively immobile. Observed concentrations in *in situ* samples are likely due to the elevated turbidity associated with *in situ* samples.

Few VOCs, SVOCs, or explosives were detected in groundwater. Therefore, a comprehensive discussion of these is not warranted.

4.5.2.7 Releases from Groundwater to Surface Water

The Mattawoman Creek is the final receptor of all groundwater from Site 11. Significant past or ongoing releases of organics or explosives from groundwater to surface water are

unlikely due to the low concentrations at the site and the low mobility of these in groundwater.

Release of inorganics from groundwater to surface water is part of the natural hydrologic cycle and is on-going. It is not clear that elevated levels of inorganic constituents (relative to concentrations reported in the BIR) observed in groundwater are impacting surface water. Although a background data set has not been generated for surface water, a review of the site data indicates that, in general, concentrations are consistent from sample to sample. Further, concentrations of constituents discussed in Section 4.4.5 are greatly reduced in surface water relative to groundwater, presumably due to dilution in the surface water. Also, the data suggest that most inorganics are relatively immobile in the groundwater. Additionally, as noted above, surface runoff appears to be a more important process for the transport of contaminants to the Mattawoman Creek. Therefore, release of contaminants from groundwater to surface water does not appear to be a significant transport process at Site 11.

4.5.3 Conceptual Site Model

The above fate and transport discussions may be summarized into a conceptual site model that describes the fate and transport mechanisms at Site 11. The conceptual model is provided in Table 4-13. The primary migration mode at the site appears to be from soil to sediment in the Mattawoman Creek.

4.6 Baseline Human Health Risk Assessment

This section presents the results of the HHRA for Site 11, the Caffee Road Landfill.

4.6.1 Data Summary

The only data collected at Site 11 were collected during the RI. The RI data used in the risk assessment are presented in this section. Table 4-14 lists the samples that were used to estimate potential exposure and risks for each medium. Figure 4-2 identifies the sampling locations for surface and subsurface soil, groundwater, sediment, and surface water.

Forty-four surface soil samples (including five duplicate samples) were collected from the top 6 in. of soil in July of 2000 and February and March of 2002 and analyzed for VOCs, SVOCs, explosives, and inorganics (Figure 4-2). Thirteen subsurface soil samples were collected in July 2000 and March of 2002 and analyzed for the same parameters as the surface soil samples. Four surface soil samples and four subsurface soil samples were collected from site-specific background locations and were not used to evaluate the risks associated with exposure to site soil.

Groundwater data collected in September 2000 and March 2002 as part of the RI were evaluated in the risk assessment. Groundwater samples were collected from seven shallow monitoring wells (Figure 4-2). Groundwater samples were analyzed for VOCs, SVOCs, explosives, and inorganics (filtered and unfiltered). A groundwater sample was also collected from one background well; these data were not used to evaluate the risks associated with exposure to site-related groundwater. *In situ* groundwater samples were not used in the risk assessment.

Sediment and surface water samples were collected in July 2000 and March 2002. Eleven surface water samples (including one duplicate sample) and eight sediment samples were collected from the Mattawoman Creek and the unnamed creek adjacent to Site 11 (Figure 4-2). The samples were analyzed for VOCs, SVOCs, explosives, and inorganics (filtered and unfiltered). As discussed in Section 4.6.3.3, exposure to sediment is not evaluated in the human health risk assessment.

The full set of data used for the HHRA is presented in Appendix G.1a. Appendix G.1b includes the detected constituents only, and Appendix G.1c is the sample statistics. The sample statistics include frequency of detection, minimum and maximum detected values, normal and lognormal arithmetic mean, normal and lognormal standard deviation, results of W-test, and 95 percent UCL based on the normal and lognormal distribution.

4.6.2 Identification of Chemicals of Potential Concern

Table 4-15 lists the COPCs retained for Site 11. COPCs were retained for all media. The majority of the COPCs for all media were inorganic constituents. Additionally, a number of SVOCs, mainly PAHs, were retained as COPCs for the soil, and a few VOCs were retained as COPCs for the groundwater. The only constituents that were retained as COPCs for the sediment and surface water do not bioaccumulate in fish tissue. Therefore, there were no COPCs retained for the fish ingestion pathway, and this pathway was not quantitatively evaluated in the risk assessment.

perchlorate was detected in four of the 39 surface soil samples, four of the 51 combined surface and subsurface soil samples, and three of the 10 surface water samples collected at Site 11. Since, the Region III RBCs for this constituent have been withdrawn from the October 2003 Tables, provisional values (USEPA, 1999b) provided by the USEPA's Office of Research and Development (ORD) have been used for screening purposes. Based on a provisional interim RfD range of 0.0001 mg/kg-day to 0.0005 mg/kg-day for perchlorate (USEPA, 1999b), the resulting provisional action level would be from 7.8 to 39 mg/kg for soil. The detected concentration of perchlorate in the Site 11 surface soil and combined surface and subsurface soil is above this level. Therefore, perchlorate is retained as a COPC for these media.

Similarly, using the above provisional RfDs, a standard default body weight of 70 kg, and a water ingestion rate of 2 L/day, the lowest resulting provisional action level would be 4 μg/L for groundwater. Multiplying this by ten, as done for the other groundwater RBCs, results in a provisional action level of 40 μg/L for surface water. The maximum detected concentration of perchlorate in the Site 11 surface water is below this level. Therefore, perchlorate is not a COPC for the Site 11 surface water.

4.6.3 Exposure Assessment

The site-specific exposure assessment includes the information necessary to develop the exposure scenarios applicable for Site 11. This includes identifying the exposure setting, the current and future site use, the potentially exposed populations, and the potential exposure pathways.

4.6.3.1 Exposure Setting

Site 11, the Caffee Road Landfill, is a former landfill area situated at the end of Caffee Road extending about 200 ft on either side of the road to the edge of the unnamed creek on the West and to the Mattawoman Creek on the South. The site is an open area surrounded by woods. The site is currently used to burn metal debris to "clean" off the explosives prior to transport to a metal recycling center.

The nearest potable water wells are Well 16A, located 1,400 ft north-northwest, and Well 17, located 1,600 ft north-northeast.

4.6.3.2 Potentially Exposed Populations

The surface above the Site 11 landfill is used as the Decontamination Burn Point and a large collection of flashed metal parts is located on top of the unit. A contractor periodically removes the metal parts for sale off the site. The eastern area of the site is used for drum storage and waste segregation. Therefore, the current exposed population at Site 11 is the industrial site workers. Adult and adolescent trespassers/visitors are also current potentially exposed populations because access to the site from the Mattawoman Creek is not restricted by fencing (i.e., there is no fencing around the site). Additionally, current potentially exposed populations include recreational users of the Mattawoman Creek and the unnamed creek.

Although unlikely because the site was a landfill, it was conservatively assumed that the site could be developed and used for industrial or residential activities in the future. Therefore, the future use receptors include construction workers and adult and child residents, in addition to the trespasser/visitor, industrial worker, and recreational user.

Shallow groundwater is not currently used as a potable water supply at the base, and is not anticipated to be used in the future. However, groundwater downgradient of the site could be used as a potable water supply in the future. Therefore, the shallow groundwater data from the site will be used as a conservative assessment of groundwater quality down-gradient of the site for the future exposure scenario.

4.6.3.3 Potential Exposure Pathways

As mentioned in Section 3.3.2.2, a complete exposure pathway has five elements: a source, a mechanism for release and migration, an environmental transport medium, a point of potential human contact, and a route of intake. These elements as they apply to Site 11 are discussed below.

Contaminant Sources Potential sources of contaminants at Site 11 include bulk metal items and trash, rocket motor casings, exploded building debris, rifles, demilitarized ordnance, propellant grains residue, and open burning residues, all of which were disposed of in the landfill. Contaminants appear to have leached from these materials into the soil, and then leached through the soil to the shallow groundwater, resulting in groundwater contamination beneath the site. In 1980, NDWIH reportedly removed 5,000 to 6,000 cubic yards of flashed metal parts from the wetland area.

Release and Transport Mechanisms Releases from soil to sediment and surface water via surface runoff are likely the most significant processes affecting contaminant migration at

Site 11. Another transport mechanism for contamination at Site 11 appears to be leaching of some analytes from the soil to the groundwater and transport in the groundwater. However, it should be noted that many of the VOCs and the explosives detected in the shallow groundwater were not detected in the soil samples. Additionally, the majority of the organic constituents detected in the soil at concentrations above the soil screening level (SSL) for transport to groundwater were not detected in the groundwater. It is possible that the majority of the leaching to groundwater occurred during and shortly after the wastes were disposed of at the site. The majority of the inorganic constituents that were detected in the soil above the SSL for transport to groundwater was detected in the groundwater and retained as groundwater COPCs. Shallow groundwater discharges to the Mattawoman Creek and the unnamed creek, and surface water runoff from the site flows to these two creeks. This may result in some contamination being transported to the sediment and surface water in these creeks.

Fate and transport modeling was conducted for volatilization from groundwater during showering and from an open excavation.

Potential Exposure Points and Exposure Routes Exposure points are locations where humans could contact contamination. Onsite exposure points include surface soil, subsurface soil, surface water, sediment, and groundwater beneath the site. Offsite exposure points include surface water, sediment, and groundwater downgradient of the site. Only onsite exposure points were evaluated in the risk assessment. It is expected that dilution and attenuation of any contamination would occur in downgradient locations, and any associated risks would be less than those at the site.

Potential exposure routes were evaluated for current and potential future site use. Existing and potential exposure pathways are illustrated in the conceptual exposure model (Figure 4-10). Exposure scenarios and potentially complete pathways of exposure evaluated in this risk assessment are presented in Table 4-16 and Appendix G.1d, Table 1.

Current Exposure Routes The only media of potential concern currently accessible at Site 11 are surface soil, surface water, and sediment. Based on current site use, potential receptors include industrial site workers and adult and adolescent trespassers/visitors exposed to soil, and recreational adults and children exposed to surface water while swimming in the Mattawoman Creek and the unnamed creek. Exposure to sediment is not considered a complete pathway. All of the sediment is completely covered by water, and there is no shoreline with exposed sediment. Therefore, all of the sediment would be washed from the skin. The shallow groundwater at the base is not used as a potable supply, and therefore, there is no current exposure to shallow groundwater.

In summary, the current land use exposure routes for quantitative evaluation include:

- Industrial Worker: incidental ingestion of and dermal contact with surface soil.
- Trespasser/Visitor (adult and adolescent): incidental ingestion of and dermal contact with surface soil.
- Recreational (adult and child): incidental ingestion of and dermal contact with surface water.

Additionally, ingestion of fish by adult and children recreational users is a potentially complete pathway that is evaluated qualitatively in the risk assessment.

Future Exposure Routes As discussed above, potential future site use may be industrial or residential. Future industrial workers, trespassers, residents, and/or construction workers may be exposed to the site soil (both current surface soil and subsurface soil that may be placed on the surface due to construction or excavation activities). Construction workers may also be exposed to shallow groundwater during excavation activities. It was also conservatively assumed that shallow groundwater may be used as a potable water supply, although this is highly unlikely. Unfiltered groundwater samples were used to evaluate both the construction worker and residential exposure scenarios, as discussed in Section 3.3.2.3.

In summary, the future land use exposure routes include the current recreational scenario and the following:

- Industrial Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).
- Trespassers/Visitors (adult and adolescent): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).
- Resident (adult and child): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil), ingestion of and dermal contact with shallow groundwater, and inhalation (adults only) of volatile emissions from shallow groundwater.
- Construction Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil), and dermal contact with and inhalation of volatile emissions from shallow groundwater.

The exposure concentrations used to calculate potential risks to each of the receptors are presented in Appendix G.1d, Tables 3.1 through 3.8. The exposure parameters and equations used to calculate the risks are presented in Appendix G.1d Tables 4.1 through 4.31.

4.6.4 Risk Characterization

Risks were evaluated for all of the complete exposure pathways identified in Section 4.6.3. The calculated risks are discussed below.

4.6.4.1 Soil

Risks were evaluated for exposure to surface soil for current scenarios and exposure to combined surface and subsurface soil for future scenarios.

Surface Soil RME risk estimates for exposure to surface soil were calculated for an adolescent and adult trespasser/visitor and an adult industrial worker under current site use (Appendix G.1d, Tables 7.1.RME through 7.3.RME, and Tables 8.1.RME through 8.3.RME). The risks are summarized in Table 4-17. Exposure to surface soil via incidental ingestion and dermal contact was evaluated. Inhalation of volatile and fugitive emissions from surface soil was not evaluated because no COPCs were retained for this pathway.

The noncarcinogenic hazards associated with exposure to surface soil by current adolescent and adult trespassers/visitors (0.25 and 0.20, respectively) are below USEPA's target HI of 1.0. The carcinogenic risks associated with exposure to surface soil for these receptors ($1x10^{-6}$ and $3x10^{-6}$) are within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface soil by current industrial workers (1.4) exceeds USEPA's target HI of 1.0. There are no constituents or target organ/effects with HI's above 1.0. The carcinogenic risk associated with exposure to surface soil by an industrial worker ($2x10^{-5}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

CT noncarcinogenic hazards and carcinogenic risks were calculated for the receptors where the RME noncarcinogenic hazards and carcinogenic risks exceed 1.0 and $1x10^{-4}$, respectively (Appendix G.1d, Table 7.17.CT and summarized in Table 4-18). The CT noncarcinogenic hazard due to exposure to surface soil by an industrial worker is below USEPA's target HI of 1.0.

Lead was retained as a COPC for surface soil because the maximum detected concentration of lead exceeds the residential lead screening value of 400 mg/kg. Exposure to surface soil by a resident is not expected under current site use; however, adult industrial workers may be exposed to lead in the surface soil. Therefore, the adult lead soil model (USEPA, 1996b) was run to determine if the concentration of lead in the soil may be a potential health concern for adult workers (Table 4-19). This model calculates an acceptable concentration of lead in soil for an adult worker of 1,113 mg/kg. The average concentration of lead in the Site 11 surface soil is 5 mg/kg. The average concentration is based on a lognormal distribution because this is the distribution the lead surface soil data best fit. Therefore, it is not expected that exposure to lead in the surface soil by an adult industrial worker would be a potential concern.

Exposure to lead in the surface soil by an adolescent or adult trespasser is expected to be less than that of a resident or industrial worker, and is therefore not expected to result in any adverse health effects.

Combined Surface and Subsurface Soil RME risk estimates for exposure to combined surface and subsurface soil were calculated for an adult and child resident, a construction worker, an industrial worker, and an adolescent and adult trespasser/visitor under potential future site use (Appendix G.1d, Tables 7.11.RME through 7.16.RME, and Tables 8.10.RME through 8.14.RME). The calculated RME risks are summarized in Table 4-17. It was assumed these receptors would be exposed to surface and subsurface soil through incidental ingestion and dermal contact. Inhalation of volatile and fugitive emissions from soil was not evaluated because no COPCs were retained for this pathway.

The noncarcinogenic hazard due to exposure to soil by an adult resident (1.4) and child resident (7.7) exceed USEPA's target HI of 1.0. The hazard is mainly associated with ingestion and dermal contact with the cadmium and iron detected in the soil.

As discussed in Section 3.3.2.3, the carcinogenic risk for the resident is calculated as a lifetime age-adjusted risk. The carcinogenic risk associated with exposure to soil by the resident exposed over his or her lifetime ($6x10^{-5}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$. The risk is primarily associated with ingestion of PAHs and arsenic in the soil.

The noncarcinogenic hazard associated with exposure to soil by a construction worker (2.8) is greater than USEPA's target HI of 1.0. Cadmium and iron contribute the largest amount to the overall hazard, however, neither of these constituents contribute individual HIs above 1.0. The carcinogenic risk associated with exposure to the soil by a construction worker ($2x10^{-6}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to soil by future industrial workers (1.1) exceeds USEPA's target HI of 1.0. There are no constituents or target organ/effects with HI's above 1.0. The carcinogenic risk associated with exposure to soil by an industrial worker ($2x10^{-5}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazards associated with exposure to soil by adolescent and adult trespassers (0.20 and 0.18, respectively) are below USEPA's target HI of 1.0. The carcinogenic risks associated with exposure to the soil by adolescent and adult trespassers ($1x10^{-6}$ and $3x10^{-6}$, respectively) are within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

CT noncarcinogenic hazards and carcinogenic risks were calculated for the receptors where the RME noncarcinogenic hazards and carcinogenic risks exceed 1.0 and $1x10^{-4}$, respectively (Appendix G.1d, Tables 7.20.CT through 7.23.CT, and summarized in Table 4-18). The CT noncarcinogenic hazard due to exposure to combined surface and subsurface soil by all receptors are equal to or below USEPA's target HI of 1.0.

Lead was retained as a COPC for combined surface and subsurface soil because the maximum detected concentration of lead exceeds the residential lead screening value of 400 mg/kg. Exposure to the combined surface and subsurface soil by a child resident was evaluated using the IEUBK lead model. Using the mean lead soil concentration of 5 mg/kg and the default values for the other parameters in the model, the IEUBK evaluation resulted in a geometric mean blood concentration of 2.9 µg/L blood for children 0 to 72 months old, which is below USEPA's recommended level of 10 µg/L. Approximately 99.63 percent of the population would have a blood lead level below USEPA's recommended level. Potential exposure to lead in the soil by residential children is not expected to result in blood-lead concentrations above USEPA's recommended levels.

Exposure to soil by an adult industrial worker was evaluated using the adult lead model (USEPA, 1996b, Table 4-19). This model calculates an acceptable concentration of lead in soil for an adult worker of 1,113 mg/kg. The average concentration of lead in the Site 11 combined surface and subsurface soil, 5 mg/kg, is below this level. Therefore, it is not expected that exposure to lead in the surface soil by an adult industrial worker would be a potential health concern.

Exposure to lead in the surface soil by an adolescent or adult trespasser is expected to be less than that of a resident or industrial worker, and is therefore, not expected to result in any adverse health effects.

4.6.4.2 Groundwater

Shallow groundwater beneath the site is not currently used as a potable water supply and will not likely be used as a potable water supply in the future. However, shallow groundwater beneath the site was evaluated as a worst-case risk estimate for potable groundwater use.

Risk estimates for exposure to shallow groundwater were calculated for child and adult residents under potential future residential use of the site (Appendix G.1d, Tables 7.6.RME, 7.7.RME, and 7.9.RME, and Tables 8.6.RME and 8.8.RME, and summarized in Table 4-17). It was assumed that a resident would drink the water, and bathe with the water, resulting in inhalation of volatiles (adult only) and dermal absorption.

The RME noncarcinogenic hazards associated with use of the groundwater as a potable residential water supply are above USEPA's benchmark noncarcinogenic HI of 1.0 for both the potential future child and adult resident. The noncarcinogenic hazards to a child and adult resident are 30 and 13, respectively. The hazard is primarily associated with ingestion of iron and manganese in the groundwater. Aluminum, arsenic, barium, chromium, and vanadium contribute individual HQs above 1 for the child resident.

As with residential soil exposure, the carcinogenic risk for groundwater for the resident is presented as a lifetime age-adjusted risk. The RME carcinogenic risk associated with use of the groundwater as a potable residential water supply exceeds USEPA's benchmark of $1x10^{-4}$ to $1x10^{-6}$. The residential lifetime carcinogenic risk is $2x10^{-4}$. This risk is associated with ingestion of arsenic in the groundwater.

Exposure to shallow groundwater by a construction worker during excavation was evaluated as a potential future exposure scenario (Appendix G.1d, Tables 7.8.RME, 7.10.RME, 8.7.RME, and 8.9.RME, and summarized in Table 4-17). The RME noncarcinogenic risk (0.25) is below USEPA's benchmark of 1.0. The RME carcinogenic risk is $2x10^{-8}$, which is below USEPA's target risk range.

The RME noncarcinogenic hazard for exposure to groundwater by a future adult and child resident exceeds USEPA benchmark value of 1.0, and the RME carcinogenic risks for exposure to groundwater by a lifetime resident exceeds a risk of $1x10^{-4}$. Therefore, CT exposure was evaluated for these scenarios. The CT risk estimates are summarized in Table 4-19 (and Appendix G.1d Tables 7.18.CT, 7.19.CT, and 8.15.CT). The calculated CT noncarcinogenic hazard for an adult resident (3.0) exceeds USEPA's target HI. The CT noncarcinogenic hazard for a child resident (9.8) is also greater than USEPA's target HI. Iron and manganese contribute the greatest amount to these hazard indices. The CT lifetime carcinogenic risk of $2x10^{-5}$ is within USEPA's target risk range.

Lead was retained as a COPC for shallow groundwater because the maximum detected concentration of lead exceeded the tap water action level of 15 µg/L. Exposure to the lead in groundwater by a child resident was evaluated using the IEUBK lead model. Using the mean shallow groundwater concentration of 30 µg/L and the default values for the other parameters in the model, the IEUBK evaluation resulted in a geometric mean blood concentration of 5.4 µg/L blood for children 0 to 72 months old, which is below USEPA's recommended level of 10 µg/L. Approximately 91 percent of the population would have a blood lead level below USEPA's recommended level. Potential exposure to lead in the groundwater by residential children is not expected to result in blood-lead concentrations above USEPA's recommended levels.

4.6.4.3 Surface Water

Risk estimates for exposure to surface water from the Mattawoman Creek were calculated for child and adult recreational users (Appendix G.1d, Tables 7.4.RME, 7.5.RME, 8.4.RME,

and 8.5.RME, and summarized in Table 4-17). It was assumed that a recreational user would be exposed to the surface water through incidental ingestion and dermal contact. and dermal absorption.

The noncarcinogenic hazards associated with exposure to surface water by child and adult recreational users (0.57 and 0.17, respectively) are below USEPA's target HI of 1.0. The carcinogenic risks associated with exposure to surface water for these receptors ($9x10^{-7}$ and $9x10^{-7}$) are below USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Lead was retained as a COPC for surface water from the Mattawoman Creek and the unnamed creek. It is not possible to quantify the risks associated with exposure to lead in surface water because there are no published toxicity values for lead. The maximum detected concentration of lead in the surface water is about twice the Safe Drinking Water Act action level for lead. The average concentration of lead in the surface water is 7 µg/L, which is below the action level for lead of 15 µg/L. Additionally, exposure to lead in surface water would be much less than exposure to lead in groundwater. Therefore, it is not expected that exposure to lead in the surface water would result in any adverse effects to child or adult recreational users who swim in the Mattawoman Creek or the unnamed creek.

4.6.4.4 Fish

None of the COPCs (which are all inorganic constituents) for surface water or constituents detected in the sediment significantly bioaccumulates in fish tissue. Therefore, ingestion of fish caught in the Mattawoman Creek and the unnamed creek was not quantitatively evaluated in the risk assessment. It is not expected that the ingestion of fish would result in risks above USEPA's target levels.

4.6.4.5 Summary of Total Risks Across Pathways and Media

Table 4-17 and Appendix G.1d, Tables 9.1.RME through 9.12.RME summarize the RME potential noncarcinogenic hazards and carcinogenic risks to each receptor. Table 4-18 and Appendix G.1d, Tables 9.13.CT through 9.18.CT summarize the CT potential hazards and risks to each receptor that have HIs in excess of 1.0 or carcinogenic risks greater than $1x10^{-4}$. Potential risks were summarized for a current adolescent trespasser/visitor, current adult trespasser/visitor, current industrial worker, current/future adult recreational user, current/future child recreational user, future adult resident, future child resident, future lifetime resident, future construction worker, future industrial worker, future adolescent trespasser/visitor, and future adult trespasser/visitor. Appendix G.1d, Tables 10.1.RME through 10.6.RME and 10.7.CT and 10.8.CT show only the chemicals that contribute a hazard greater than 0.1 or a carcinogenic risk greater than 10^{-6} for scenarios with total HIs greater than 1.0 or total carcinogenic risks greater than 10^{-4}.

The risk assessment results may be summarized as follows:

- **Current Trespasser/Visitor, Adolescent** (Appendix G.1d, Table 9.1.RME): HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.

- **Current Trespasser/Visitor, Adult** (Appendix G.1d, Table 9.2.RME): HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Current Industrial Worker** (Appendix G.1d, Table 9.3.RME): HI exceeds USEPA benchmark value and carcinogenic risk is within USEPA target risk range. None of the constituents or target organs/effects alone pose an HI greater than 1.0. The CT current industrial worker has a HI below the USEPA benchmark value (Appendix G.1d, Table 9.13.CT). No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Current/Future Recreational User, Adult** (Appendix G.1d, Table 9.4.RME): HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface water.
- **Current/Future Recreational User, Child** (Appendix G.1d, Table 9.5.RME): HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface water.
- **Future Resident, Adult** (Appendix G.1d, Table 9.6.RME): HI greater than 1.0 from exposure to both groundwater and combined surface and subsurface soil. Iron, manganese, and vanadium in groundwater contribute HIs above 1.0. The CT hazard is also above USEPA's benchmark value, due to exposure to groundwater (Appendix G.1d, Table 9.14.CT).
- **Future Resident, Child** (Appendix G.1d, Table 9.7.RME): HI exceeds 1.0, due to exposure to groundwater and combined surface and subsurface soil. Aluminum, arsenic, barium, chromium, iron, manganese, and vanadium in groundwater contribute HIs above 1.0, and cadmium and iron in soil contribute HIs above 1.0. The CT future child resident also has a HI above the USEPA benchmark value due to CT exposure to groundwater (Appendix G.1d, Table 9.15.CT).
- **Future Lifetime Resident** (Appendix G.1d, Table 9.8.RME): The carcinogenic risk posed by the Site 11 COPCs to the age-adjusted future lifetime resident is above the target USEPA risk range. This risk is primarily associated with exposure to groundwater. The risk associated with groundwater is from ingestion of the arsenic detected in the groundwater. The risk associated with soil, which alone is below USEPA's target risk range, is primarily from arsenic. The CT future lifetime resident carcinogenic risk associated with exposure to groundwater is within the USEPA target risk range (Appendix G.1d, Table 9.16.CT).
- **Future Construction Worker** (Appendix G.1d, Table 9.9.RME): HI is above USEPA benchmark value and carcinogenic risk is within the USEPA target risk range. Hazard is associated with cadmium, and iron detected in soil. However, both cadmium and iron alone HIs below USEPA's benchmark value. Groundwater does not contribute to this hazard. The CT noncarcinogenic hazard is below the USEPA benchmark value (Appendix G.1d, Table 9.17.CT).
- **Future Industrial Worker** (Appendix G.1d, Table 9.10.RME): HI is above USEPA benchmark value and carcinogenic risk is within the USEPA target risk range associated

with exposure to combined surface and subsurface soil. There are no individual constituents or target organs/effects with HIs above USEPA's benchmark value. The CT noncarcinogenic hazard is below 1.0 (Appendix G.1d, Table 9.18.CT). No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.

- **Future Trespasser/Visitor, Adolescent** (Appendix G.1d, Table 9.11.RME): HI is below USEPA benchmark value and carcinogenic risk is within the USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Trespasser/Visitor, Adult** (Appendix G.1d, Table 9.11.RME): HI is below USEPA benchmark value and carcinogenic risk is within the USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.

4.7 Ecological Risk Assessment (Steps 1–3A)

The following presents the SERA and the first part of the BERA for Sites 11 and 17. The sites were combined for the evaluation because they abut and are hydrologically connected by The Mattawoman Creek. It should be noted that the data collected during the Area B investigation is not presented here because, as discussed below, these sites will likely proceed to the later steps of the BERA. The data will be presented as part of the BERA work plan

4.7.1 Screening Problem Formulation

Problem formulation involves preparing descriptions of environmental setting, sources, fate and transport of site chemicals, chemical ecotoxicity, and potential receptors. This information is used to build the conceptual model. The conceptual model includes a discussion of exposure pathways, as well as assessment and measurement endpoints.

4.7.1.1 Environmental Setting

Site 11 is the Caffee Road Landfill (Area A) and the burning grounds (Area B; Figure 4-1). The site is bordered to the west by the unnamed creek and associated emergent wetland and The Mattawoman Creek to the south (Figure 4-2). Review of historical aerial photos indicated that filling activities have extended the shoreline into The Mattawoman Creek as much as 150 ft from its original position. Site reconnaissance verified that the majority of the Mattawoman Creek shoreline next to Site 11 consists of concrete, debris, and fill.

Until the early 1960s, Site 11 was used for the disposal of bulk metal items and trash, rocket motor casings, exploded building debris, rifles, demilitarized ordnance, propellant grains residue and open burning residues. The surface above the landfill is now used as the Decontamination Burn Point and a large collection of flashed metal parts are located atop the unit. Flashed metal refers to metal debris that was burned to remove trace amounts of explosive residue. The eastern area of Site 11 is now used for drum storage and waste segregation. This site was never permitted as a landfill so there is no organized cover

material application procedures to secure deposited or stored waste materials. There are no historical sampling data available for Site 11.

Habitats within the vicinity of Site 11 include mixed hardwood and pine forest, tidal emergent and open water wetland, the intermittent stream which discharges into the wetland, and The Mattawoman Creek. Mixed hardwood and pine forest is located on the hillsides north of the landfill and west of the wetland. The forests are second or third growth and are dominated by several species of oaks (*Quercus* spp.) with red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), and Virginia pine (*Pinus virginiana*). The forest understory is dominated by American holly *(Ilex opaca*). The landfill itself is relatively barren with compacted soils. Herbaceous vegetation grows in some areas.

The tidal wetland is located at the confluence of the unnamed creek and The Mattawoman Creek. The marsh is approximately 0.75 acres in size with exposed mudflats at low tide. The low marsh is dominated by cattail (*Typha* spp.) and the high marsh is dominated by rose mallow (*Hibiscus palustris*), wool grass (*Scirpus cyperinus*), and soft rush (*Juncus effusus*). A sparse mixture of immature trees has established in the marsh including sycamore (*Platanus occidentalis*) and black willow (*Salix nigra*). The marsh edge abutting the landfill is dominated by clumps of wild rye (*Elymus villosus*) and black locust (*Robinia pseudoacacia*).

Fauna previously observed at Site 11 by CH2M HILL natural resources staff include the marsh wren (*Cistothorus palustris*), northern flicker (*Colaptes auratus*), American crow (*Corvas brachyrhynchos*), gulls (*Larus* spp.), gray squirrel (*Scirius carolinensis*), and white-tailed deer (*O. virginianus*).

Site 17 is located east of and immediately adjacent to Site 11 (Figure 6-1). Site 17 is defined as a 1,000-ft stretch of shoreline along the Mattawoman Creek where metal parts were discarded. Metals were discarded along the Mattawoman Creek shoreline from the 1960s until the early 1980s. The disposed materials included rocket motor casings, shipping containers, empty drums, and various metal parts. The defined areas of this site was expanded in 1997 to include the forested area 100 ft from the shoreline where dozens of rusted drums were identified. There are no historic sampling data available for Site 17.

The Mattawoman Creek supports spawning populations of fish including white perch (*Morone americana*), yellow perch (*Perca flavenscens*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), and largemouth bass (*Micropterus salmoides*). The Mattawoman Creek also supports channel catfish (*Ictalurus punctatus*) and bluegill (*Lepomis macrochirus*). The shoreline of the Mattawoman Creek is gravelly and degraded with discarded metal parts, concrete, and other debris used for erosion control. Vegetation within the intertidal shore includes wild rye (*E. villosus*) and rose-mallow (*H. palustris*).

The riparian forested buffer is sparsely vegetated with black locust (*R. pseudoacacia*) and sweet gum (*L. styraciflua*). Japanese honeysuckle (*Lonicera japonica*) is also common within the buffer. Wild rye (*E. villosus*) dominates the herbaceous layer. The ground surface is littered with rusted drums.

4.7.1.2 Summary of Available Analytical Data

A total of 32 surface soil samples (0–6 in.) were collected during the investigation. Thirty-two were collected at and upslope of Site 11 (Figure 4-2): thirteen samples were collected within the Caffee Road Landfill; six samples were collected from the area surrounding Buildings 24 and 24A; three samples were collected from a primary drainageway trending north to south along the west side of Buildings 24 and 24A; six samples were collected from a predetermined grid pattern; and four samples were collected upslope of the landfill. All samples were analyzed for TCL organics, TAL inorganics, TPH, perchlorate, explosives, NG, and PETN. One of the upslope surface soil samples was also analyzed for TOC and pH.

Fifteen surface soil samples were collected near rusted drums located along the shoreline of the Mattawoman Creek at Site 17 (Figure 6-1). Surface soil samples were analyzed for TCL organics, TAL inorganics, explosives, NG, PETN, perchlorate, TOC, and pH.

There were 13 sediment and surface water samples collected from Sites 11 and 17 combined (Figures 4-2 and 6-2). Sediment samples were collected from the same locations as surface water samples. Four samples were collected in the Mattawoman Creek immediately south of the Caffee Road Landfill. One sample was collected in the stream upgradient of the tidal wetland. Two samples were collected in the tidal wetland. Six samples were collected in the Mattawoman Creek along the length of Site 17. Sediment samples were analyzed for TCL organics, TAL inorganics, TPH, explosives, NG, PETN, and perchlorate. Surface water samples were analyzed for the same plus filtered TAL metals.

4.7.1.3 Ecotoxicity and Potential Receptors

Because a variety of wastes were disposed of at the site and the type and quantity of disposal is unknown, there is no one chemical or set of chemicals that are expected to be of primary ecological concern at the site. Based on what is known about the site, metals and explosives are likely to be present. Each of these classes can potentially affect aquatic and terrestrial receptors under certain circumstances.

Receptors potentially exposed to soil contaminants at Sites 11/17 include organisms that have significant direct contact with soil or consume prey that live in the soil or leaf litter. These could include plants, soil invertebrates, and birds or mammals that consume plants or invertebrates. If chemicals that biomagnify are present, top consumers such as raptors or foxes could also be exposed to potentially significant levels of chemicals in their diet.

If chemicals are present in the intermittent stream, tidal wetland, or the Mattawoman Creek, potential receptors include aquatic plants, invertebrates, and fish. If chemicals that biomagnify are present, semi-aquatic organisms that feed in these areas may also be potential receptors (e.g., raccoon and great blue heron).

4.7.1.4 Preliminary Conceptual Model

Information on the habitat features and the fate and transport of the chemicals detected at the site were used to build the preliminary conceptual model (Figure 4-11). The conceptual model addresses complete exposure pathways, receptors, and endpoints.

Exposure Pathways The soils at Sites 11 and 17 are known to have been impacted by past disposal activities. Key exposure routes for ecological receptors include ingestion of chemicals adsorbed to soil (invertebrates) and direct contact with chemicals in the soil (invertebrates and plants). Other organisms that forage in the area are also potentially exposed to chemicals by direct contact, incidental ingestion of soil, and ingestion of invertebrates and/or plants that have accumulated body burdens.

Chemicals may have transported to site water bodies through direct disposal, transport of eroded soil from upland areas, or groundwater discharge. If chemicals are present in the tidal wetland and the Mattawoman Creek, direct contact with and ingestion of surface water and sediment may be relevant exposure pathways. In addition, organisms using the aquatic system such as herons, raccoons, and frogs may be exposed to chemicals through the ingestion of plant or animal tissues with chemical burdens.

Assessment and Measurement Endpoints The conclusion of problem formulation includes the selection of assessment and measurement endpoints, based on the preliminary conceptual model. Based on the habitat and types of contaminants potentially present, eight assessment endpoints were chosen to evaluate the potential risk to ecological receptor populations from chemicals disposed of at Sites 11 and 17. Each assessment endpoint and corresponding representative species or community is described below.

1. **Growth, survival, and reproduction of soil invertebrate communities —** Soil invertebrates, such as earthworms, promote soil fertility by breaking down organic matter and releasing nutrients. They also improve aeration, drainage, and aggregation of soil, and serve as a forage base for many terrestrial species. The soils at the site will support fewer insectivorous birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of soil invertebrate communities.

2. **Growth, survival, and reproduction of terrestrial plant communities —**Plants provide food, cover, and nesting material for many animals. The soils at the site will support fewer birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of plants.

3. **Growth, survival, and reproduction of benthic invertebrate communities —** Healthy, viable sediment invertebrate communities are necessary for a well-developed and balanced aquatic ecosystem. Benthic invertebrates influence nutrient cycling and availability, and sediment condition. By serving as prey species for many upper trophic predators (e.g., fish), they are critical to the sustenance of the communities of upper trophic level species. The sediments at the site will support fewer fish and other upper trophic level species if chemical concentrations are limiting the growth, survival, and reproduction of benthic invertebrates.

4. **Growth, survival, and reproduction of aquatic plant communities —**Plants provide food, cover, and nesting material for many animals. The sediments at the site will support fewer fish and other animals if chemical concentrations are limiting the growth, survival, and reproduction of aquatic plants.

5. **Growth, survival, and reproduction of water column organisms —** Water column organisms (e.g., phytoplankton) form the foundation of aquatic food chains. These organisms are primary producers and consumers that are important in nutrient and

energy recycling in aquatic ecosystems. By serving as the base of the food chain, they are critical to the sustenance of the communities of upper trophic level species, such as fish. Fish provide a critical link in the nutrient and energy transfer within aquatic ecosystems. Fish are important consumers of plants, invertebrates, and other fishes (as well as other organisms in some cases). Fish are prey for many species of mammals and birds. Many fish species are also valued by society for food and recreation.

6. **Growth, survival, and reproduction of insectivorous terrestrial birds —** These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. American robin (*Turdus migratorius*) was chosen to represent this assessment endpoint. Robins live in a variety of habitats, including woodlands, swamps, suburbs, and parks. Robins forage on the ground in open areas, along edge habitats, or along the edges of streams. They forage along the ground for ground-dwelling invertebrates and search for fruit and foliage-dwelling insects in low tree branches (USEPA, 1993). The 7-day robin hatchling was used as the ecological receptor because it is more susceptible to exposure to bioaccumulative chemicals than adult robins because its diet is mainly composed of earthworms.

7. **Growth, survival, and reproduction of carnivorous terrestrial birds —** These receptors are top level predators and are susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial food chains. The American kestrel (*Falco sparverius*) was chosen to represent this endpoint**.** They are found in open to semi-open areas and near the edges of groves. American kestrels eat small mammals, birds, and invertebrates (USEPA, 1993).

8. **Growth, survival, and reproduction of insectivorous terrestrial mammals —**These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. Short-tailed shrew (*Blarina brevicauda*) was chosen to represent this assessment endpoint. Short-tailed shrews live in a wide variety of habitats and need cool, moist conditions (Randolf, 1973). They eat insects, worms, snails, and other invertebrates (Robinson and Brodie, 1982).

9. **Growth, survival, and reproduction of omnivorous wetland mammals—**These receptors are third order consumers and are thus more susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify in food webs. The raccoon (*Procyon lotor*) was chosen to represent this endpoint. The raccoon is the most abundant and widespread medium-sized omnivore in North America (USEPA, 1993). They are opportunistic feeders and eat fruits, nuts, insects, frogs, eggs, and virtually any other edible material that is available.

10. **Growth, survival, and reproduction of herbivorous terrestrial mammals —**These receptors are primary consumers, feeding on plants. Many of the species in this group are prey for upper trophic levels. The meadow vole (*Microtus pennsylvanicus*) was chosen to represent this assessment endpoint. The meadow vole inhabits areas where there is good grass cover. It consumes primarily shoots, grasses, and bark (USEPA, 1993).

11. **Growth, survival, and reproduction of carnivorous terrestrial mammals —** These receptors are top level consumers and are thus most susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial foodchains. The red fox (*Vulpes vulpes*) was chosen to represent this endpoint. Red fox utilize many different types of habitats including salt marshes, cropland, rolling farmland, brush, pastures, hardwood stands, and coniferous forests. Their diet consists primarily of small mammals including meadow voles, mice, and rabbits. They also consume plant material, mainly in the summer and fall when fruits, berries, and nuts become available.

12. **Growth, survival, and reproduction of insectivorous wetland birds—**These receptors are 2nd order consumers and are susceptible to exposure to bioaccumulative chemicals. The marsh wren (*Cistothorus palustris*) was selected to represent this endpoint. Marsh wrens inhabit emergent wetlands and consume insects.

13. **Growth, survival, and reproduction of piscivorous birds —** Avian piscivores (fish eaters), such as the great blue heron (*Ardea herodias*), are important upper trophic level consumers in aquatic ecosystems. In this function, they are often reflective of ecosystem health, and are particularly susceptible to toxins that bioaccumulate in the food chain. In their function as a predator, they serve to maintain a balance in fish populations versus forage abundance and available habitat. Many such birds are also valued by society for their visual and vocal traits. The great blue heron was chosen as the surrogate species to represent this assessment endpoint. Fish are preferred prey, but they also feed on amphibians, reptiles, insects, crustaceans, birds, and mammals (Alexander, 1977; Peifer, 1979).

Although potentially complete exposure pathways exist for reptiles and amphibians, they were not specifically selected as receptors because information on the toxicological effects of chemicals on adult amphibians and reptiles via ingestion is limited. The assessment indirectly evaluates these groups because there are receptors included in the assessment that have similar diets to reptiles and amphibians (such as the shrew).

The corresponding measurement endpoints associated with each assessment endpoint were defined as follows:

Assessment Endpoints		Measurement Endpoints
Growth, survival, and reproduction of soil invertebrate communities.	⇨	Comparison of HQs for soil invertebrates to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of soil invertebrates.
Growth, survival, and reproduction of terrestrial plant communities.	⇨	Comparison of HQs for terrestrial plants to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of terrestrial plants.
Growth, survival, and reproduction of benthic invertebrate communities.	⇨	Comparison of HQs for benthic invertebrates to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the maximum sediment concentration by a benchmark that is intended to be protective of benthic invertebrates.
Growth, survival, and		Comparison of HQs for aquatic plants to a target HQ of 1. Medium-specific

Assessment Endpoints		Measurement Endpoints
reproduction of aquatic plant communities.	⇨	HQs are calculated for individual contaminants by dividing the maximum sediment concentration by a benchmark that is intended to be protective of aquatic plants.
Growth, survival, and reproduction of water column organisms.	⇨	Comparison of HQs for water column organisms to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the maximum surface water concentration by a surface water benchmark that is intended to be protective of aquatic life.
Growth, survival, and reproduction of insectivorous terrestrial birds.	⇨	Comparison of HQs for robin to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of carnivorous terrestrial birds.	⇨	Comparison of HQs for kestrel to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of insectivorous terrestrial mammals.	⇨	Comparison of HQs for short-tailed shrew to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of omnivorous wetland mammals.	⇨	Comparison of HQs for raccoon to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by toxicity values that are associated with NOAELs and LOAELs.
Growth, survival, and reproduction of herbivorous terrestrial mammals.	⇨	Comparison of HQs for meadow vole to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of carnivorous terrestrial mammals.	⇨	Comparison of HQs for red fox to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of insectivorous wetland birds.	⇨	Comparison of HQs for marsh wren to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of piscivorous birds.	⇨	Comparison of HQs for great blue heron to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.

4.7.2 Analysis

The ecological exposure estimation was conducted as described in Section 3.4. Site-specific modifications are addressed below.

4.7.2.1 Site-Specific Ecological Effects Evaluation

The TOC-adjustable soil screening values were adjusted using the average soil percent TOC of 5.4 percent. Sediment and surface water screening values were adjusted based on 1.7 percent TOC and a hardness of 42.6 mg/L, respectively. Salinity measurements collected during the site reconnaissance in April 2001 showed the surface water in the Mattawoman Creek to be slightly brackish. Therefore, a set of brackish screening values was developed for site sediment and surface water.

4.7.2.2 Site-Specific Ecological Exposure Estimation

Exposure parameters (i.e., ingestion rates and dietary composition) for each receptor species are presented in Table 4-20. The diet of the American robin is for a 7-day old hatchling. It includes earthworms and soil, but no plant material.

4.7.3 Screening-Level Risk Calculations

The SERA indicated that some detected inorganics and PAHs in soil may impact the growth, survival, and/or reproduction of soil invertebrates and plants (Table 4-21). Preliminary COPCs for soil invertebrates and plants included multiple chemicals from all classes. The majority of these preliminary COPCs were chemicals that were not detected but had maximum detection limits in excess of screening values, or chemicals for which no medium-specific screening value was available.

For sediment, screening-level risk calculations indicated that some detected inorganics, PAHs, explosives, and acetone may impact the growth, survival, and/or reproduction of benthic invertebrates and plants (Table 4-22). As for soil, the preliminary COPC list for sediment is long due to chemicals that were not detected but had maximum detection limits in excess of screening values, or chemicals for which no medium-specific screening value was available.

For surface water, the SERA calculations indicated several detected inorganics may pose a risk to water column receptors (Table 4-23). As for the other two media, the preliminary COPC list included multiple contaminants from all classes.

The results of food chain modeling showed that two or more detected inorganics at the site potentially pose a risk to every receptor category (Table 4-24). The preliminary COPCs also included five organics without reference toxicity values and hexachlorobenzene, which had a maximum detection limit in excess of the reference toxicity value.

4.7.4 Refinement of Conservative Exposure Assumptions (Step 3A)

In Step 3A, exposure assumptions are refined and risk estimates (i.e., HQs) are recalculated. Risk is again characterized and uncertainties associated with the conclusions are described. If re-evaluation of the conservative exposure assumptions supports an acceptable risk determination then the site may exit the ecological risk assessment process (CNO, 1999).

4.7.4.1 Exposure Assumption Refinements

The results of Steps 1 and 2 (i.e., the SERA) indicated that, based on a set of conservative assumptions, there are multiple chemicals that may pose a risk to several receptor communities/species used in the screening assessment. The set of preliminary COPCs

includes chemicals with HQs in excess of 1 and chemicals for which assessment data were unavailable.

Assumptions and methods that were modified for the calculation of medium-specific and food chain hazard quotients are listed below, along with justification for each modification.

- Maximum chemical concentrations were replaced by average chemical concentrations. For individual mammalian and avian receptors, average chemical concentrations provide a better estimate of the likely level of chemical exposure because each of the receptors would be expected to forage in several different areas of the site, and, in many cases, off the site. With adequate spatial coverage, central tendency measures are appropriate for evaluating impacts to populations of soil invertebrates and plants. While locations of maximum concentration may be important to individuals, the average value at the site can be more instructive with regard to the level of impact that might be expected at the population level.
- Central tendency estimates for body weight and ingestion rate were used to develop exposure estimates, rather than minimum body weights and maximum ingestion rates. The use of central tendency parameters is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.

Exposure parameters are presented in Table 4-25.

4.7.4.2 Refined Risk Calculations

For soil invertebrates and plants, the mean concentrations of 10 inorganics (aluminum, cadmium, chromium, copper, iron, lead, mercury, silver, vanadium, and zinc) exceeded soil screening values (Table 4-26). HQs ranged from 3.6 to 217.

For sediment invertebrates and aquatic plants, the mean concentration of 11 detected inorganics (arsenic, barium, cadmium, copper, cyanide, lead, manganese, mercury, nickel, silver, and zinc) exceeded screening values (Table 4-27). HQs ranged from 1.1 to 134. There were also several detected organics with HQs greater than 1. Benzo(a)anthracene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and phenanthrene had HQs between 1 and 5. The explosives 1,3,5–trinitrobenzene, 1,3-dinitrobenzene, and 2,6-dinitrotoluene had HQs between 1 and 6. Acetone was the only VOC with a HQ greater than 1.

For surface water, manganese was the only detected chemical with a HQ greater than 1 (Table 4-28).

Refined risk calculations for food chain receptors are shown in Table 4-29. There were exceedances of LOAEL-based HQs for short-tailed shrew (copper, lead, mercury), robin (lead), kestrel (lead), great blue heron (lead and mercury), and wren (lead). For one or more receptors, there were also NOAEL-based exceedance for arsenic, cadmium, and zinc.

4.7.4.3 Risk Characterization

The concentrations of aluminum, cadmium, chromium, copper, iron, lead, mercury, silver, vanadium, and zinc exceeded soil screening values. Of these, only aluminum and vanadium were present at concentrations that are consistent with NDWIH background levels (B&RE, 1997), as demonstrated below. Note that in the following discussion, the full sample

designations have been truncated for ease of reference (e.g., IS11SD02 is referred to as SD02).

Inorganic	Site Average (mg/kg) (n = 43)	Surface Soil Background Average (mg/kg) (n = 12 or 14)	Ratio
Aluminum	8,821	7,874	1.1
Cadmium	16.3	0.22	74
Chromium	29.3	12	2.4
Copper	413	5.15	80
Iron	43,429	10,290	4.2
Lead	3,579	20	179
Mercury	1.67	0.043	39
Silver	7.25	NA	NA
Vanadium	23.6	19.2	1.2
Zinc	1,040	18.1	57

Cadmium, chromium, copper, iron, lead, mercury, silver, and zinc were present at higher concentrations than those in the NDWIH background data set. Maximum concentrations of these inorganics were detected at Site 11, each at a different sampling location.

A similar background comparison was conducted for sediment. Brown and Root (1997) presented average inorganic concentrations for six samples collected near the mouth of the Mattawoman Creek. Comparisons to site averages are shown below:

Inorganics	Site Average (mg/kg) (n = 13)	Sediment Background Average (mg/kg) (n = 6)	Ratio
Arsenic	12.1	15	0.81
Barium	82.7	NA	NA
Cadmium	3.72	0.8	4.7
Copper	244	32	7.6
Cyanide	1.02	NA	NA
Lead	6,261	38	165
Manganese	408	1,200	0.34
Mercury	0.19	0.3	0.63
Nickel	23.3	35	0.67
Silver	3.85	NA	NA
Zinc	618	186	3.3

Inorganics	Site Average (mg/kg) (n = 13)	Sediment Background Average (mg/kg) (n = 6)	Ratio

In sediment, concentrations of arsenic, manganese, mercury, and nickel were consistent with background levels. The other seven inorganics that exceeded screening values (barium, cadmium, copper, cyanide, lead, silver, and zinc) were all selected as COPCs. Each may pose a risk to sediment invertebrates or aquatic plants. Maximum concentrations of these COPCs were observed in the Mattawoman Creek, not in the stream or tidal wetland abutting the western edge of Site 11. In addition, the location of maximum concentration for five of the six was at Site 11. Although the maximum concentration of cadmium was detected at Site 17, it was the sediment sample (SD06) closest to Site 11 and the Caffee Road Landfill.

Benzo(a)anthracene (HQ=1.4) was detected twice (Site 11, SD02 at 250 μg/kg and Site 11, SD06 at 91 μg/kg). Benzo(k)fluoranthene (HQ=1.2) was detected once (Site 11, SD02 at 170 μg/kg). In each case, only the maximum detected concentration exceeded the screening value and both locations of maximum detection were at Site 11, SD02, in the Mattawoman Creek adjacent to Caffee Road Landfill. There were two additional PAHs that were detected in the Site 11, SD02 soil sample with average site concentrations in excess of the screening value. Locations of maximum detection for four of the seven detected explosives were also at Site 11 (sample SD02). Two of these detections exceeded the screening value. Due to the number of exceedances of PAH and explosives benchmarks, these groups are selected as COPCs in the area between SD01 and SD03, encompassing sample location SD02.

Acetone was also detected in 3 of 7 sediment samples (HQ=3.3). Because acetone is a common laboratory contaminant and acetone was not stored at the site, it was not selected as a COPC.

In water, manganese was the only detected chemical with a HQ in excess of 1. The total manganese concentration was consistent across all samples, ranging from 87.4 μg/L to 134 μg/L. The filtered concentration exceeded the screening value of 10 μg/L in four of the six detections. Three of the exceedances were samples located in the stream and tidal wetland to the west (SW05, SW06, and SW07) of Caffee Road Landfill. In those sample the dissolved fraction was 61 to 92 percent of the total. This percentage is high, suggesting that there may have been breakout during the filtering process. Water depth was shallow at these locations (4 to 6 in.), increasing the chance of obtaining a sample with more suspended solids. Because the concentrations of total manganese were consistent across the site and manganese is not a COPC in soil or sediment it likely poses minimal risks to ecological receptors populations. It was therefore not selected as a COPC.

Copper, lead, and mercury were selected as COPCs for food chain receptors. By endpoint, COPCs are as follows:

- Insectivorous terrestrial mammals—copper, lead, mercury
- Insectivorous terrestrial birds—lead
- Carnivorous terrestrial birds—lead
- Piscivorous birds—lead and mercury

- Wetland insectivorous birds—lead

4.7.4.4 Uncertainty

There is uncertainty associated with the fact that there were some chemicals that were not detected, but had mean concentrations (based on one-half the detection limits) that exceeded direct contact screening values. These occurrences were limited, occurring in 5, 6 and 9 percent of cases for soil, surface water, and sediment, respectively.

Screening values were also not available for some organics. The majority of these occurrences were for compounds that were not detected. The relatively few detections of SVOCs, VOCs, and explosives tended to be at low concentrations, and, for those with screening values, most HQs were less than 1. Overall, the frequency of detection and magnitude of detections suggest that organics are not of concern at the site, with the exception of the area of sediment identified in the Mattawoman Creek. As such, the lack of screening values for some organics carries only a limited amount of uncertainty.

The few unavailable ingestion-based screening values were associated with compounds that were not detected at the site.

4.7.4.5 Risk Conclusion

As outlined in the risk characterization section, there are several inorganics in sediment and soil that were selected as COPCs. These inorganics may pose a risk to soil invertebrates, plants, insectivorous birds and mammals, carnivorous terrestrial birds, and piscivorous birds. In addition, PAHs and explosives in sediment along a 300-ft stretch of the Mattawoman Creek may pose a risk to benthic invertebrates and aquatic plants. Based on preliminary reviews of concentration distribution, the soil and sediment in the vicinity of the Caffee Road Landfill at Site 11 will likely be the focus of additional risk assessment work.

The next steps in the ecological risk assessment process are Step 3b and Step 4. In Step 3b, the problem formulation is revised. Step 3B will include additional analysis of the distribution of chemicals at the site. This will assist in determining which COPCs and specific areas require additional evaluation. Step 4 is the BERA work plan. The work plan defines what additional information should be collected and how it will be used to further evaluate risk at the site.

4.8 Summary and Conclusions

4.8.1 General

An initial remedial investigation was conducted at the landfill portion of Site 11. The objectives of the RI were to determine: 1) the extent of waste at the site; 2) whether or not the waste is a source of contamination at the site; 3) whether or not soils have been impacted; and 4) whether or not the creeks adjacent to the site have impacted. Field activities were conducted between July 20 and August 9, 2000. The work consisted of waste sampling, surface soil sampling, subsurface soil sampling, waste sampling, sediment sampling, surface water sampling, groundwater grab sampling, monitoring well installation.

A follow-up RI investigation was conducted on the eastern portion of the site (the former burning grounds). The objectives of the second RI investigation were to determine: 1) whether or not environmental media have been impacted by the former burning pits; (2) if waste is present in the area east of Building 1607; (3) the extent and thickness of waste, if present; and (4) whether or not environmental medial have been impacted from past land use in the area between Building 1607 and the former burning pits. Field activities were conducted between February 25 and March 26, 2002. The work consisted of surface and subsurface soil sampling, sediment and surface water sampling, and monitoring well installation and sampling.

The upper 5 ft of the subsurface is primarily fill material characterized by a clayey sand and gravel containing wood fragments, glass, and brick. This is underlain by sandy and clayey silts with thin clay lenses of the Quaternary. The Quaternary deposits are present to depths greater than 32 ft bgs. Groundwater generally flows from north to south and discharges to the Mattawoman Creek.

The RI objectives of both investigations were met. The lateral extent and depth of waste disposed of at the site were determined using soil borings. Samples of the waste had similar types of SVOCs, metals, and explosives as did the subsurface soil, strongly suggesting that the waste has contaminated the underlying soil. However, there are few contaminants in groundwater, indicating that the waste has not severely affected the groundwater quality.

Data generated from environmental sampling from the burning grounds indicate that past operations have impacted soil and sediment. As with Area A, few contaminants were detected in groundwater and surface water.

There is little question that past operations have impacted surface soils in both areas because many analytes were detected in surface soil at concentrations well above both facilitywide and site-specific background. Finally, there is evidence that metals in surface soil have contaminated sediment in the adjoining creeks.

4.8.2 Nature and Extent of Contamination

The nature and extent of contamination at Site 11 were evaluated based on a 'short list' of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

For simplicity, the landfill and burning grounds are referred to as Areas A and B, respectively.

Surface and subsurface soils in Area A contained few volatile organic compounds (VOCs) at low concentrations and several SVOCs widely distributed across the landfill and in its vicinity (including around Building 24). Concentrations were greatly reduced in subsurface soils as compared to surface soils. Metals in surface soil were detected at their highest levels and greatest frequency in the western and central part of the site and around Building 24. Numerous surface and subsurface soil samples contained arsenic, iron, and lead at concentrations above their background 95 percent upper confidence limits (UCLs). Total petroleum hydrocarbons—diesel range organics (TPH DRO) were observed to have a widespread distribution in surface soil and concentrations ranged as high as 400 mg/kg. Several explosives were detected in surface soil, particularly in the western part of the site,

including a high concentration of perchlorate. Few explosives were detected in subsurface soil, although one high value of perchlorate present.

Surface and subsurface soils in Area B contained few VOCs at low concentrations. SVOCs were present in numerous surface samples and all but one subsurface sample. Concentrations generally decrease from surface to subsurface soil. Notably, concentrations increase from IS11SS44 to IS11SB44, located at one of the former burning pits. Metals in surface soil did not show a distinct pattern. Metals in subsurface soil are generally reduced as compared to surface soils The highest levels and greatest frequency occur at one of the former burning pads. TPH DRO were not detected in surface soil but detected in some subsurface soil samples. Concentrations were low. Two explosives (nitroglycerine and perchlorate) were detected in surface soil. No detections of explosives were observed in subsurface soil.

Only very low concentrations of VOCs and SVOCs were detected in groundwater at both Areas A and B. Total arsenic was detected in four monitoring well samples in Area A and one sample in Area B but not detected in the background data set. Iron was detected in all wells, at similar concentrations in both unfiltered and filtered samples. The calculated mean concentration of iron in groundwater in Area A is greater than 2.5 times the background mean. The calculated mean concentration of iron in groundwater in Area B is greater than two times the background mean. Total lead was detected in all eight of the monitoring wells but was not detected in the background data set. In general, metals were lower in concentration in filtered samples than in unfiltered samples, suggesting that many of the metals remain adsorbed to solid material in the subsurface. Few explosives (and only at low concentrations) and little TPH-DRO were detected in groundwater.

In sediment, only low concentrations of VOCs, SVOCs, explosives, and TPH-DRO were detected. However, several metals, including arsenic, iron, and lead, were detected above background in the sediments, particularly in the Mattawoman Creek. Concentrations of almost all analytes in surface water were too low to warrant extensive discussion.

Based on a review of the data and knowledge of the site, it appears the primary mechanism for the spread of inorganics is runoff. The evidence for this is as follows:

- The site is almost entirely unvegetated.
- Concentrations of contaminants in subsurface soil are greatly reduced as compared to surface soil samples.
- Concentrations in sediment are elevated as compared to background.

It is likely that such inorganics as iron and manganese are being transported in groundwater to surface water. However, concentrations of these metals in surface water are not elevated with respect to background.

4.8.3 Human Health Risk Assessment

The human health risk assessment (HHRA) indicates that there are potential human health hazards and risks above United States Environmental Protection Agency (USEPA) target levels associated with exposure to surface soil, combined surface and subsurface soil, and

groundwater. Hazards and/or risks above USEPA target levels may occur for potential future industrial or residential site use.

Under current site use the hazard to the industrial site worker slightly exceeds the USEPA benchmark value, however, there are no individual constituents or target organs/effects with hazards above USEPA's benchmark value. Additionally, the hazard calculated using the central tendency (CT) assumptions is below USEPA's target level. Therefore, there is no unacceptable hazards under current site use.

Although unlikely, future residential use of the site may result in hazards and risks to children and adults above USEPA's target levels. Exposure to cadmium and iron in the soil, and aluminum, arsenic, barium, and chromium in the groundwater are the main contributors to the hazards and risks. The maximum detected concentrations in groundwater were used as the groundwater exposure point concentrations because less than five samples were available, which may result in an over-estimation of the risk. The concentrations of all of these inorganic constituents are greater than the concentrations detected in the site-specific background groundwater and soil samples.

Future industrial use of the site may result in a reasonable maximum exposure (RME) hazard slightly above USEPA target levels associated with exposure to soil by an industrial worker. However, none of the individual constituents pose a hazard above USEPA target levels, and there are no target organs/effects with a hazard above USEPA's target level. Additionally, the CT hazard is below 1.0. A future construction worker may have a hazard slightly above 1.0 because of exposure to the cadmium and iron (neither pose a hazard above USEPA's target level alone) detected in the soil. The CT hazard for the construction worker is below 1.0.

Future industrial use of the site may result in a reasonable maximum exposure (RME) hazard slightly above USEPA target levels associated with exposure to soil by an industrial worker. However, none of the individual constituents pose a hazard above USEPA target levels, and there are no target organs/effects with a hazard above USEPA's target level. Additionally, the CT hazard is below 1.0. A future construction worker may have a hazard slightly above 1.0 due to exposure to the cadmium and iron (neither pose a hazard above USEPA's target level alone) detected in the soil. The CT hazard for the construction worker is below 1.0.

4.8.4 Ecological Risk Assessment

There are several inorganics in sediment and soil that were selected as COPCs. These inorganics may pose a risk to soil invertebrates, plants, insectivorous birds and mammals, carnivorous terrestrial birds, and piscivorous birds. In addition, PAHs and explosives in sediment along a 300-ft stretch of the Mattawoman Creek may pose a risk to benthic invertebrates and aquatic plants. Based on preliminary reviews of concentration distribution, the soil and sediment in the vicinity of the Caffee Road Landfill at Site 11 will likely be the focus of additional risk assessment work.

4.9 Conclusions

The human health and ecological risk assessments determined that there are potentially unacceptable risks associated with soil, sediment, and groundwater at Site 11. Following submittal of the draft final RI report in August 2002, the Navy, in agreement with the EPA and MDE, will address each medium as follows:

Sediment – A Baseline Ecological Risk Assessment (BERA) will be conducted to assess potential ecological risk from contaminants along the shoreline and in the unnamed creek. Therefore, recommendations for sediment will await the results of the BERA, which will provide more site-specific information regarding potential ecological risk. The Mattawoman Creek Study assessed potential risk in general areas of the creek (i.e., Area 1, Area 2, etc), rather than potential risk at individual sites. Thus, the results will be used as a supplement to the BERA to determine recommendations for site sediment. If the BERA indicates ecological risks, then the sediment will be addressed in the feasibility study for the landfill.

Groundwater and Soil – A feasibility study will be conducted to address the source area and upland soil (i.e. Building 28). The feasibility study will examine a number of alternatives; however, the presumptive remedy for the site is a cap. Capping of the landfill will prevent contact by humans and wildlife with contaminated soil, reduce water infiltration that would further mobilize contaminants from soil into groundwater, and prevent further erosion of soil into the Mattawoman Creek (thus preventing further contamination of sediment).

4.10 References

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Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO06		IS11SO10		IS11SO13		IS11SO14		IS11SO15		IS11SO16		IS11SO17		IS11SO18	
Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
Acetone																
Cyclohexane																
Ethylbenzene																
Methyl acetate	1.7	J	4.2	J			1.6	J							24	J
Styrene													32	J	23	J
Toluene																
Trichloroethene			3.9	J												
Xylene, total																
cis-1,3-Dichloropropene																
trans-1,3-Dichloropropene																
Semi-volatile Organic Compounds (UG/KG)																
2-Methylnaphthalene																
4-Nitrotoluene							250								120	J
Acenaphthene																
Acetophenone	90	J			620		760		180	J	81	J	570		180	J
Anthracene			660	J												
Benzaldehyde					250	J	320	J	340	J			260	J	99	J
Benzo(a)anthracene	85	J	3,300						110	J						
Benzo(a)pyrene			510	J												
Benzo(b)fluoranthene	260	J	4,000						180	J						
Benzo(k)fluoranthene	86	J	2,200													
Butylbenzylphthalate																
Carbazole																
Chrysene	210	J	3,500						130	J						
Di-n-butylphthalate																
Di-n-octylphthalate																
Dibenz(a,h)anthracene			530	J												
Dibenzofuran																
Diethylphthalate	45	J									160	J				
Fluoranthene	300	J	6,800						180	J						
Fluorene																
Hexachlorobenzene																
Hexachlorobutadiene																
Indeno(1,2,3-cd)pyrene	49	J	640	J												
Naphthalene																
Phenanthrene	86	J	3,100						110	J						
Phenol					120	J										
Pyrene	170	J	2,400													
bis(2-Ethylhexyl)phthalate			240	J					130	J						
n-Nitrosodiphenylamine																
Explosives (UG/KG)																
2,4,6-Trinitrotoluene																
2,4-Dinitrotoluene			150	J												
2,6-Dinitrotoluene																
2-Amino-4,6-dinitrotoluene																

J - Estimated Value
K - Biased high
L - Biased low

Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO06		IS11SO10		IS11SO13		IS11SO14		IS11SO15		IS11SO16		IS11SO17		IS11SO18	
Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
2-Nitrotoluene																
4-Amino-2,6-dinitrotoluene																
4-Nitrotoluene																
Perchlorate																
HMX																
RDX																
Total Metals (MG/KG)																
Aluminum	2,410		6,270		2,560		4,580		5,040		8,070		8,730		6,810	
Antimony									14.6	L	5.2	L	18.9	L		
Arsenic	2.6	L	26.2		7.1		1.9	L	8.9		5.4		9.4		5.3	
Barium	21.5	J	129		15.9	J	21.6	J	268		367		201		64.9	
Beryllium					0.11	J										
Cadmium	1.3	J	39.9		0.21	J	0.15	J	8.7		1.4		8.6		1	J
Calcium	894	J	4,900	J	212	J	325	J	3,060	J	3,910	J	1,500	J	409	J
Chromium	5.4		24.1		8.5		5.9		28.6		21		22.7		12.2	
Cobalt	28.2	L	15	L	2.6	J	2.6	L	16.5		5.1	L	17		17.6	
Copper	20.5		520		19		4.7	J	427		337		89.8		16.8	
Cyanide																
Iron	6,500		263,000		5,770		5,930		37,100		18,300		10,100		13,800	
Lead	64.8		976		93.5		19.4		1,060		849		6,010		451	
Magnesium	363	J	1,190	J	188	J	341	J	727	J	1,000	J	749	J	776	J
Manganese	240		1,330		28.7		21.9		506		167		325		362	
Mercury	0.22	L	0.3	L	0.26	L			42	L	3.1	L	1.6	L	0.33	L
Nickel	5.2	J	30.7		3.5	J	4.5	J	189		17.4		19.8		10.5	
Potassium	170	J	447	J	207	J	284	J	407	J	877	J	685	J	551	J
Selenium																
Silver			1.6	L	0.8	J			22.3		10		15		1.5	J
Sodium			655	J							167	J				
Thallium																
Vanadium	8.9	J	33.3	J	16.1		13.5		26.3		20.2		21.2		24.6	
Zinc	101	J	10,000	J	30.2	J	22.3	J	1,150	J	697	J	923	J	116	J
Wet Chemistry (MG/KG)																
% Moisture	22.5		45.4		20.5		24		23.5		10.7		38.2		21.9	
% Solids																
Total organic carbon (TOC)																
pH																
Total Petroleum Hydrocarbons (MG/KG)																
TPH-diesel range	9.4		80		18		54		310		8.8		65		82	
TPH-gas range													0.34		3.9	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO19	IS11SO20	IS11SO21	IS11SO22	IS11SO23	IS11SO24		IS11SO25	IS11SO26	IS11SO27		IS11SO28
Sample ID	IS11SS190001	IS11SS200001	IS11SS210001	IS11SS220001	IS11SS230001	IS11SS240001	IS11SS240001P	IS11SS250001	IS11SS260001	IS11SS270001	IS11SS270001P	IS11SS280001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name												
Volatile Organic Compounds (UG/KG)												
Acetone												
Cyclohexane												
Ethylbenzene												
Methyl acetate	2.9					1.5						2.2
Styrene												
Toluene												1.6
Trichloroethene												
Xylene, total												
cis-1,3-Dichloropropene								18 J				
trans-1,3-Dichloropropene								18 J				
Semi-volatile Organic Compounds (UG/KG)												
2-Methylnaphthalene					50 J				80 J	68 J		
4-Nitrotoluene												
Acenaphthene					78 J							
Acetophenone	190 J		710	130 J	160 J	57 J			89 J	82 J	61 J	
Anthracene		48 J		54 J	180 J						45 J	
Benzaldehyde	110 J		370 J		110 J				97 J	58 J	55 J	110 J
Benzo(a)anthracene	330 J	200 J	120 J	450	720	130 J	98 J		210 J	210 J	290 J	210 J
Benzo(a)pyrene	81 J			79 J	150 J			590 L	47 J	63 J	76 J	58 J
Benzo(b)fluoranthene	560 J	430	440	750	940	250 J	200 J		370 J	350 J	460	350 J
Benzo(k)fluoranthene	250 J	170 J	150 J	260 J	380 J	100 J	81 J		130 J	150 J	180 J	140 J
Butylbenzylphthalate					96 J					67 J	86 J	
Carbazole					85 J							
Chrysene	390 J	320 J	240 J	530	760	180 J	150 J		240 J	250 J	340 J	240 J
Di-n-butylphthalate				290 J	100 J				94 J	82 J	78 J	
Di-n-octylphthalate								590 L				
Dibenz(a,h)anthracene					120 J				51 J	48 J	66 J	47 J
Dibenzofuran					65 J							
Diethylphthalate	150 J				69 J					46 J		
Fluoranthene	530 J	590	210 J	750	1,500	240 J	180 J	590	300 J	330 J	450	370 J
Fluorene					120 J			590				
Hexachlorobenzene								590				
Hexachlorobutadiene								590				
Indeno(1,2,3-cd)pyrene	100 J	73 J	70 J	120 J	180 J				80 J	82 J	100 J	80 J
Naphthalene					65 J				52 J			
Phenanthrene	180 J	230 J		290 J	1,000	69 J			130 J	160 J	220 J	160 J
Phenol			160 J									
Pyrene	250 J		150 J	310 J	610	130 J	90 J		170 J	200 J	240 J	200 J
bis(2-Ethylhexyl)phthalate		1,800		250 J	360 J	71 J	51 J	1,200 L	260 J	380 J	290 J	210 J
n-Nitrosodiphenylamine										66 J		
Explosives (UG/KG)												
2,4,6-Trinitrotoluene									360			
2,4-Dinitrotoluene												
2,6-Dinitrotoluene									90 J		98 J	
2-Amino-4,6-dinitrotoluene									130 J			

J - Estimated Value
K - Biased high
L - Biased low

Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO19	IS11SO20	IS11SO21	IS11SO22	IS11SO23	IS11SO24		IS11SO25	IS11SO26	IS11SO27		IS11SO28
Sample ID	IS11SS190001	IS11SS200001	IS11SS210001	IS11SS220001	IS11SS230001	IS11SS240001	IS11SS240001P	IS11SS250001	IS11SS260001	IS11SS270001	IS11SS270001P	IS11SS280001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name												
2-Nitrotoluene								170 J				
4-Amino-2,6-dinitrotoluene									170 J			
4-Nitrotoluene												
Perchlorate									480,000	78 J	110	
HMX					220 J				3,700	1,900	2,100	
RDX		210 J							530	730	860	
Total Metals (MG/KG)												
Aluminum	7,490	5,320	4,480	4,740	15,100	5,810	5,240	12,700	25,600	21,100	25,300	8,070
Antimony	3.1 L	1.5 L		4.3 L	8.4 L	10.4 L	10.1 L		11.8 L	17 L	12.5 L	1.7 L
Arsenic	13	6.1	4 L	8.1 L	21.8	11.1 L	11.9 L	5.8 L	42.7 L	35.8 L	31.6 L	6.3 L
Barium	152	58.2	71.6	70.6	202	85.4	65.8	137	248	264	249	52.2
Beryllium											0.049	
Cadmium	18.4	5.3	0.6 J	23.7	79.4	9.5 J	6.8 J	4.5 J	145 J	147 J	130 J	17.3 J
Calcium	4,010 J	983 J		6,610 J	5,820 J	1,940	1,440 J	2,470 J	8,300 J	7,870 J	7,520 J	1,080 J
Chromium	26.1	12	6.5	28.7	112	57 L	24.3 L	22.2 L	156 L	128 L	143 L	19.6 L
Cobalt	6.7 L	6.1 L	4.4 L	4.7 L	9.4 L	9.2 J	6.7 J	12.2 J	12.9	14.3	12 J	5.1 J
Copper	218	44.9	12.1	249	1,400	4,960 J	1,640 J	39.9	1,840 J	2,680 J	4,320 J	136 J
Cyanide						0.33 J			0.52 J	0.3 J	0.093 J	
Iron	29,300	10,400	7,210	23,300	78,500	212,000 J	62,500 J	24,100 J	108,000 J	110,000 J	155,000 J	21,900 J
Lead	501	97	61.6	132,000	1,300	278 J	174 J	94.7 J	1,540 J	2,580 J	1,610 J	351 J
Magnesium	1,210 J	559 J	260 J	2,210	2,810	942 J	788 J	2,200	5,300	11,500	4,640	1,100 J
Manganese	281	185	29.1	192	465	423 L	325 L	156 L	728 L	892 L	710 L	136 L
Mercury	0.68 L	0.45 L	0.2 L	0.97 L	1.2 L	0.64 J	0.31 J	0.24 J	1.7 J	2.1 J	2 J	0.94 J
Nickel	26.2	9.4 J	5.8 J	36	63.9	28.8	24.3	21.7	115	127	157	15.6
Potassium	694 J	382 J	309 J	390 J	932 J	654 J	565 J	1,130 J	1,290 J	903 J	794 J	463 J
Selenium												
Silver	17	3.3 L	1.4 L	9.1	20.2	14	7.8		27.4	22.2	44.5	6.4
Sodium				120 J	593 J				1,270 J	1,220 J		
Thallium				5.5	1.3 J		1.5 J			1.8 J	1.6 J	
Vanadium	27.5	22	22.5	15.4	27.9	18.2	14.2	29.7	36.8	36.4	43.3	24.2
Zinc	755 J	232 J	32.8 J	901 J	4,210 J	683 J	383	203 J	4,980 J	8,820 J	5,720 J	396 J
Wet Chemistry (MG/KG)												
% Moisture	43	21.6	18	10.9	18.4	29.3 J	26.8	44	23.8	19.1	18.2	19.6
% Solids												
Total organic carbon (TOC)												
pH												
Total Petroleum Hydrocarbons (MG/KG)												
TPH-diesel range	74	90	34	33	94	26	57	41	240	150	94	44
TPH-gas range	0.24											

J - Estimated Value
K - Biased high
L - Biased low

Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO29		IS11SO30		IS11SO31		IS11SO32		IS11SO33			
Sample ID	IS11SS290001		IS11SS300001		IS11SS310001		IS11SS320001		IS11SS330001		IS11SS330001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name												
Volatile Organic Compounds (UG/KG)												
Acetone					23	J						
Cyclohexane												
Ethylbenzene												
Methyl acetate					16	J	3.1	J	1.6			
Styrene												
Toluene												
Trichloroethene							1.6	J	4.4		9.6	J
Xylene, total												
cis-1,3-Dichloropropene												
trans-1,3-Dichloropropene												
Semi-volatile Organic Compounds (UG/KG)												
2-Methylnaphthalene					130	J						
4-Nitrotoluene												
Acenaphthene	130	J			250	J			110	J		
Acetophenone												
Anthracene	540	J			500	J			230	J	77	J
Benzaldehyde												
Benzo(a)anthracene	2,600		66	J	2,700		250	J	880		160	J
Benzo(a)pyrene	510	J	100	J	860	J	110	J	210	J		
Benzo(b)fluoranthene	2,800		170	J	4,300		460		1,100		160	J
Benzo(k)fluoranthene	1,500		61	J	1,400		130	J	610		83	J
Butylbenzylphthalate												
Carbazole	180	J			210	J			89	J		
Chrysene	2,400		110	J	2,900		280	J	870		160	J
Di-n-butylphthalate	280	J										
Di-n-octylphthalate												
Dibenz(a,h)anthracene	390	J			590	J	57	J	130	J		
Dibenzofuran	110	J			130	J						
Diethylphthalate												
Fluoranthene	5,000		140	J	4,000		410	J	1,600		380	J
Fluorene	140	J			200	J			88	J		
Hexachlorobenzene												
Hexachlorobutadiene												
Indeno(1,2,3-cd)pyrene	510	J	80	J	990	J	120	J	240	J		
Naphthalene												
Phenanthrene	2,300		53	J	1,900		170	J	920		310	J
Phenol												
Pyrene	2,100		240	J	1,700		210	J	680		130	J
bis(2-Ethylhexyl)phthalate	150	J	280	J	2,600		210	J	160	J	3,300	
n-Nitrosodiphenylamine	130	J							81	J		
Explosives (UG/KG)												
2,4,6-Trinitrotoluene												
2,4-Dinitrotoluene												
2,6-Dinitrotoluene												
2-Amino-4,6-dinitrotoluene												

J - Estimated Value
K - Biased high
L - Biased low

Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO29		IS11SO30		IS11SO31		IS11SO32		IS11SO33			
Sample ID	IS11SS290001		IS11SS300001		IS11SS310001		IS11SS320001		IS11SS330001		IS11SS330001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name												
2-Nitrotoluene												
4-Amino-2,6-dinitrotoluene												
4-Nitrotoluene												
Perchlorate	140											
HMX												
RDX	190	J										
Total Metals (MG/KG)												
Aluminum	8,450		11,100		14,500		14,100		14,600		11,200	
Antimony	7.2	L	1.1	L	18.9	L	6.2	L	2.5	L	2.8	L
Arsenic	12.8	L	11.6	L	13.4	L	12.4	L	11.3	L	10.6	L
Barium	286		67.6		160		120		107		90.2	
Beryllium												
Cadmium	35	J	5.2	J	48.3	J	49.2	J	31.3	J	25.5	J
Calcium	5,250	J	2,480	J	7,330	J	2,310	J	1,580	J	1,760	J
Chromium	58.6	L	46.7	L	56	L	71.1	L	31.4	L	38.2	L
Cobalt	6.8	J	5.3	J	11.6	J	10.2	J	8.2	J	11.2	J
Copper	441	J	39.6	J	560	J	857	J	552	J	786	J
Cyanide	0.09	J	0.094	J	0.19	J	0.21	J	0.081	J	0.21	J
Iron	66,600	J	20,100	J	40,300	J	64,600	J	54,100	J	54,400	J
Lead	2,260	J	141	J	945	J	638	J	345	J	389	J
Magnesium	3,030		1,020	J	4,130		3,830		2,950		7,850	
Manganese	295	L	142	L	295	L	446	L	604	L	581	L
Mercury	8.6	J	0.55	J	1.2	J	1.7	J	0.3	J	0.65	J
Nickel	42.6		13.1		56.4		65		54.2		38.6	
Potassium	771	J	617	J	1,120	J	780	J	387	J	496	J
Selenium												
Silver	10.6		8.1		62.5		18.4		6.9		7.4	
Sodium												
Thallium												
Vanadium	33.1		25.6		60.2		45.6		18.5		23.5	
Zinc	2,120	J	181	J	1,880	J	1,820	J	1,120	J	1,040	J
Wet Chemistry (MG/KG)												
% Moisture	22.3		21.2		69.7		22.5		24.9		38.9	
% Solids												
Total organic carbon (TOC)												
pH												
Total Petroleum Hydrocarbons (MG/KG)												
TPH-diesel range	160		20		400		34		120		130	
TPH-gas range												

J - Estimated Value
K - Biased high
L - Biased low

Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO34		IS11SO35		IS11SO36		IS11SO37		IS11SO38		IS11SO39		IS11SO40		IS11SO41		IS11SO41		IS11SO42	
Sample ID	IS11SS340001		IS11SS350001		IS11SS360001		IS11SS370001		IS11SS380001		IS11SS390001		IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		08/04/00		08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name																				
Volatile Organic Compounds (UG/KG)																				
Acetone	65	J					3.1	J	9.9	J										
Cyclohexane																			3.6	J
Ethylbenzene													2.4	J						
Methyl acetate	8.5	J									2.3	J								
Styrene																				
Toluene											70		140	J	42		23			
Trichloroethene																				
Xylene, total													5.2	J	1.7	J			9.9	J
cis-1,3-Dichloropropene																				
trans-1,3-Dichloropropene																				
Semi-volatile Organic Compounds (UG/KG)																				
2-Methylnaphthalene																				
4-Nitrotoluene																				
Acenaphthene																				
Acetophenone									64	J			64	J						
Anthracene			140	J			90	J												
Benzaldehyde	150	J	63	J			47	J	56	J										
Benzo(a)anthracene	240	J	880				400													
Benzo(a)pyrene	390	J	170	J			79	J												
Benzo(b)fluoranthene	810	J	1,100				620													
Benzo(k)fluoranthene	280	J	560	J			300	J												
Butylbenzylphthalate																				
Carbazole																				
Chrysene	390	J	950				570													
Di-n-butylphthalate																				
Di-n-octylphthalate																				
Dibenz(a,h)anthracene			130	J			77	J												
Dibenzofuran																				
Diethylphthalate																				
Fluoranthene	480	J	1,300				940						65	J						
Fluorene							47	J												
Hexachlorobenzene																				
Hexachlorobutadiene																				
Indeno(1,2,3-cd)pyrene	390	J	160	J			100	J												
Naphthalene																				
Phenanthrene	210	J	390	J			410													
Phenol																				
Pyrene	900	J	610		60	J	400						120	J						
bis(2-Ethylhexyl)phthalate	220	J	72	J			1,700													
n-Nitrosodiphenylamine																				
Explosives (UG/KG)																				
2,4,6-Trinitrotoluene																				
2,4-Dinitrotoluene																				
2,6-Dinitrotoluene																				
2-Amino-4,6-dinitrotoluene																				

J - Estimated Value
K - Biased high
L - Biased low

Table 4-1
Detected Compounds in Site 11 Area A Surface Soil Samples
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Station ID	IS11SO34		IS11SO35		IS11SO36		IS11SO37		IS11SO38		IS11SO39		IS11SO40		IS11SO41		IS11SO41		IS11SO42	
Sample ID	IS11SS340001		IS11SS350001		IS11SS360001		IS11SS370001		IS11SS380001		IS11SS390001		IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		08/04/00		08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name																				
2-Nitrotoluene													150	J						
4-Amino-2,6-dinitrotoluene																				
4-Nitrotoluene													210	J						
Perchlorate																				
HMX																				
RDX																				
Total Metals (MG/KG)																				
Aluminum	10,900		11,700		9,050		10,100		6,590		12,900	J	3,960	J	10,300	J	7,500	J	5,930	
Antimony																				
Arsenic	2.3	L	1.7	L	3.8	L	4.2	L	3.5		7.1	L	2.7	L	4.3	L	4.1	L	2.2	J
Barium	8.4	J	7.9	J	54.6	J	42.6	J	56.3	J	52.6	J	49.1	J	58.4		63.3		68.6	
Beryllium											0.5	J			0.46	J	0.47	J		
Cadmium			0.14						0.68	J	0.2	J	0.12	J	0.098		0.25	J		
Calcium	184,000	J	124,000	J	1,420	J			1,520	J	497	J	176	J	512	J	597	J	682	J
Chromium	3.8	L	3.6	L	9.5	L	9.8		11.3		16.1		5.6		14		11.6		7.1	
Cobalt					7.6	J	7.8	J	9.4	J	7.1	J	2.2	J	10.1	J	8.3	J	13	J
Copper	2.1	J	3.7	J	8.8	J	10.2		17		9.5		5.2	J	9.7		11.6		7.7	
Cyanide	0.16	J	0.23	J	0.16	J					0.66									
Iron	24,700	J	33,000		15,100	J	13,000		13,000		24,400		5,680		21,300		20,100		6,870	J
Lead	2.6	J	3.5	J	17.1	J	28.5		32.9	K	12.5		24.3		13.8		15.5		29.4	K
Magnesium	1,560	J	1,510		952	J	640	J	1,040	J	714	J	256	J	837	J	743	J	484	J
Manganese	48.5	L	33	L	326	L	260		511		222		17.4		156		595		792	J
Mercury							0.066	J	0.083	J			0.093	L					0.11	
Nickel			1.2	J	6.5	J	5.9	J	11.4	J	8.8	J	3.5	J	9.5	J	18.6		8.1	J
Potassium	123	J	95.7	J	310	J	400	J	524	J	543	J	281	J	721	J	590	J	395	J
Selenium											1.1		1.2		1.1					
Silver											0.82		0.84		0.76		0.81			
Sodium	2,120	J	1,350	J							116		120		108		115			
Thallium											1.4		1.4		1.3		1.4			
Vanadium	3.9	J	3.7	J	20.7		20.3		21.5		26.7		13.9		24.8		22		24	
Zinc	13.4	J	12.4	J	33	J	32.5	J	72.4	J	27	J	17.3	J	33.5	J	33.6	J	21.3	J
Wet Chemistry (MG/KG)																				
% Moisture	64.4		44.2		36.7		14.2		38.1		24.1		26.5		18.3		23.4		32.9	
% Solids																			66	
Total organic carbon (TOC)																			40,100	
pH																			5.7	
Total Petroleum Hydrocarbons (MG/KG)																				
TPH-diesel range	130		48		32		17		29				47		3.8		4.8		15	
TPH-gas range															0.18				0.17	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-2
Detected Compounds in Site 11 Area B Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO43		IS11SO44		IS11SO44		IS11SO45		IS11SO46		IS11SO47		IS11SO47		IS11SO48	
Sample ID	IS11SS430001		IS11SS440001		IS11SS440001P		IS11SS450001		IS11SS460001		IS11SS470001		IS11SS470001P		IS11SS480001	
Sample Date	02/25/02		02/25/02		02/25/02		03/04/02		03/04/02		03/04/02		03/04/02		03/04/02	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
Acetone																
Bromomethane																
Chloromethane																
Cyclohexane																
Methylene chloride	2	J	2	J	2	J			0.9	J						
Semivolatile Organic Compounds (UG/KG)																
2-Methylnaphthalene																
Acenaphthene					24	J	37	J								
Acenaphthylene			38	J	63	J	68	J							11	J
Anthracene	20	J	140	J	200	J	150	J							11	J
Benzaldehyde	20	J	24	J	25	J										
Benzo(a)anthracene	59	J	330	J	470	J	500	J							54	J
Benzo(a)pyrene	65	J	320	J	430	J	460	J							56	J
Benzo(b)fluoranthene	110	J	440	J	630		640	J							90	J
Benzo(g,h,i)perylene			120	J	170	J	370	J							61	J
Benzo(k)fluoranthene	89	J	410	J	600		550	J							72	J
Carbazole			34	J	44	J	76	J								
Chrysene	94	J	480		640		660	J							79	J
Di-n-butylphthalate			35	J												
Di-n-octylphthalate	16	J							46	J						
Dibenz(a,h)anthracene	18	J	81	J	100	J	170	J							24	J
Dibenzofuran					13	J										
Diethylphthalate			140	J			38	J								
Dimethyl phthalate			380	J												
Fluoranthene	88	J	510	J	960	J	950	J	19	J	17	J			68	J
Fluorene			16	J	32	J	49	J								
Indeno(1,2,3-cd)pyrene	43	J	180	J	230	J	390	J							62	J
Naphthalene					12	J										
Phenanthrene	37	J	150	J	230	J	460	J							24	J
Pyrene	86	J	470	J	850	J	770	J							77	J

J - Estimated
K - Biased high
L - Biased low

Table 4-2
Detected Compounds in Site 11 Area B Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO43		IS11SO44		IS11SO44		IS11SO45		IS11SO46		IS11SO47		IS11SO47		IS11SO48	
Sample ID	IS11SS430001		IS11SS440001		IS11SS440001P		IS11SS450001		IS11SS460001		IS11SS470001		IS11SS470001P		IS11SS480001	
Sample Date	02/25/02		02/25/02		02/25/02		03/04/02		03/04/02		03/04/02		03/04/02		03/04/02	
Chemical Name																
Explosives (UG/KG)																
Nitroglycerin					27,000											
Perchlorate											1,400		1,400			
Total Metals (MG/KG)																
Aluminum	9,290		11,500		15,500		6,920		8,760		6,100		5,980		23,400	
Antimony	0.66	L	5.7	L	9.5	L	4.1	L							2.9	L
Arsenic	5.3	K	16.1	K	25.3	K	13.8		3.3		2.8		1.4	J	25.5	
Barium	59.2		103		127		110		52.2	J	35.8	J	35.3	J	86.2	
Beryllium	0.35	J	0.28	J	0.44	J	0.21	J	0.58	J	0.45	J	0.36	J	0.61	J
Cadmium	1	J	10.4		15.4		8.7		1.1	J	0.1	J	0.11	J	10.7	
Calcium	1,070	J	5,410		4,620		8,130		1,170	J	168	J	168	J	2,670	
Chromium	19.4	J	47.3	J	44.3	J	16.4		15.5		11.8		11.4		55.2	
Cobalt	12.7	J	8.1	J	14	J	6	J	7.4	J	3.6	J	3.5	J	7.1	J
Copper	54.6	J	589	J	797	J	265	K	32	K	10.9	K	10	K	1,380	K
Iron	22,000		34,900		54,600		14,800		27,500		17,500		14,900		31,900	
Lead	120		823		1,240		825		54.2		10.7		9.7		761	
Magnesium	740	J	1,700		1,650		1,800	J	1,300	J	792	J	765	J	1,530	
Manganese	356	L	444	L	673	L	566		121		55.3		42.7		354	
Mercury			0.17		0.19		0.16	J							0.27	
Nickel	11.3	J	50.3	J	48.2	J	17		11.1		6.9	J	6.5	J	37.1	
Potassium	507	J	505	J	554	J	601	J	735	J	516	J	522	J	795	J
Selenium	1.6		2.5		2.7		2.3		1.9		1.2		1.4		2.5	
Silver	0.56	J	8.5		10.4		8.5		0.6	J					4.6	
Sodium	480	J	2,080		2,650		1,710	J	369	J	234	J	204	J	3,430	
Thallium																
Vanadium	30.2		20.7		27.8		23.3		23.9		22		17.5		24.5	
Zinc	129		1,170		1,640		686	K	69.2	K	31.8	K	30.2	K	1,990	K
Wet Chemistry (MG/KG)																
% Solids	74		76		72		51.5		78.8		79.4		80.3		79.6	
Carbon	166,800		57,830								14,970	J			17,000	J
Total Petroleum Hydrocarbons (MG/KG)																
No detections																

J - Estimated
K - Biased high
L - Biased low

Table 4-2
Detected Compounds in Site 11 Area B Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO49		IS11SO50		IS11SO51		IS11SO52		IS11SO53	
Sample ID	IS11SS490001		IS11SS500001		IS11SS510001		IS11SS520001		IS11SS530001	
Sample Date	03/04/02		03/01/02		03/01/02		03/01/02		03/01/02	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
Acetone							5	J		
Bromomethane			2	J	2	J	2	J	2	J
Chloromethane			0.7	J			0.6	J		
Cyclohexane					0.8	J				
Methylene chloride	0.8	J	0.8	J						
Semivolatile Organic Compounds (UG/KG)										
2-Methylnaphthalene					14	J				
Acenaphthene					20	J				
Acenaphthylene	33	J			48	J				
Anthracene	30	J			110	J			22	J
Benzaldehyde			10	J	16	J	9	J	30	J
Benzo(a)anthracene	110	J			250	J			69	J
Benzo(a)pyrene	130	J			260	J			64	J
Benzo(b)fluoranthene	170	J			390	J			92	J
Benzo(g,h,i)perylene	120	J			130	J				
Benzo(k)fluoranthene	140	J			290	J			75	J
Carbazole	13	J			30	J				
Chrysene	170	J			330	J			93	J
Di-n-butylphthalate										
Di-n-octylphthalate	140	J					29	J		
Dibenz(a,h)anthracene	49	J			90	J			23	J
Dibenzofuran					19	J				
Diethylphthalate										
Dimethyl phthalate										
Fluoranthene	200	J			380	J	9	J	140	J
Fluorene					26	J				
Indeno(1,2,3-cd)pyrene	120	J			210	J			50	J
Naphthalene					18	J				
Phenanthrene	90	J			170	J			65	J
Pyrene	190	J			400				130	J

J - Estimated
K - Biased high
L - Biased low

Table 4-2
Detected Compounds in Site 11 Area B Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO49		IS11SO50		IS11SO51		IS11SO52		IS11SO53	
Sample ID	IS11SS490001		IS11SS500001		IS11SS510001		IS11SS520001		IS11SS530001	
Sample Date	03/04/02		03/01/02		03/01/02		03/01/02		03/01/02	
Chemical Name										
Explosives (UG/KG)										
Nitroglycerin										
Perchlorate										
Total Metals (MG/KG)										
Aluminum	7,780		9,250		6,730		7,520		7,120	
Antimony	0.39	L			3.1	L			1.6	L
Arsenic	23.4				17.6	K	2.4	K	7.5	K
Barium	69.5		44.6	J	73.2		50.1		95	
Beryllium	0.52	J	0.4	J	0.35	J	0.45	J	0.46	J
Cadmium	1.2	J			20.4				13	
Calcium	2,990		331	J	1,740		381	J	2,340	
Chromium	17		13.5	J	151	J	13.1	J	22.3	J
Cobalt	7.8	J	5.7	J	15.5		5.9	J	9	J
Copper	41.3	K	11	J	348	J	8.1	J	153	J
Iron	20,700		14,500		130,000		15,500		31,100	
Lead	96		12.9		563		16.2		286	
Magnesium	970	J	1,220		955	J	539	J	965	J
Manganese	160		57.3	L	733	L	220	L	618	L
Mercury	0.14				0.41				0.09	J
Nickel	12.1		10.3	J	77.7	J	6.5	J	21.5	J
Potassium	781	J	654	J	649	J	380	J	671	J
Selenium	1.9		0.99	J	5.7		1	J	1.8	
Silver	5.6				3.6				1.9	J
Sodium	398	J	218	J	1,550		198	J	772	J
Thallium					5.2	L				
Vanadium	29.4		22		19.8		23.8		23.5	
Zinc	114	K	38.7		1,060		23.4		377	
Wet Chemistry (MG/KG)										
% Solids	67.4									
Carbon	52,300	J					22,790		60,310	
Total Petroleum Hydrocarbons (MG/KG)										
No detections										

J - Estimated
K - Biased high
L - Biased low

Table 4-3
Detected Compounds in Site 11 Area A Subsurface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
2-Butanone													4.3	J
Acetone			2.6	J									17	
Cyclohexane	4.5	J	2.3	J										
Toluene					3.3	J								
Xylene, total	1.8	J					9	J			2.4	J		
Semi-volatile Organic Compounds (UG/KG)														
Acetophenone	65	J											48	J
Benzo(a)anthracene													63	J
Benzo(b)fluoranthene													110	J
Chrysene													76	J
Diethylphthalate													43	J
Fluoranthene													120	J
Phenanthrene													49	J
Pyrene													48	J
bis(2-Ethylhexyl)phthalate			47	J									890	
Explosives (UG/KG)														
1,3-Dinitrobenzene	33	J									32	J		
Total Metals (MG/KG)														
Aluminum	9,660		4,530		9,430	J	10,500	J	17,900	J	15,400		10,500	
Arsenic	3		1.7	J	6.8	L	4.3	L	5.1	L	4.3		3.6	L
Barium	46.7	J	40.1	J	36.7	J	40.9	J	65.5		64		85	
Beryllium							0.28	J			0.39	J		
Cadmium	0.77	J	0.17		0.1	J	0.095		0.14	J				
Calcium	290	J			170	J	75.4	J	130	J			1,780	J
Chromium	13.7		6.8		12.5		12.4		19.3		15.7		20	
Cobalt	4.6	J	3.6	J	5.4	J	5.5	J	4.9	J	4.3	J	14	
Copper	12.4		3.9	J	7.5		6.3		8.6		6.4	J	57	J
Cyanide					0.59		0.59		0.68					
Iron	15,400	J	7,850	J	23,800		16,100		36,800		26,000	K	25,500	
Lead	15.8	K	5.5	K	7.6		8.7		13.7		12.5	J	58.1	J

J - Estimated Value
K - Biased high
L - Biased low

Table 4-3
Detected Compounds in Site 11 Area A Subsurface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
Magnesium	799	J	1,100	J	664	J	501	J	819	J	642	J	2,980	
Manganese	19.1	J	38.8	J	120		39.7		23.7		15.9	J	346	L
Mercury									0.18	L			0.078	L
Nickel	7.1	J	3.9	J	7.2	J	6.5	J	8.1	J	6.4	J	23.5	
Potassium	617	J	353	J	524	J	565	J	653	J	548	J		
Selenium							1		1.2					
Silver					0.73		0.73		0.85				3.2	J
Sodium					103		104		120					
Thallium							1.3		1.4					
Vanadium	22.3		11.1	J	19.9		22.4		31.7		30.1		23.7	
Zinc	43.3	J	17.4	J	21	J	20.6	J	27.7	J	24.7	J	126	K
Wet Chemistry (MG/KG)														
% Moisture	29.6		14.5		14.5		15.3		26.6		20		20.1	
Total Petroleum Hydrocarbons (MG/KG)														
TPH-diesel range													31	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-4
Detected Compounds in Site 11 Area B Subsurface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO44		IS11SO46		IS11SO47		IS11SO48		IS11SO49		IS11SO49		IS11SO50		IS11SO51		IS11SO52		IS11SO53	
Sample ID	IS11SB440002		IS11SB460002		IS11SB470204		IS11SB480002		IS11SB490002		IS11SB490002P		IS11SB500608		IS11SB510002		IS11SB520406		IS11SB530002	
Sample Date	02/28/02		02/28/02		02/28/02		02/28/02		02/28/02		02/28/02		02/25/02		02/28/02		02/28/02		02/28/02	
Chemical Name																				
Volatile Organic Compounds (UG/KG)																				
Acetone	33								19	J	48	J			13				14	
Bromomethane																			2	J
Carbon disulfide									0.8	J	1	J								
Cyclohexane							1	J												
Methylene chloride	3	J			0.9	J			2	J			2	J						
Trichloroethene															0.9	J				
Semivolatile Organic Compounds (UG/KG)																				
2-Methylnaphthalene					12	J	16	J			17	J			67	J				
Acenaphthene	68	J																	17	J
Acenaphthylene	310	J			79	J			25	J	28	J			35	J				
Anthracene	420	J			62	J			41	J	47	J			81	J			29	J
Benzaldehyde	47	J	14	J	37	J	11	J			14	J			19	J	8	J	14	J
Benzo(a)anthracene	1,400		21	J	150	J			120	J	130	J			200	J			94	J
Benzo(a)pyrene	1,100		21	J	170	J	160	J	150	J	150	J			240	J			96	J
Benzo(b)fluoranthene	1,500		28	J	200	J	18	J	180	J	160	J			340	J			110	J
Benzo(g,h,i)perylene	600						170	J	100	J	130	J			140	J			66	J
Benzo(k)fluoranthene	1,100		23	J	160	J			170	J	180	J			210	J			110	J
Butylbenzylphthalate															11	J				
Carbazole	80	J							13	J	17	J			28	J			20	J
Chrysene	1,400		30	J	260	J			180	J	180	J			270	J			110	J
Di-n-octylphthalate									120	J					160	J	12	J		
Dibenz(a,h)anthracene	360	J			55	J			46	J	54	J			79	J			33	J
Dibenzofuran	36	J									9	J								
Diethylphthalate	18	J													370	J				
Fluoranthene	2,900		26	J	290	J	14	J	180	J	210	J			340	J			190	J
Fluorene	88	J									13	J								
Indeno(1,2,3-cd)pyrene	750		18	J	130	J	58	J	110	J	130	J			200	J			74	J
Naphthalene					15	J	13	J			30	J			36	J				
Phenanthrene	600				130	J	16	J	78	J	100	J			150	J			100	J
Pyrene	2,200		28	J	420		27	J	190	J	190	J			400				160	J
bis(2-Ethylhexyl)phthalate																	4,500	D		
Explosives (UG/KG)																				
No detections																				
Total Metals (MG/KG)																				
Aluminum	14,800		7,320		4,770		5,330		10,600		8,940		6,800		10,100		10,200		5,670	
Antimony	4.1	L	0.4	L	0.45	L			4.2	L	3.7	L			4.4	L				
Arsenic	15.1	K	3	K	4.9	K	3.2	K	17.5	K	17.6	K	8.1	K	21.1	K	2.4	K	2.3	K
Barium	112		56.6		101		53.8		125		127		88.4		117		71.8		74.7	
Beryllium	0.32	J	0.53	J	0.39	J	0.33	J	0.66	J	0.53	J	0.83	J	0.26	J	0.56	J	0.37	J
Cadmium	8.3		0.57	J	0.26	J	0.28	J	7.7		9				7.2				0.23	J

D - Dilution result
J - Estimated
K - Biased high
L - Biased low

Table 4-4
Detected Compounds in Site 11 Area B Subsurface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SO44		IS11SO46		IS11SO47		IS11SO48		IS11SO49		IS11SO49		IS11SO50		IS11SO51		IS11SO52		IS11SO53	
Sample ID	IS11SB440002		IS11SB460002		IS11SB470204		IS11SB480002		IS11SB490002		IS11SB490002P		IS11SB500608		IS11SB510002		IS11SB520406		IS11SB530002	
Sample Date	02/28/02		02/28/02		02/28/02		02/28/02		02/28/02		02/28/02		02/25/02		02/28/02		02/28/02		02/28/02	
Chemical Name																				
Calcium	2,920		737	J	387	J	1,030	J	30,600		35,600		298	J	1,560		234	J	727	J
Chromium	41.5	J	12.6	J	10.4	J	9.5	J	26.6	J	21.5	J	15.7	J	30.4	J	12.4	J	9.7	J
Cobalt	5.8	J	4.7	J	4.3	J	8.8	J	4.6	J	3.9	J	6.8	J	6.6	J	5.5	J	11	J
Copper	690	J	70.7	J	12.1	J	10.8	J	366	J	402	J	15.7	J	290	J	5.8	J	10.8	J
Iron	27,300		15,000		7,190		9,390		26,600		21,400		15,500		16,900		14,900		11,500	
Lead	715		101		36.2		25		742		688		9.3		728		11.1		69.6	
Magnesium	1,340	J	990	J	373	J	504	J	2,390		2,270		1,290		1,600		551	J	503	J
Manganese	277	L	63.5	L	60	L	254	L	241	L	204	L	55.8	L	184	L	199	L	368	L
Mercury	0.36		0.07	J	0.11	J	0.24		0.09	J	0.18				0.22				0.08	J
Nickel	29	J	9.2	J	6	J	5.3	J	14.8	J	14.1	J	12.6	J	13.5	J	6.5	J	5.4	J
Potassium	421	J	495	J	231	J	329	J	493	J	388	J	650	J	359	J	429	J	284	J
Selenium	2.1		1.3		1.3		1.1	J	0.77	J	1.9		1.3	J	1.4		0.86	J	1.1	J
Silver	9.2		0.21	J	0.29	J	0.87	J	2.7		2.5				7.1				0.46	J
Sodium	1,870		331	J	261	J	244	J	1,420		1,290		246	J	1,240		202	J	366	J
Vanadium	22.6		22.2		17		19.9		38.3		32.5		29.5		18.8		24.6		18.2	
Zinc	1,120		113		45		39.2		820		753		40.9		763		21.5		63.2	
Wet Chemistry (MG/KG)																				
% Solids	80		82		82		84		86		80		85		89		85		82	
Total Petroleum Hydrocarbons (MG/KG)																				
TPH-diesel range	51						23				5.6	J			30					

D - Dilution result
J - Estimated
K - Biased high
L - Biased low

Table 4-5
Detected Compounds in Site 11 Area A Waste Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
Volatile Organic Compounds (UG/KG)				
2-Butanone	2	J	17	
Acetone			84	
Benzene			2.1	J
Carbon disulfide			5.4	J
Cyclohexane			13	
Ethylbenzene			5.2	J
Toluene			7.3	J
Trichloroethene			24	
Vinyl chloride			7.3	J
Xylene, total			29	
cis-1,2-Dichloroethene			35	
Semi-volatile Organic Compounds (UG/KG)				
4-Methylphenol			59	J
Acenaphthene			52	J
Acetophenone			64	J
Anthracene			86	J
Benzo(a)anthracene	99	J	430	
Benzo(a)pyrene			110	J
Benzo(b)fluoranthene	86	J	570	
Benzo(k)fluoranthene	45	J	260	J
Carbazole			40	J
Chrysene	100	J	460	
Di-n-butylphthalate			38	J
Diethylphthalate	140	J	120	J
Fluoranthene	170	J	750	
Fluorene			60	J
Indeno(1,2,3-cd)pyrene			100	J
Naphthalene			160	J
Phenanthrene	84	J	460	
Phenol			64	J
Pyrene	72	J	430	
bis(2-Ethylhexyl)phthalate	28,000		14,000	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-5
Detected Compounds in Site 11 Area A Waste Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
Explosives (UG/KG)				
2,6-Dinitrotoluene	420	L	120	L
Ammonium perchlorate	1,200			
HMX	360	L	480	L
RDX			280	L
Total Metals (MG/KG)				
Aluminum	3,580	J	24,100	J
Antimony			13.6	L
Arsenic	3	L	17.1	L
Barium	79.6		147	
Beryllium			0.044	
Cadmium	6.5		139	
Calcium	1,440		10,400	
Chromium	7.6		212	
Cobalt	3.3	J	17.2	
Copper	28.4		1,270	
Cyanide	0.56		0.19	J
Iron	6,530		76,000	
Lead	79.2		4,200	
Magnesium	630	J	4,800	
Manganese	83.2		500	
Mercury	45.9	L	0.85	L
Nickel	6.6	J	107	
Potassium	319	J	803	J
Selenium			1.9	
Silver	3.4		23.8	
Sodium	106	J	847	J
Thallium	1.2		1.2	
Vanadium	9.4	J	73.5	
Zinc	304	J	4,110	J
Wet Chemistry (MG/KG)				
% Moisture	11.4		9	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-5
Detected Compounds in Site 11 Area A Waste Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
Total Petroleum Hydrocarbons (MG/KG)				
TPH-diesel range	92		450	
TPH-gas range	0.52		0.27	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-6
Detected Compounds in Site 11Area A Insitu Groundwater Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
Volatile Organic Compounds (UG/L)												
Chloroethane									12			
Methylene chloride	1.7	J										
Toluene	1.5	J	1.7	J								
Semi-volatile Organic Compounds (UG/L)												
4-Methylphenol	7	J	4	J								
Diethylphthalate					3	J						
Phenol			5	J								
bis(2-Ethylhexyl)phthalate									1,100		310	
n-Nitrosodiphenylamine					2	J						
Explosives (UG/L)												
1,3-Dinitrobenzene	0.1	J					0.044	J				
2,4,6-Trinitrotoluene			4.1	K							0.11	J
2,4-Dinitrotoluene			6.2	K			0.068	J	0.22			
2,6-Dinitrotoluene			2.7	K					0.13	J		
2-Nitrotoluene			1.7	K	0.14	J						
3-Nitrotoluene			0.32	K								
4-Amino-2,6-dinitrotoluene							0.1	J				
4-Nitrotoluene			1.5		0.39							
Ammonium perchlorate									0.25	J		
Nitrobenzene					0.13	J	0.077	J				
Tetryl							0.068	J				
Total Metals (UG/L)												
Aluminum	80,900		38,200		15,700		6,300		2,930		3,250	
Antimony	6.7	L	6.1	L	254	L	15.6	L			82.7	
Arsenic	44.4	J	39.7		24.5		10.3				9.4	J
Barium	647	J	1,980		7,900		1,650		2,200		1,520	
Beryllium			10.3									
Cadmium			3	J	27.1		9.2				10.5	
Calcium	37,600		186,000		226,000		46,800		76,800		65,100	
Chromium	91.3		94.8		97.5		19.2		11.8		14.4	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-6
Detected Compounds in Site 11Area A Insitu Groundwater Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
Cobalt	56.3	J	83.2		31	J	6.2	J	6	J	3.8	J
Copper	105		56.8		802		133		6.8	J	238	
Cyanide			1.2		1.8				2.8		5.7	
Iron	125,000		211,000		165,000		26,500		84,000		23,100	
Lead	288		222		4,170		684		157		673	
Magnesium	17,300		120,000		60,500		38,000		38,000		44,600	
Manganese	2,710		7,460		3,980		349		884		456	
Mercury	0.81		107		8.3		0.35		0.18	J	1.1	
Nickel	69.9		120		124		18.6	J	29.4	J	25.7	J
Potassium	10,400		20,200		59,700		32,300		30,700		40,900	
Selenium			5.3									
Silver	7.5	J	16.3		170		10.4		4.7	J	50.8	
Sodium	25,000		45,000		108,000		104,000		100,000		113,000	
Thallium	9.4	J	16.5		9	J			7.8	J		
Vanadium	141		226		39.7	J	33.1	J	5.5	J	10.6	J
Zinc	412	J	767	J	13,900	J	1,240		1,500	J	1,090	
Dissolved Metals (UG/L)												
Antimony											55.1	J
Arsenic	8.7	J			4.9	J			4.2	J		
Barium	133	J	208		2,510		1,600		1,770		1,190	
Calcium	35,800		69,400		55,900		46,900		58,600		53,100	
Cobalt	3.8	J	2.5	J								
Copper											4.7	J
Iron	24,300		33,600		7,610		2,010		16,700			
Lead					4.6						3.5	
Magnesium	11,500		29,200		35,000		39,200		34,300		44,600	
Manganese	2,230		2,450		282		110		125		210	
Nickel	4.1	J	4.4	J	3.2	J	1.9	J	2.7	J	8.7	J
Potassium	6,100		8,070		45,100		33,000		28,000		41,600	
Sodium	27,800		32,700		94,600		106,000		97,700		121,000	
Thallium									5.3	J		
Vanadium	2.3	J							1.4	J		
Zinc	19.1				72.6				26.5	J	42.4	
Total Petroleum Hydrocarbons (UG/L)												
TPH-diesel range	310		530		1,400		190		770		1,200	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-7
Detected Compounds in Site 11 Area A Monitoring Well Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03				IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane									4.5	J		
1,1-Dichloroethane									3.8	J		
1,1-Dichloroethene									2.6	J		
Chloroethane	3.8	J										
Methyl acetate					4.4	J	5	J				
Toluene					16		18					
Semi-volatile Organic Compounds (UG/L)												
4-Methylphenol					23		14					
Explosives (UG/L)												
1,3-Dinitrobenzene	0.064	J									0.066	J
2,4-Dinitrotoluene							0.16	J				
2,6-Dinitrotoluene							0.11	J				
2-Nitrotoluene											0.15	J
3-Nitrotoluene									0.15	J		
4-Nitrotoluene	0.15	J			0.37		0.29					
RDX									0.16	J		
Tetryl									0.12	J		
Total Metals (UG/L)												
Aluminum	1,350				2,180		1,100		31,400		10,700	
Antimony	3.7	J	4.2	J								
Arsenic	4	J	4.5	J					8.2	J		
Barium	1,680		685		237		218		319		319	
Beryllium											1.1	J
Cadmium											0.71	J
Calcium	56,400		62,200		85,400		80,800		8,690		6,340	J
Chromium	5.3	J	1.1	J	9.2	J	4.4	J	59.6		37.8	
Cobalt			1	J	2.6	J	1.5	J	59.7		17.1	J
Copper	20.7	J	1.4	J	5.1	J	4.1	J	33.9		21.1	J
Cyanide	10.1	L										
Iron	14,000		8,590		37,800		34,800		51,000		15,600	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-7
Detected Compounds in Site 11 Area A Monitoring Well Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03				IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
Lead	78.6		14.5		6.1		3.5		20.7		8	
Magnesium	35,600		32,300		25,500		22,200		9,700		4,600	J
Manganese	188		2,360		2,570		2,480		928		337	J
Mercury	0.1		0.1									
Nickel	4.2	J	2	J	7.3	J	2.9	J	110		61.7	
Potassium	30,900		41,200		8,710		8,110		3,350	J	2,190	J
Silver	6.1	J			2.1	J						
Sodium	98,400		81,300		33,400		32,200		43,500		26,100	
Vanadium	2.2	J			5.3	J	2.9	J	55.4		21	J
Zinc	195		196		39.9		25.7		217		93	J
Dissolved Metals (UG/L)												
Aluminum											1,330	
Antimony			5	J								
Arsenic			5.1	J								
Barium	1,630		792		215		223		138	J	24.5	J
Cadmium									0.62	J	0.47	J
Calcium	54,500		66,000		81,800		84,700		7,550		1,960	J
Chromium											9.2	J
Cobalt			1	J					35	J	3.7	J
Iron	10,900		9,240		34,200		35,300				2,040	
Magnesium	34,500		33,300		23,100		23,800		6,240		1,290	J
Manganese	165		2,320		2,500		2,590		712		90.3	J
Nickel			2.6	J					58		16.2	J
Potassium	30,100		42,200		8,220		8,590				578	J
Sodium	94,800		84,900		31,300		32,700		42,500		29,900	
Vanadium					1.1	J	1.1	J			2.6	J
Zinc			181						63.3		34.5	J

J - Estimated Value
K - Biased high
L - Biased low

Table 4-8
Detected Compounds in Site 11 Area B Groundwater Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11MW06				IS11MW07		IS11MW08	
Sample ID	IS11MW060302		IS11MW060302P		IS11MW070302		IS11MW080302	
Sample Date	03/26/02		03/26/02		03/26/02		03/26/02	
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane					15			
1,1-Dichloroethene					9	J		
Acetone	9	J	11		10		10	
Benzene	1	J	1	J				
Bromomethane			2	J				
Chloromethane	2	J			2	J	2	J
Cyclohexane	0.5	J	0.6	J				
Ethylbenzene			0.4	J				
Toluene	3	J	3	J	0.5	J	0.4	J
Semivolatile Organic Compounds (UG/L)								
4-Methylphenol	4	J	5	J	5	J	0.8	J
Acenaphthene	0.4	J	0.4	J				
Acetophenone	0.3	J	0.4	J				
Explosives (UG/L)								
No detections								
Total Metals (UG/L)								
Aluminum	1,150		385		192	J	1,350	
Antimony					2.9	J	1.8	J
Arsenic	2.9	J						
Barium	156	J	155	J	178	J	151	J
Beryllium	0.64	J	0.32	J	0.51	J	0.59	J
Calcium	48,900		51,400		54,100		51,200	
Chromium	7.9	J	5	J	1.6	J	4.4	J
Copper	7.3	J	5.7	J	2.6	J	4.3	J
Iron	42,100		41,800		31,300		44,700	
Lead	8.8		4.3		1.9	J	32.8	
Magnesium	20,600		20,600		27,000		14,700	
Manganese	1,410		1,450		2,600		3,020	
Nickel	6.4	J	3.7	J	2.3	J	3.7	J

J - Estimated
L - Biased low

Table 4-8
Detected Compounds in Site 11 Area B Groundwater Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11MW06				IS11MW07		IS11MW08	
Sample ID	IS11MW060302		IS11MW060302P		IS11MW070302		IS11MW080302	
Sample Date	03/26/02		03/26/02		03/26/02		03/26/02	
Chemical Name								
Potassium	4,220	J	3,990	J	5,940	J	6,300	J
Selenium	2.5	L			2.9	L		
Silver							0.68	J
Sodium	69,400		71,100		68,400		44,400	
Vanadium	3.1	J	1.9	J	2.1	J	3.6	J
Zinc	31.6		16.2	J	15.7	J	39.9	
Dissolved Metals (UG/L)								
Antimony					2.8	J		
Arsenic	2.7	J	3.3	J				
Barium	133	J	133	J	180	J	137	J
Beryllium	0.61	J	0.73	J	0.49	J	0.77	J
Calcium	46,800		47,500		54,600		50,800	
Chromium	7.7	J	4.5	J	1.5	J	1.7	J
Iron	37,400		37,900		33,100		43,600	
Magnesium	19,800		20,000		27,800		14,700	
Manganese	1,320		1,330		2,610		3,010	
Nickel	3.9	J	3.9	J	2.1	J	1.4	J
Potassium	4,040	J	4,080	J	6,000	J	6,300	J
Selenium					2.8	L	3.1	L
Sodium	67,700		67,900		67,500		42,500	
Thallium					6.2	J	3.8	J
Vanadium					1.9	J		
Zinc	14.4	J	13.7	J	20.7		12.3	J
Total Petroleum Hydrocarbons (UG/L)								
TPH-diesel range			500	J				

J - Estimated
L - Biased low

Table 4-9
Detected Compounds in Site 11 Area A Surface Water Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Volatile Organic Compounds (UG/L)														
Methyl-tert-butyl ether (MTBE)	1	J												
Semi-volatile Organic Compounds (UG/L)														
bis(2-Ethylhexyl)phthalate	1	J												
Explosives (UG/L)														
1,3-Dinitrobenzene	0.075	J												
Ammonium perchlorate			1.6	J	2.9	J	3.6	J						
HMX									0.4	J	0.41	J		
Total Metals (UG/L)														
Aluminum	457		239		276		366		995		694		909	
Barium	29	J	24	J	24.7	J	26	J	59.1	J	54.2	J	65.5	J
Calcium	11,500		10,400		10,700		10,100		18,000		16,800		18,100	
Copper					4.2	J	5.2	J	10.6	J	7.3	J	7.1	J
Iron	772		475		564		726		3,180		2,410		3,100	
Lead	38.4		1.6	J	1.3	J	6.1		5.1		2.6	J	2.4	J
Magnesium	5,920		5,380		5,360		5,190		4,390	J	3,760	J	3,960	J
Manganese	127		98.3		103		111		134		95.3		117	
Potassium	2,950	J	2,670	J	2,630	J	2,650	J	2,250	J	2,090	J	2,250	J
Sodium	13,300		12,200		12,000		11,900		20,000		16,700		16,800	
Vanadium	2	J	1.5	J	1.5	J			3.8	J	3.4	J	3.4	J
Dissolved Metals (UG/L)														
Barium	23.6	J	21.2	J	22	J	22.9	J	46.9	J	53.2	J	55.7	J
Calcium	12,000		11,600		11,900		11,400		16,800		18,400		16,900	
Copper					2.4	J			5	J	3.5	J	5.9	J
Iron									613		229		186	
Lead	1.3													
Magnesium					5,980		5,910		4,130	J	4,070	J	3,600	J
Manganese	4.5	J	2.2	J					83		88.6		74.5	
Potassium	2,940	J	2,910	J	2,870	J	2,910	J	2,080	J	2,250	J	2,010	J
Sodium	13,900		14,000		13,900		14,300		19,200		18,400		16,600	
Total Petroleum Hydrocarbons (UG/L)														
TPH-diesel range	160		160		100		120							

J - Estimated Value
K - Biased high
L - Biased low

Table 4-10
Detected Compounds in Site 11 Area B Surface Water Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SW08		IS11SW09				IS11SW10	
Sample ID	IS11SW08		IS11SW09		IS11SW09P		IS11SW10	
Sample Date	03/05/02		03/06/02		03/06/02		03/06/02	
Chemical Name								
Volatile Organic Compounds (UG/L)								
No detections								
Semivolatile Organic Compounds (UG/L)								
No detections								
Explosives (UG/L)								
No detections								
Total Metals (UG/L)								
Aluminum	515		245		135	J	268	
Antimony	35.8	J						
Arsenic	8	J						
Barium	200	J	83.5	J	79.1	J	89.2	J
Beryllium	3.1	J					0.21	J
Cadmium	3	J						
Calcium	66,200		67,800		64,800		68,000	
Chromium	6.9	J			0.99	J	0.84	J
Cobalt	32	J	0.97	J			1.4	J
Copper	22.4	K	8.2	K			7.5	K
Iron	792		465		157		555	
Lead	9.7		4.5				3.4	
Magnesium	94,300		103,000		98,200		102,000	
Manganese	108		136		122		180	
Nickel	28.1	J	3.4	J	3.5	J	3.3	J
Potassium	52,000	J	57,100	J	54,500	J	56,700	J
Selenium	5.2	L						
Silver	6.4	J						
Sodium	836,000	J	756,000	J	710,000	J	769,000	J
Thallium	11.5							
Vanadium	32.1	J	1.6	J			1.7	J
Dissolved Metals (UG/L)								

J - Estimated
K - Biased high
L - Biased low

Table 4-10
Detected Compounds in Site 11 Area B Surface Water Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SW08		IS11SW09				IS11SW10	
Sample ID	IS11SW08		IS11SW09		IS11SW09P		IS11SW10	
Sample Date	03/05/02		03/06/02		03/06/02		03/06/02	
Chemical Name								
Barium	72.6	J	78.3	J	79.1	J	80.2	J
Calcium	66,400		67,200		67,400		64,400	
Magnesium	94,300		101,000		101,000		96,600	
Manganese	47.3		106		107		138	
Mercury	0.17	J			0.14	J		
Nickel	2	J	2.3	J	2.3	J	2.4	J
Potassium	51,600	J	55,600	J	56,300	J	53,500	J
Sodium	801,000	J	757,000	J	770,000	J	807,000	J
Zinc			3.2	J				
Wet Chemistry (MG/L)								
Hardness	606		552				554	
pH	8.28		8.37				8.48	
Total Petroleum Hydrocarbons (UG/L)								
No detections								

J - Estimated
K - Biased high
L - Biased low

Table 4-11
Detected Compounds in Site 11 Area A Sediment Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
2-Butanone	14	J							17	J	24	J	42	J
Acetone									82	J	110	J	130	J
Chloromethane	14	J							12	J	10	J		
Toluene									5.5	J				
Semi-volatile Organic Compounds (UG/KG)														
Benzo(a)anthracene			250	J							91	J		
Benzo(a)pyrene			77	J										
Benzo(b)fluoranthene			400	J	51	J					130	J		
Benzo(k)fluoranthene			170	J										
Chrysene			370	J	46	J					110	J		
Dibenz(a,h)anthracene			55	J										
Fluoranthene			300	J	56	J					200	J	110	J
Indeno(1,2,3-cd)pyrene			92	J										
Phenanthrene			79	J							74	J		
Pyrene			240	J	48	J					99	J	140	J
bis(2-Ethylhexyl)phthalate					150	J	67	J	120	J	110	J		
Explosives (UG/KG)														
3-Nitrotoluene	180	J									150	J		
4-Nitrotoluene							140	J			160	J		
Total Metals (MG/KG)														
Aluminum	8,230		2,450		3,740		1,900		9,720		8,940		11,100	
Antimony	22.8	L	63.9	L	33.6	L	34.4	L	3.3	L				
Arsenic	6.7	J	15.2	J	24.5	J	18.9	J	6.5	J	7.7	J	11.8	J
Barium	169		86.4		50.4	J	112		111		89.4		140	
Cadmium	1.2	L	4.5	L	6.5	L	4.9	L	1.9	L	1.3	L	4.2	L
Calcium	3,610	J	22,100	J	632	J	1,070	J	2,250	J	3,320	J	3,510	J
Chromium	14.2	L	57.2	L	28.8	L	69.7	L	22.6	L	16.6	L	28.9	L
Cobalt			6.3	J	7.4	J	14		12.7	J	10.9	J	16.8	J
Copper	757	L	149	L	343	L	650	L	83.1	L	50.3	L	222	J
Cyanide							0.12	J						

J - Estimated Value
K - Biased high
L - Biased low

Table 4-11
Detected Compounds in Site 11 Area A Sediment Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Iron	23,100	J	8,360	J	134,000	J	129,000	J	32,900	J	28,800	J	41,800	J
Lead	76,400	J	1,160	J	375	J	1,000	J	113	J	53.2	J	272	J
Magnesium	2,660	J	3,190	J	717	J	688	J	1,840	J	1,370	J	1,700	J
Manganese	330	J	637	J	432	J	940	J	517	J	302	J	430	J
Mercury	0.2		0.081	J	0.53		0.11	J	0.19	J	0.17	J	0.36	
Nickel	14.6	L	45.1	L	29.5	L	46.4	L	20.8	L	16.6	L	33.2	L
Potassium	454	J	182	J	164	J	131	J	780	J	673	J	1,070	J
Selenium					1.7	L								
Silver	8.7				10.9		7.5		3.8	J	1.5	J	2.8	J
Thallium	4.2				1.5	J								
Vanadium	22.1		16.1		12.9		14.1	J	29		26.7		43.4	
Zinc	1,310	J	847	J	898	J	1,910	J	258	J	147	J	800	J
Wet Chemistry (MG/KG)														
% Moisture	26.6		24.3		22.1		21.2		61.1		51.5		64.8	
Total Petroleum Hydrocarbons (MG/KG)														
TPH-diesel range			13		26		15		69		11		13	

J - Estimated Value
K - Biased high
L - Biased low

Table 4-12
Detected Compounds in Site 11 Area B Sediment Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SD08	
Sample ID	IS11SD08	
Sample Date	03/05/02	
Chemical Name		
Volatile Organic Compounds (UG/KG)		
2-Butanone	3	J
Semivolatile Organic Compounds (UG/KG)		
Acenaphthene	35	J
Acenaphthylene	28	J
Anthracene	140	J
Benzaldehyde	25	J
Benzo(a)anthracene	900	
Benzo(a)pyrene	790	
Benzo(b)fluoranthene	1,100	
Benzo(g,h,i)perylene	380	J
Benzo(k)fluoranthene	650	
Carbazole	36	J
Chrysene	1,000	
Dibenz(a,h)anthracene	220	J
Dibenzofuran	22	J
Fluoranthene	720	
Fluorene	51	J
Indeno(1,2,3-cd)pyrene	440	J
Phenanthrene	330	J
Pyrene	640	
Explosives (UG/KG)		
No detections		
Total Metals (MG/KG)		
Aluminum	11,300	
Antimony	3.1	L
Arsenic	10.3	
Barium	34.3	J
Beryllium	0.28	J
Cadmium	4	

J - Estimated
K - Biased high

Table 4-12
Detected Compounds in Site 11 Area B Sediment Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS11SD08	
Sample ID	IS11SD08	
Sample Date	03/05/02	
Chemical Name		
Calcium	778	J
Chromium	77	
Cobalt	5.8	J
Copper	342	K
Iron	51,600	
Lead	335	
Magnesium	929	J
Manganese	378	
Mercury	0.11	J
Nickel	26.1	
Potassium	380	J
Selenium	2.9	
Silver	3.2	
Sodium	1,750	
Vanadium	15	
Zinc	514	K
Wet Chemistry (MG/KG)		
% Solids	58.2	
Carbon	12,800	J
pH	7.16	
Total Petroleum Hydrocarbons (MG/KG)		
No detections		

J - Estimated
K - Biased high

TABLE 4-13
Conceptual Site Model for Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Surface Soil:

- Transport of organic and inorganic contaminants via erosion and deposition as sediment in Mattawoman Creek and Unnamed Creek. Once deposited as sediment, limited desorption and dissolution into surface water, with subsequent transport in the surface water.
- Limited leaching of organic and inorganic contaminants from the surface soil to the subsurface soil via the infiltration of precipitation.
- Some bioaccumulation of inorganic and organic compounds in ecological receptors.
- Very slow biodegradation of organic compounds.
- Entrainment of inorganics and perhaps some SVOCs on soil into the air by wind.

Subsurface Soil:

- Limited leaching of inorganic contaminants to the groundwater via the infiltration of precipitation and direct contact with groundwater when the water table is high.

Groundwater:

- Movement of dissolved contaminants with the groundwater flow southward from the site to Mattawoman Creek. Contaminant concentration will decrease with distance from the source area due to the dilution caused by advection and dispersion and due to the removal of inorganics from the aqueous phase via precipitation and transformation.

Table 4-14
Summary of Data Quantitatively Used in Risk Assessment-Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Medium	Date of Sampling	Sample	Parameters
Soil			
Subsurface Soil (Below 2 feet)	07/25/2000	IS11SB040608	EXPLO, METAL, SVOA, VOA
	07/26/2000	IS11SB090102	EXPLO, METAL, SVOA, VOA
	07/26/2000	IS11SB120103	EXPLO, METAL, SVOA, VOA
	02/25/2002	IS11SB500608	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB520406	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB530002	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB440002	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB460002	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB490002	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB490002P	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB510002	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB470204	EXPLO, METAL, SVOA, VOA
	02/28/2002	IS11SB480002	EXPLO, METAL, SVOA, VOA
Surface Soil (0 to 6 inches)	07/18/2000	IS11SS060001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS100001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS130001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS140001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS150001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS160001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS170001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS180001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS190001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS200001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS210001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS220001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS11SS230001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS240001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS240001P	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS250001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS260001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS270001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS270001P	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS280001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS290001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS300001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS310001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS320001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS330001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS330001P	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS340001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS350001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS360001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS370001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS11SS380001	EXPLO, METAL, SVOA, VOA
	02/25/2002	IS11SS440001P	EXPLO, METAL, SVOA, VOA
	02/25/2002	IS11SS440001	EXPLO, METAL, SVOA, VOA
	02/25/2002	IS11SS430001	EXPLO, METAL, SVOA, VOA
	03/01/2002	IS11SS530001	EXPLO, METAL, SVOA, VOA
	03/01/2002	IS11SS520001	EXPLO, METAL, SVOA, VOA
	03/01/2002	IS11SS500001	EXPLO, METAL, SVOA, VOA
	03/01/2002	IS11SS510001	EXPLO, METAL, SVOA, VOA
	03/04/2002	IS11SS450001	EXPLO, METAL, SVOA, VOA
	03/04/2002	IS11SS460001	EXPLO, METAL, SVOA, VOA
	03/04/2002	IS11SS490001	EXPLO, METAL, SVOA, VOA
	03/04/2002	IS11SS470001	EXPLO, METAL, SVOA, VOA
	03/04/2002	IS11SS470001P	EXPLO, METAL, SVOA, VOA
	03/04/2002	IS11SS480001	EXPLO, METAL, SVOA, VOA

Table 4-14
Summary of Data Quantitatively Used in Risk Assessment-Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Medium	Date of Sampling	Sample	Parameters
Groundwater			
	09/11/2000	IS11MW010900	EXPLO, FMETAL, METAL, SVOA, VOA
	09/11/2000	IS11MW020900	FMETAL, METAL, VOA
	09/11/2000	IS11MW030900	EXPLO, FMETAL, METAL, SVOA, VOA
	09/11/2000	IS11MW030900P	EXPLO, FMETAL, METAL, SVOA, VOA
	09/11/2000	IS11MW040900	EXPLO, FMETAL, METAL, SVOA, VOA
	03/26/2002	IS11MW080302	EXPLO, FMETAL, METAL, SVOA, VOA
	03/26/2002	IS11MW070302	EXPLO, FMETAL, METAL, SVOA, VOA
	03/26/2002	IS11MW060302	EXPLO, FMETAL, METAL, SVOA, VOA
	03/26/2002	IS11MW060302P	EXPLO, FMETAL, METAL, SVOA, VOA
Surface Water			
	07/20/2000	IS11SW01	EXPLO, FMETAL, METAL, SVOA, VOA
	07/20/2000	IS11SW02	EXPLO, FMETAL, METAL, SVOA, VOA
	07/20/2000	IS11SW03	EXPLO, FMETAL, METAL, SVOA, VOA
	07/20/2000	IS11SW04	EXPLO, FMETAL, METAL, SVOA, VOA
	07/20/2000	IS11SW05	EXPLO, FMETAL, METAL, SVOA, VOA
	07/20/2000	IS11SW06	EXPLO, FMETAL, METAL, SVOA, VOA
	07/20/2000	IS11SW07	EXPLO, FMETAL, METAL, SVOA, VOA
	03/05/2002	IS11SW08	EXPLO, FMETAL, METAL, SVOA, VOA
	03/06/2002	IS11SW09	EXPLO, FMETAL, METAL, SVOA, VOA
	03/06/2002	IS11SW09P	EXPLO, FMETAL, METAL, SVOA, VOA
	03/06/2002	IS11SW10	EXPLO, FMETAL, METAL, SVOA, VOA

Table 4-15
Summary of Chemicals of Potential Concern for the HHRA-Site 11 (based on comparison to RBCs)
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Groundwater	Soil		Surface Water
Shallow Aquifer	Surface Soil	Surface and Subsurface	
Benzene	Benzo(a)anthracene	Benzo(a)anthracene	Antimony
Bromomethane	Benzo(a)pyrene	Benzo(a)pyrene	Arsenic
Chloroethane	Benzo(b)fluoranthene	Benzo(b)fluoranthene	Lead
4-Methylphenol	Dibenz(a,h)anthracene	Dibenz(a,h)anthracene	Thallium
Aluminum	Hexachlorobenzene	Hexachlorobenzene	Vanadium
Antimony	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	
Arsenic	Perchlorate	Perchlorate	
Barium	Aluminum	Aluminum	
Chromium	Antimony	Antimony	
Iron	Arsenic	Arsenic	
Lead	Cadmium	Cadmium	
Manganese	Chromium	Chromium	
Nickel	Copper	Copper	
Vanadium	Iron	Iron	
	Lead	Lead	
	Manganese	Manganese	
	Mercury	Mercury	
	Nickel	Nickel	
	Silver	Silver	
	Thallium	Thallium	
	Vanadium	Vanadium	
	Zinc	Zinc	

* COPCs for groundwater for all scenarios (based on unfiltered metals results).

Table 4-16
Exposure Pathways-Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Exposure Route	Current					Future							
		Industrial	Trespasser/ Visitor		Recreational User		Construction	Industrial	Trespasser/ Visitor		Recreational User		Resident	
		Worker	Adult	Adolescents	Adult	Child	Worker	Worker	Adult	Adolescents	Adult	Child	Adult	Child
Groundwater - Shallow Aquifer														
	Ingestion												X	X
	Dermal						X						X	X
	Inhalation						X						X	
Surface Soil														
	Ingestion	X	X	X										
	Dermal	X	X	X										
	Inhalation	NC	NC	NC										
Combined Surface and Subsurface Soil														
	Ingestion						X	X	X	X			X	X
	Dermal						X	X	X	X			X	X
	Inhalation						NC	NC	NC	NC			X	X
Surface Water														
	Ingestion				X*	X*					X*	X*		
	Dermal				X*	X*					X*	X*		
	Inhalation													
Fish														
	Ingestion				Q*	Q*					Q*	Q*		

X Quantitative evaluation (if COPCs selected for pathway).

NC No COPCs retained for this pathway, therefore, not evaluated quantitatively.

Q Evaluated qualitatively since COPCs retained for surface water and constituents detected in sediment do not bioaccumulate in fish tissue.

* Current and Future scenario are the same.

Table 4-17
Summary of RME Cancer Risks and Hazard Indices-Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current Trespasser/Visitor Adolescent	Surface Soil	Ingestion	1.2E-06				0.19	
		Dermal Contact	2.9E-07				0.061	
		Inhalation	NA				NA	
		Total	1.5E-06			Arsenic	0.25	
	All Media	Total	1.5E-06				0.25	
Current Trespasser/Visitor Adult	Surface Soil	Ingestion	2.3E-06				0.14	
		Dermal Contact	7.5E-07				0.064	
		Inhalation	NA				NA	
		Total	3.1E-06			Arsenic	0.20	
	All Media	Total	3.1E-06				0.20	
Current Industrial Worker	Surface Soil	Ingestion	1.2E-05			Arsenic	0.65	
		Dermal Contact	8.8E-06			Benzo(a)Pyrene, Dibenz(a,h)anthracene, Arsenic	0.72	
		Inhalation	NA				NA	
		Total	2.0E-05		Arsenic	Benzo(a)Pyrene, Dibenz(a,h)anthracene	1.4	
	All Media	Total	2.0E-05				1.4	
Current/Future Recreational User Adult	Surface Water	Ingestion	7.2E-07				0.089	
		Dermal Contact	1.8E-07				0.083	
		Inhalation	NA				NA	
		Total	9.0E-07				0.17	
	All Media	Total	9.0E-07				0.17	
Current/Future Recreational User Child	Surface Water	Ingestion	8.4E-07				0.42	
		Dermal Contact	8.3E-08				0.15	
		Inhalation	NA				NA	
		Total	9.2E-07				0.57	
	All Media	Total	9.2E-07				0.57	
Future Resident Adult	Groundwater	Ingestion	NA				13	Iron, Manganese, Vanadium
		Dermal Contact	NA				0.23	
		Inhalation	N/A				0.09	
		Total	N/A				13	Iron, Manganese, Vanadium
	Soil*	Ingestion	NA				0.73	
		Dermal Contact	NA				0.65	
		Inhalation	NA				NA	
		Total	NA				1.4	
	All Media	Total	NA				14	
Future Resident Child	Groundwater	Ingestion	NA				30	Aluminum, Arsenic, Barium, Chromium, Iron, Manganese, Vanadium
		Dermal Contact	NA				0.66	
		Inhalation	NA				NA	
		Total	NA				30	Aluminum, Arsenic, Barium, Chromium, Iron, Manganese, Vanadium
	Soil*	Ingestion	NA				6.8	Cadmium, Iron
		Dermal Contact	NA				0.86	
		Inhalation	NA				NA	
		Total	NA				7.7	Cadmium, Iron
	All Media	Total	NA				38	

Table 4-17
Summary of RME Cancer Risks and Hazard Indices-Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Resident Child/Adult	Groundwater	Ingestion	1.8E-04	Arsenic			NA	
		Dermal Contact	5.1E-07				NA	
		Inhalation	5.8E-07				NA	
		Total	1.9E-04	Arsenic			NA	
	Soil*	Ingestion	4.4E-05		Arsenic	Benzo(a)Pyrene, Dibenz(a,h)anthracene	NA	
		Dermal Contact	1.2E-05			Benzo(a)Pyrene, Dibenz(a,h)anthracene, Arsenic	NA	
		Inhalation	NA				NA	
		Total	5.6E-05		Arsenic	Benzo(a)Anthracene, Benzo(a)Pyrene, Benzo(b)Fluoranthene, Dibenz(a,h)anthracene, Hexachlorobenzene	NA	
	All Media	Total	2.4E-04				NA	
Future Construction Worker Adult	Groundwater	Ingestion	NA				NA	
		Dermal Contact	1.4E-08				0.24	
		Inhalation	2.4E-09				0.009	
		Total	1.6E-08				0.25	
	Soil*	Ingestion	1.9E-06			Arsenic	2.4	
		Dermal Contact	2.5E-07				0.39	
		Inhalation	NA				NA	
		Total	2.1E-06			Arsenic	2.8	
	All Media	Total	2.2E-06				3.1	
Future Industrial Worker Adult	Soil*	Ingestion	9.9E-06			Arsenic	0.52	
		Dermal Contact	8.3E-06			Benzo(a)Pyrene, Dibenz(a,h)anthracene, Arsenic	0.60	
		Inhalation	NA				NA	
		Total	1.8E-05		Arsenic	Benzo(a)Pyrene, Dibenz(a,h)anthracene	1.1	
	All Media	Total	1.8E-05				1.1	
Future Trespasser/Visitor Adolescent	Soil*	Ingestion	1.0E-06				0.15	
		Dermal Contact	2.5E-07				0.051	
		Inhalation	NA				NA	
		Total	1.3E-06				0.20	
	All Media	Total	1.3E-06				0.20	
Future Trespasser/Visitor Adult	Soil*	Ingestion	2.0E-06			Arsenic	0.11	
		Dermal Contact	7.1E-07				0.073	
		Inhalation	NA				NA	
		Total	2.7E-06			Arsenic	0.18	
	All Media	Total	2.7E-06				0.18	

NA - Not applicable, pathway incomplete.

Table 4-18
Summary of CT Cancer Risks and Hazard Indices-Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current Industrial Worker	Surface Soil	Ingestion	NA				0.089	
		Dermal Contact	NA				0.10	
		Inhalation	NA				NA	
		Total	NA				0.19	
	All Media	Total	NA				0.19	
Future Resident Adult	Groundwater	Ingestion	NA				2.9	Iron, Manganese
		Dermal Contact	NA				0.024	
		Inhalation	NA				NA	
		Total	NA				3.0	Iron, Manganese
	Soil*	Ingestion	NA				0.079	
		Dermal Contact	NA				0.18	
		Inhalation	NA				NA	
		Total	NA				0.26	
	All Media	Total	NA				3.2	
Future Resident Child	Groundwater	Ingestion	NA				9.8	Iron, Manganese
		Dermal Contact	NA				0.066	
		Inhalation	NA				NA	
		Total	NA				9.9	Iron, Manganese
	Soil*	Ingestion	NA				0.74	
		Dermal Contact	NA				0.23	
		Inhalation	NA				NA	
		Total	NA				1.0	
	All Media	Total	NA				11	
Future Resident Child/Adult	Groundwater	Ingestion	2.0E-05		Arsenic		NA	
		Dermal Contact	8.5E-08				NA	
		Inhalation	NA				NA	
		Total	2.0E-05		Arsenic		NA	
	All Media	Total	2.0E-05				NA	
Future Construction Worker Adult	Soil*	Ingestion	NA				0.69	
		Dermal Contact	NA				0.060	
		Inhalation	NA				NA	
		Total	NA				0.75	
	All Media	Total	NA				0.75	
Future Industrial Worker Adult	Soil*	Ingestion	NA				0.074	
		Dermal Contact	NA				0.093	
		Inhalation	NA				NA	
		Total	NA				0.17	
	All Media	Total	NA				0.17	

NA - Not applicable, pathway incomplete.

Table 4-19
Lead Risk-based Concentration for the Adult - Industrial Worker- Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

$$PbB_{adult,\ central} = PbB_{fetal,\ 0.95,goal} / ((GSD^{\wedge}1.645) * R)$$

$$PbS = ((PbB_{adult,\ central} - PbB_{adult,0}) * AT) / (BKSF * IR * AF * EF)$$

Exposure Parameter	Description	Industrial Adult Values	Source[1]
PbS	Soil Lead Concentration expressed in ug/g;	1,113	Calc.
$PbB_{adult,central}$	Central estimate of Blood Lead Concentrations in adults exposed to the site expressed in ug/dl;	3.55	Calc.
$PbB_{fetal,0.95,goal}$	Goal for 95th % blood lead concentration (ug/dl);	10	A
GSD	Geometric standard deviation (dimensionless);	2.0	A
R	Constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (dimensionless);	0.9	A
$PbB_{adult,0}$	Typical Blood Lead Concentration in the absence of exposure to the site expressed in ug/dL;	2.0	A
AT	Averaging Time (days/year)	365	A
BKSF	Biokinetic Slope Factor expressed in ug/dL blood lead increase per ug/day lead uptake;	0.4	A
IR	Intake rate of soil (g/day);	0.05	A
AF	Gastrointestinal absorption fraction for ingested lead in soil and lead in dust from soil (dimensionless)	0.12	A
EF	Exposure frequency (days/year)	219	A

A - EPA, December 1996. *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil.*

Table 4-20
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American kestrel	0.083	Palmer 1988	0.01685	allometric equation	0.01192	USEPA 1993
American robin	0.0452	USEPA 1993	0.00741	allometric equation	0.00162	Levey and Karasov 1989
Great blue heron	2.1	Butler 1992	0.10901	allometric equation	0.43894	allometric equation
Marsh wren	0.00975	Dunning 1993	0.00330	allometric equation	0.00298	USEPA 1993
Mammals						
Meadow vole	0.03	Silva and Downing 1995	0.01334	USEPA 1993	0.00310	USEPA 1993
Raccoon	4.23	Silva and Downing 1995	0.60919	allometric equation	0.12681	Conover 1989
Red fox	3.17	Silva and Downing 1995	0.41154	allometric equation	0.14763	Sample and Suter 1994
Short-tailed shrew	0.01331	USEPA 1993	0.00475	USEPA 1993	0.00189	USEPA 1993

Table 4-20
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American kestrel	0	38	60	0	0	0	USEPA 1993	2	Assumed based on diet
American robin	0	95	0	0	0	0	Martin et al. 1951	5	Sample and Suter 1994
Great blue heron	0	0	0	100	0	0	USEPA 1993; Quinney and Smith 1980	0	Sample and Suter 1994
Marsh wren	0	0	0	0	0	95	USEPA 1993	5	Assumed based on diet
Mammals									
Meadow vole	95.6	2	0	0	0	0	USEPA 1993	2.4	Beyer et al. 1994
Raccoon	0	0	0	7	40	43.6	USEPA 1993	9.4	Beyer et al. 1994
Red fox	7	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994

Table 4-21
Step 2 Soil Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Inorganics (MG/KG)						
Aluminum	4.2 - 12.4	43 / 43	25,600	IS11SS260001	50	512.00
Antimony	0.69 - 3.2	18 / 42	18.9	IS11SS170001	5	3.78
Arsenic	0.71 - 2.6	42 / 43	42.7	IS11SS260001	10	4.27
Barium	0.033 - 0.26	43 / 43	367	IS11SS160001	500	0.73
Beryllium	0.018 - 0.13	7 / 43	0.50	IS17SS100001	10	0.05
Cadmium	0.056 - 0.29	34 / 43	147	IS11SS270001	4	36.75
Chromium	0.25 - 1.5	43 / 43	156	IS11SS260001	0.4	390.00
Cobalt	0.19 - 1.5	41 / 43	29.0	IS17SS060001	20	1.45
Copper	0.29 - 1.3	43 / 43	4,960	IS11SS240001	50	99.20
Cyanide	0.56 - 2.8	14 / 43	0.64	IS17SS020001	27.5	0.02
Iron	3.6 - 38.6	43 / 43	263,000	IS11SS100001	200	1315.00
Lead	0.29 - 29.2	43 / 43	132,000	IS11SS220001	50	2640.00
Manganese	0.033 - 0.29	43 / 43	1,330	IS11SS100001	500	2.66
Mercury	0.056 - 0.65	30 / 43	42.0	IS11SS150001	0.1	420.00
Nickel	0.43 - 1.3	42 / 43	189	IS11SS150001	30	6.30
Selenium	0.89 - 3.2	2 / 43	1.6	IS17SS050001	1	1.60
Silver	0.25 - 2.1	23 / 43	62.5	IS11SS310001	2	31.25
Thallium	1.2 - 3.9	6 / 43	5.5	IS11SS220001	1	5.50
Vanadium	0.17 - 1	43 / 43	60.2	IS11SS310001	2	30.10
Zinc	0.13 - 1.6	43 / 43	10,000	IS11SS100001	50	200.00
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	370 - 1,200	0 / 43	--	--	NSV	NSV
2,2'-Oxybis(1-chloropropane)	370 - 1,200	0 / 43	--	--	NSV	NSV
2,4,5-Trichlorophenol	920 - 3,000	0 / 43	--	--	430	6.98
2,4,6-Trichlorophenol	370 - 1,200	0 / 43	--	--	580	2.07
2,4-Dichlorophenol	370 - 1,200	0 / 42	--	--	13,400	0.09
2,4-Dimethylphenol	370 - 1,200	0 / 43	--	--	100	12.00
2,4-Dinitrophenol	920 - 1,500	0 / 11	--	--	20,000	0.08
2-Chloronaphthalene	370 - 1,200	0 / 43	--	--	2,789	0.43
2-Chlorophenol	370 - 1,200	0 / 43	--	--	100	12.00
2-Methylnaphthalene	370 - 1,200	4 / 43	130	IS11SS310001	1,730	0.08
2-Methylphenol	370 - 1,200	0 / 43	--	--	100	12.00
2-Nitroaniline	920 - 3,000	0 / 43	--	--	NSV	NSV
2-Nitrophenol	370 - 1,200	0 / 43	--	--	NSV	NSV
3,3'-Dichlorobenzidine	370 - 1,200	0 / 43	--	--	NSV	NSV
3-Nitroaniline	920 - 3,000	0 / 43	--	--	NSV	NSV
4,6-Dinitro-2-methylphenol	920 - 3,000	0 / 43	--	--	NSV	NSV
4-Bromophenyl-phenylether	370 - 1,200	0 / 43	--	--	NSV	NSV
4-Chloro-3-methylphenol	370 - 1,200	0 / 43	--	--	100	12.00
4-Chloroaniline	370 - 1,200	0 / 43	--	--	NSV	NSV
4-Chlorophenyl-phenylether	370 - 1,200	0 / 43	--	--	NSV	NSV

NSV - No Screening Value

Table 4-21
Step 2 Soil Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
4-Methylphenol	370 - 1,200	0 / 43	--	--	100	12.00
4-Nitroaniline	920 - 3,000	0 / 43	--	--	NSV	NSV
4-Nitrophenol	920 - 3,000	0 / 43	--	--	380	7.89
4-Nitrotoluene	250 - 250	2 / 18	250	IS11SS140001	NSV	NSV
Acenaphthene	370 - 1,200	4 / 43	250	IS11SS310001	2,500	0.10
Acenaphthylene	370 - 1,200	0 / 43	--	--	1,730	0.69
Acetophenone	370 - 1,200	17 / 43	760	IS11SS140001	NSV	NSV
Anthracene	370 - 1,200	10 / 43	660	IS11SS100001	1,730	0.38
Atrazine	370 - 1,200	0 / 43	--	--	NSV	NSV
Benzaldehyde	370 - 1,200	19 / 43	1,100	IS17SS010001	NSV	NSV
Benzo(a)anthracene	370 - 1,200	23 / 43	3,300	IS11SS100001	1,730	1.91
Benzo(a)pyrene	370 - 1,200	18 / 43	860	IS11SS310001	1,730	0.50
Benzo(b)fluoranthene	370 - 1,200	24 / 43	4,300	IS11SS310001	1,730	2.49
Benzo(g,h,i)perylene	370 - 1,200	0 / 43	--	--	1,730	0.69
Benzo(k)fluoranthene	370 - 1,200	22 / 43	2,200	IS11SS100001	1,730	1.27
Butylbenzylphthalate	370 - 1,200	2 / 43	96.0	IS11SS230001	NSV	NSV
Caprolactam	370 - 1,200	0 / 43	--	--	NSV	NSV
Carbazole	370 - 1,200	4 / 43	210	IS11SS310001	NSV	NSV
Chrysene	370 - 1,200	24 / 43	3,500	IS11SS100001	1,730	2.02
Di-n-butylphthalate	370 - 1,200	6 / 43	290	IS11SS220001	200,000	0.00
Di-n-octylphthalate	370 - 1,200	1 / 43	590	IS11SS250001	NSV	NSV
Dibenz(a,h)anthracene	370 - 1,200	13 / 43	590	IS11SS310001	1,730	0.34
Dibenzofuran	370 - 1,200	3 / 43	130	IS11SS310001	NSV	NSV
Diethylphthalate	370 - 1,200	5 / 43	160	IS11SS160001	13,400	0.01
Dimethyl phthalate	370 - 1,200	0 / 43	--	--	10,640	0.11
Fluoranthene	370 - 1,200	26 / 43	6,800	IS11SS100001	1,730	3.93
Fluorene	370 - 1,200	6 / 43	590	IS11SS250001	1,730	0.34
Hexachlorobenzene	370 - 1,200	1 / 43	590	IS11SS250001	100,000	0.01
Hexachlorobutadiene	370 - 1,200	1 / 43	590	IS11SS250001	NSV	NSV
Hexachlorocyclopentadiene	370 - 1,200	0 / 43	--	--	1,000	1.20
Hexachloroethane	370 - 1,200	0 / 43	--	--	NSV	NSV
Indeno(1,2,3-cd)pyrene	370 - 1,200	21 / 43	990	IS11SS310001	1,730	0.57
Isophorone	370 - 1,200	0 / 43	--	--	NSV	NSV
Naphthalene	370 - 1,200	2 / 43	65.0	IS11SS230001	1,730	0.04
Nitrobenzene	470 - 600	0 / 5	--	--	2,260	0.27
Pentachlorophenol	890 - 2,900	0 / 43	--	--	3,000	0.97
Phenanthrene	370 - 1,200	21 / 43	3,100	IS11SS100001	1,730	1.79
Phenol	370 - 1,200	2 / 43	160	IS11SS210001	1,880	0.09
Pyrene	370 - 1,200	27 / 43	2,400	IS11SS100001	1,730	1.39
bis(2-Chloroethoxy)methane	370 - 1,200	0 / 43	--	--	NSV	NSV
bis(2-Chloroethyl)ether	370 - 1,200	0 / 43	--	--	NSV	NSV
bis(2-Ethylhexyl)phthalate	370 - 1,200	20 / 43	3,300	IS11SS330001	16,227	0.20

NSV - No Screening Value

Table 4-21
Step 2 Soil Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
n-Nitroso-di-n-propylamine	370 - 1,200	0 / 43	--	--	NSV	NSV
n-Nitrosodiphenylamine	370 - 1,200	3 / 43	130	IS11SS290001	1,090	0.12
Explosives (UG/KG)						
1,3,5-Trinitrobenzene	250 - 250	1 / 43	210	IS17SS150001	NSV	NSV
1,3-Dinitrobenzene	250 - 250	2 / 43	46.0	IS17SS040001	NSV	NSV
2,4,6-Trinitrotoluene	250 - 250	1 / 43	360	IS11SS260001	10,000	0.04
2,4-Dinitrotoluene	250 - 250	1 / 43	150	IS11SS100001	NSV	NSV
2,6-Dinitrotoluene	250 - 250	2 / 43	98.0	IS11SS270001	NSV	NSV
2-Amino-4,6-dinitrotoluene	250 - 250	1 / 43	130	IS11SS260001	80,000	0.00
2-Nitrotoluene	250 - 390	1 / 43	170	IS11SS250001	NSV	NSV
3-Nitrotoluene	250 - 250	0 / 43	--	--	NSV	NSV
4-Amino-2,6-dinitrotoluene	250 - 1,200	1 / 43	170	IS11SS260001	NSV	NSV
4-Nitrotoluene	250 - 630	1 / 25	240	IS17SS070001	NSV	NSV
Ammonium perchlorate	4.6 - 100	4 / 43	480,000	IS11SS260001	NSV	NSV
HMX	500 - 500	3 / 43	3,700	IS11SS260001	50,000	0.07
Nitrobenzene	250 - 870	0 / 43	--	--	2,260	0.38
Nitroglycerin	1,100 - 3,100	0 / 43	--	--	NSV	NSV
Nitroguanidine	100 - 100	1 / 43	40.0	IS17SS040001	NSV	NSV
PETN	2,500 - 2,500	0 / 43	--	--	NSV	NSV
RDX	500 - 910	4 / 43	860	IS11SS270001	50,000	0.02
Tetryl	650 - 650	0 / 43	--	--	25,000	0.03
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	11.0 - 160	0 / 43	--	--	300	0.53
1,1,2,2-Tetrachloroethane	11.0 - 160	0 / 43	--	--	300	0.53
1,1,2-Trichloro-1,2,2- trifluoroethane	11.0 - 160	0 / 43	--	--	NSV	NSV
1,1,2-Trichloroethane	11.0 - 160	0 / 43	--	--	300	0.53
1,1-Dichloroethane	11.0 - 160	0 / 43	--	--	300	0.53
1,1-Dichloroethene	11.0 - 160	0 / 43	--	--	NSV	NSV
1,2,4-Trichlorobenzene	11.0 - 160	0 / 43	--	--	1,270	0.13
1,2-Dibromo-3-chloropropane	11.0 - 160	0 / 31	--	--	NSV	NSV
1,2-Dibromoethane	11.0 - 160	0 / 43	--	--	5,000	0.03
1,2-Dichlorobenzene	11.0 - 160	0 / 43	--	--	100	1.60
1,2-Dichloroethane	11.0 - 160	0 / 43	--	--	1,083	0.15
1,2-Dichloroethene (total)	12.0 - 14.0	0 / 4	--	--	300	0.05
1,2-Dichloropropane	11.0 - 160	0 / 43	--	--	38,800	0.00
1,3-Dichlorobenzene	11.0 - 160	0 / 43	--	--	100	1.60
1,4-Dichlorobenzene	11.0 - 160	2 / 43	1.7	IS17SS150001	1,280	0.00
2-Butanone	11.0 - 160	0 / 43	--	--	NSV	NSV
2-Hexanone	11.0 - 160	0 / 43	--	--	NSV	NSV
4-Methyl-2-pentanone	11.0 - 160	0 / 43	--	--	10,000	0.02
Acetone	11.0 - 160	5 / 43	65.0	IS11SS340001	NSV	NSV
Benzene	11.0 - 160	0 / 43	--	--	284	0.56

NSV - No Screening Value

Table 4-21
Step 2 Soil Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Bromodichloromethane	11.0 - 160	0 / 43	--	--	45,000	0.00
Bromoform	11.0 - 160	0 / 43	--	--	114,700	0.00
Bromomethane	11.0 - 160	0 / 43	--	--	NSV	NSV
Carbon disulfide	11.0 - 160	0 / 43	--	--	NSV	NSV
Carbon tetrachloride	11.0 - 160	0 / 43	--	--	1,000,000	0.00
Chlorobenzene	11.0 - 160	0 / 43	--	--	2,400	0.07
Chloroethane	11.0 - 160	0 / 43	--	--	NSV	NSV
Chloroform	11.0 - 160	0 / 43	--	--	2,700	0.06
Chloromethane	11.0 - 160	0 / 43	--	--	NSV	NSV
Cumene	11.0 - 160	0 / 43	--	--	NSV	NSV
Cyclohexane	11.0 - 160	6 / 43	26.0	IS17SS100001	NSV	NSV
Dibromochloromethane	11.0 - 160	1 / 43	14.0	IS17SS090001	NSV	NSV
Dichlorodifluoromethane	11.0 - 160	0 / 43	--	--	NSV	NSV
Ethylbenzene	11.0 - 160	2 / 43	2.9	IS17SS060001	13,514	0.00
Methyl acetate	11.0 - 160	11 / 43	24.0	IS11SS180001	NSV	NSV
Methyl-tert-butyl ether (MTBE)	11.0 - 160	0 / 43	--	--	NSV	NSV
Methylcyclohexane	11.0 - 160	0 / 43	--	--	NSV	NSV
Methylene chloride	11.0 - 160	0 / 43	--	--	2,703	0.06
Styrene	11.0 - 160	3 / 43	32.0	IS11SS170001	27,027	0.00
TPH-gas range	120 - 330	0 / 14	--	--	NSV	NSV
Tetrachloroethene	11.0 - 160	0 / 43	--	--	1,083	0.15
Toluene	11.0 - 160	2 / 43	250	IS17SS020001	35,114	0.01
Trichloroethene	11.0 - 160	5 / 43	25.0	IS17SS070001	16,200	0.00
Trichlorofluoromethane	11.0 - 160	0 / 43	--	--	NSV	NSV
Vinyl chloride	11.0 - 160	0 / 43	--	--	300	0.53
Xylene, total	11.0 - 160	8 / 43	20.0	IS17SS060001	6,764	0.00
cis-1,2-Dichloroethene	11.0 - 160	0 / 43	--	--	300	0.53
cis-1,3-Dichloropropene	11.0 - 160	1 / 43	18.0	IS11SS250001	300	0.06
trans-1,2-Dichloroethene	11.0 - 160	0 / 43	--	--	300	0.53
trans-1,3-Dichloropropene	11.0 - 160	1 / 43	18.0	IS11SS250001	300	0.06

NSV - No Screening Value

Table 4-22
Step 2 Sediment Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Inorganics (MG/KG)						
Aluminum	4.6 - 10.7	13 / 13	13,100	IS17SD050001	18,000	0.73
Antimony	1.1 - 2.4	8 / 13	63.9	IS11SD020001	150	0.43
Arsenic	0.89 - 2.1	13 / 13	32.7	IS17SD060001	8.2	3.99
Barium	0.099 - 0.23	13 / 13	169	IS11SD010001	48.0	3.52
Beryllium	0.049 - 0.11	4 / 13	0.39	IS17SD050001	NSV	NSV
Cadmium	0.099 - 0.23	11 / 13	18.7	IS17SD060001	1.2	15.58
Chromium	0.49 - 1.1	13 / 13	69.7	IS11SD040001	81.0	0.86
Cobalt	0.54 - 1.3	12 / 13	16.8	IS11SD070001	10.0	1.68
Copper	0.47 - 1.1	13 / 13	757	IS11SD010001	34.0	22.26
Cyanide	0.62 - 5.7	1 / 13	0.12	IS11SD040001	0.10	1.20
Iron	6.7 - 15.5	13 / 13	134,000	IS11SD030001	188,400	0.71
Lead	0.32 - 17.7	13 / 13	76,400	IS11SD010001	46.7	1635.97
Manganese	0.099 - 0.23	13 / 13	940	IS11SD040001	260	3.62
Mercury	0.062 - 0.14	11 / 13	0.53	IS11SD030001	0.15	3.53
Nickel	0.47 - 1.1	12 / 13	46.4	IS11SD040001	20.9	2.22
Selenium	1.1 - 2.4	1 / 13	1.7	IS11SD030001	1	1.70
Silver	0.77 - 1.8	8 / 13	10.9	IS11SD030001	1	10.90
Thallium	1.3 - 3	2 / 13	4.2	IS11SD010001	NSV	NSV
Vanadium	0.35 - 0.80	13 / 13	43.4	IS11SD070001	57.0	0.76
Zinc	0.15 - 0.34	13 / 13	1,910	IS11SD040001	150	12.73
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	420 - 940	0 / 7	--	--	NSV	NSV
2,2'-Oxybis(1-chloropropane)	420 - 940	0 / 7	--	--	NSV	NSV
2,4,5-Trichlorophenol	1,100 - 2,400	0 / 7	--	--	1,307	1.84
2,4,6-Trichlorophenol	420 - 940	0 / 7	--	--	914	1.03
2,4-Dichlorophenol	420 - 940	0 / 7	--	--	93	10.14
2,4-Dimethylphenol	420 - 940	0 / 7	--	--	400	2.35
2,4-Dinitrophenol	1,100 - 2,400	0 / 2	--	--	87	27.53
2-Chloronaphthalene	420 - 940	0 / 7	--	--	140	6.71
2-Chlorophenol	420 - 940	0 / 7	--	--	120	7.84
2-Methylnaphthalene	420 - 940	0 / 7	--	--	1,686	0.56
2-Methylphenol	420 - 940	0 / 7	--	--	21	45.02
2-Nitroaniline	1,100 - 2,400	0 / 7	--	--	2,953	0.81
2-Nitrophenol	420 - 940	0 / 7	--	--	154	6.12
3,3'-Dichlorobenzidine	420 - 940	0 / 7	--	--	358	2.62
3-Nitroaniline	1,100 - 2,400	0 / 7	--	--	414	5.80
4,6-Dinitro-2-methylphenol	1,100 - 2,400	0 / 6	--	--	NSV	NSV
4-Bromophenyl-phenylether	420 - 940	0 / 7	--	--	2,088	0.45
4-Chloro-3-methylphenol	420 - 940	0 / 7	--	--	NSV	NSV
4-Chloroaniline	420 - 940	0 / 7	--	--	57	16.42
4-Chlorophenyl-phenylether	420 - 940	0 / 7	--	--	NSV	NSV

NSV - No Screening Value

Table 4-22
Step 2 Sediment Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
4-Methylphenol	420 - 940	0 / 7	--	--	670	1.40
4-Nitroaniline	1,100 - 2,400	0 / 7	--	--	NSV	NSV
4-Nitrophenol	1,100 - 2,400	0 / 7	--	--	193	12.43
Acenaphthene	420 - 940	0 / 7	--	--	1,079	0.87
Acenaphthylene	420 - 940	0 / 7	--	--	44.0	21.36
Acetophenone	420 - 940	0 / 7	--	--	NSV	NSV
Anthracene	420 - 940	0 / 7	--	--	383	2.46
Atrazine	420 - 940	0 / 7	--	--	NSV	NSV
Benzaldehyde	420 - 940	0 / 7	--	--	NSV	NSV
Benzo(a)anthracene	420 - 940	2 / 7	250	IS11SD020001	191	1.31
Benzo(a)pyrene	420 - 940	1 / 7	77.0	IS11SD020001	244	0.32
Benzo(b)fluoranthene	420 - 940	3 / 7	400	IS11SD020001	221,681	0.00
Benzo(g,h,i)perylene	420 - 940	0 / 7	--	--	670	1.40
Benzo(k)fluoranthene	420 - 940	1 / 7	170	IS11SD020001	240	0.71
Butylbenzylphthalate	420 - 940	0 / 7	--	--	19,140	0.05
Caprolactam	420 - 940	0 / 7	--	--	NSV	NSV
Carbazole	420 - 940	0 / 7	--	--	588	1.60
Chrysene	420 - 940	3 / 7	370	IS11SD020001	384	0.96
Di-n-butylphthalate	420 - 940	0 / 7	--	--	2,013	0.47
Di-n-octylphthalate	420 - 940	0 / 7	--	--	4,374,522	0.00
Dibenz(a,h)anthracene	420 - 940	1 / 7	55.0	IS11SD020001	63.4	0.87
Dibenzofuran	420 - 940	0 / 7	--	--	731	1.29
Diethylphthalate	420 - 940	0 / 7	--	--	379	2.48
Dimethyl phthalate	420 - 940	0 / 7	--	--	200	4.70
Fluoranthene	420 - 940	4 / 7	300	IS11SD020001	600	0.50
Fluorene	420 - 940	0 / 7	--	--	940	1.00
Hexachlorobenzene	420 - 940	0 / 7	--	--	39,496	0.02
Hexachlorobutadiene	420 - 940	0 / 7	--	--	2,981	0.32
Hexachlorocyclopentadiene	420 - 940	0 / 7	--	--	2,422	0.39
Hexachloroethane	420 - 940	0 / 7	--	--	1,740	0.54
Indeno(1,2,3-cd)pyrene	420 - 940	1 / 7	92.0	IS11SD020001	600	0.15
Isophorone	420 - 940	0 / 7	--	--	1,053	0.89
Naphthalene	420 - 940	0 / 7	--	--	418	2.25
Pentachlorophenol	1,000 - 2,300	0 / 7	--	--	11,759	0.20
Phenanthrene	420 - 940	2 / 7	79.0	IS11SD020001	240	0.33
Phenol	420 - 940	0 / 7	--	--	54	17.43
Pyrene	420 - 940	4 / 7	240	IS11SD020001	665	0.36
bis(2-Chloroethoxy)methane	420 - 940	0 / 7	--	--	105	8.99
bis(2-Chloroethyl)ether	420 - 940	0 / 7	--	--	640	1.47
bis(2-Ethylhexyl)phthalate	420 - 940	4 / 7	150	IS11SD030001	1,548,600	0.00
n-Nitroso-di-n-propylamine	420 - 940	0 / 7	--	--	NSV	NSV
n-Nitrosodiphenylamine	420 - 940	0 / 7	--	--	13,010	0.07

NSV - No Screening Value

Table 4-22
Step 2 Sediment Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Explosives (UG/KG)						
1,3,5-Trinitrobenzene	250 - 250	1 / 13	94.0	IS17SD020001	21	4.50
1,3-Dinitrobenzene	250 - 250	1 / 13	69.0	IS17SD020001	82	0.84
2,4,6-Trinitrotoluene	250 - 250	2 / 13	100	IS17SD020001	157	0.64
2,4-Dinitrotoluene	250 - 250	0 / 13	--	--	379	0.66
2,6-Dinitrotoluene	250 - 250	1 / 13	100	IS17SD030001	72	1.39
2-Amino-4,6-dinitrotoluene	250 - 250	1 / 13	220	IS17SD050001	NSV	NSV
2-Nitrotoluene	250 - 250	0 / 13	--	--	NSV	NSV
3-Nitrotoluene	250 - 250	3 / 13	220	IS17SD020001	NSV	NSV
4-Amino-2,6-dinitrotoluene	250 - 250	0 / 13	--	--	NSV	NSV
4-Nitrotoluene	250 - 250	2 / 13	160	IS11SD060001	NSV	NSV
Ammonium perchlorate	4.6 - 4.6	0 / 13	--	--	NSV	NSV
HMX	500 - 500	0 / 13	--	--	371	1.35
Nitrobenzene	250 - 250	0 / 13	--	--	748	0.33
Nitroglycerin	1,200 - 3,000	0 / 13	--	--	NSV	NSV
Nitroguanidine	100 - 100	0 / 13	--	--	NSV	NSV
PETN	2,500 - 2,500	0 / 13	--	--	NSV	NSV
RDX	500 - 500	0 / 13	--	--	17	28.74
Tetryl	650 - 650	0 / 7	--	--	NSV	NSV
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	13.0 - 28.0	0 / 7	--	--	296	0.09
1,1,2,2-Tetrachloroethane	13.0 - 28.0	0 / 7	--	--	2,426	0.01
1,1,2-Trichloro-1,2,2- trifluoroethane	13.0 - 28.0	0 / 7	--	--	NSV	NSV
1,1,2-Trichloroethane	13.0 - 28.0	0 / 7	--	--	2,088	0.01
1,1-Dichloroethane	13.0 - 28.0	0 / 7	--	--	47	0.60
1,1-Dichloroethene	13.0 - 28.0	0 / 7	--	--	54	0.52
1,2,4-Trichlorobenzene	13.0 - 28.0	0 / 7	--	--	16,704	0.00
1,2-Dibromo-3-chloropropane	13.0 - 28.0	0 / 7	--	--	NSV	NSV
1,2-Dibromoethane	13.0 - 28.0	0 / 7	--	--	291	0.10
1,2-Dichlorobenzene	13.0 - 28.0	0 / 7	--	--	574	0.05
1,2-Dichloroethane	13.0 - 28.0	0 / 7	--	--	435	0.06
1,2-Dichloroethene (total)	14.0 - 28.0	0 / 2	--	--	696	0.04
1,2-Dichloropropane	13.0 - 28.0	0 / 7	--	--	4,573	0.01
1,3-Dichlorobenzene	13.0 - 28.0	0 / 7	--	--	1,368	0.02
1,4-Dichlorobenzene	13.0 - 28.0	0 / 7	--	--	592	0.05
2-Butanone	13.0 - 28.0	4 / 7	42.0	IS11SD070001	470	0.09
2-Hexanone	13.0 - 28.0	0 / 7	--	--	38	0.73
4-Methyl-2-pentanone	13.0 - 28.0	0 / 7	--	--	57	0.49
Acetone	13.0 - 28.0	3 / 7	130	IS11SD070001	15	8.59
Benzene	13.0 - 28.0	0 / 7	--	--	278	0.10
Bromodichloromethane	13.0 - 28.0	0 / 7	--	--	2,220	0.01
Bromoform	13.0 - 28.0	0 / 7	--	--	1,131	0.02

NSV - No Screening Value

Table 4-22
Step 2 Sediment Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Bromomethane	13.0 - 28.0	0 / 7	--	--	28	0.99
Carbon disulfide	13.0 - 28.0	0 / 7	--	--	1	18.93
Carbon tetrachloride	13.0 - 28.0	0 / 7	--	--	82	0.34
Chlorobenzene	13.0 - 28.0	0 / 7	--	--	713	0.04
Chloroethane	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Chloroform	13.0 - 28.0	0 / 7	--	--	38	0.73
Chloromethane	13.0 - 28.0	3 / 7	14.0	IS11SD010001	369	0.04
Cumene	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Cyclohexane	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Dibromochloromethane	13.0 - 28.0	0 / 7	--	--	2,601	0.01
Dichlorodifluoromethane	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Ethylbenzene	13.0 - 28.0	0 / 7	--	--	155	0.18
Methyl acetate	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Methyl-tert-butyl ether (MTBE)	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Methylcyclohexane	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Methylene chloride	13.0 - 28.0	0 / 7	--	--	644	0.04
Styrene	13.0 - 28.0	0 / 7	--	--	3,257	0.01
Tetrachloroethene	13.0 - 28.0	0 / 7	--	--	713	0.04
Toluene	13.0 - 28.0	1 / 7	5.5	IS11SD050001	87	0.06
Trichloroethene	13.0 - 28.0	0 / 7	--	--	383	0.07
Trichlorofluoromethane	13.0 - 28.0	0 / 7	--	--	NSV	NSV
Vinyl chloride	13.0 - 28.0	0 / 7	--	--	602	0.05
Xylene, total	13.0 - 28.0	0 / 7	--	--	278	0.10
cis-1,2-Dichloroethene	13.0 - 28.0	0 / 7	--	--	1,361	0.02
cis-1,3-Dichloropropene	13.0 - 28.0	0 / 7	--	--	127	0.22
trans-1,2-Dichloroethene	13.0 - 28.0	0 / 7	--	--	2,189	0.01
trans-1,3-Dichloropropene	13.0 - 28.0	0 / 7	--	--	127	0.22

NSV - No Screening Value

Table 4-23
Step 2 Surface Water Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Dissolved Metals (UG/L)						
Aluminum	18.8 - 18.8	0 / 13	--	--	87.0	0.22
Antimony	4.3 - 4.3	0 / 13	--	--	30.0	0.14
Arsenic	3.6 - 3.6	0 / 13	--	--	36.0	0.10
Barium	0.40 - 0.40	13 / 13	55.7	IS11SW07	1,000	0.06
Beryllium	0.20 - 0.20	1 / 13	0.31	IS17SW01	5.3	0.06
Cadmium	0.40 - 0.40	0 / 13	--	--	1.19	0.34
Chromium	2 - 2	0 / 13	--	--	11.0	0.18
Cobalt	2.2 - 2.2	0 / 13	--	--	23.0	0.10
Copper	1.9 - 1.9	7 / 13	5.9	IS11SW07	3.1	1.90
Iron	27.3 - 27.3	7 / 13	613	IS11SW05	1,000	0.61
Lead	1.3 - 1.3	1 / 13	1.3	IS11SW01	1.0	1.30
Manganese	0.40 - 0.40	6 / 13	88.6	IS11SW06	10.0	8.86
Mercury	0.10 - 0.10	0 / 13	--	--	0.77	0.13
Nickel	1.9 - 1.9	4 / 13	17.9	IS17SW01	8.2	2.18
Selenium	4.3 - 4.3	1 / 13	4.9	IS17SW04	4.6	1.07
Silver	3.1 - 3.1	0 / 13	--	--	0.23	13.48
Thallium	5.3 - 5.3	0 / 13	--	--	40.0	0.13
Vanadium	1.4 - 1.4	0 / 13	--	--	10,000	0.00
Zinc	0.60 - 1.7	1 / 13	29.9	IS17SW04	81.0	0.37
Semivolatile Organic Compounds (UG/L)						
1,1-Biphenyl	10.0 - 10.0	0 / 7	--	--	NSV	NSV
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 7	--	--	NSV	NSV
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 7	--	--	19.1	1.31
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 7	--	--	21.1	0.47
2,4-Dichlorophenol	10.0 - 10.0	0 / 5	--	--	8.7	1.15
2,4-Dimethylphenol	10.0 - 10.0	0 / 7	--	--	191.4	0.05
2-Chloronaphthalene	10.0 - 10.0	0 / 7	--	--	1.3	7.66
2-Chlorophenol	10.0 - 10.0	0 / 7	--	--	92.2	0.11
2-Methylnaphthalene	10.0 - 10.0	0 / 7	--	--	24.7	0.40
2-Methylphenol	10.0 - 10.0	0 / 7	--	--	22.6	0.44
2-Nitroaniline	25.0 - 25.0	0 / 7	--	--	4002.0	0.01
2-Nitrophenol	10.0 - 10.0	0 / 7	--	--	261.0	0.04
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 7	--	--	12.7	0.79
3-Nitroaniline	25.0 - 25.0	0 / 7	--	--	1740.0	0.01
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 7	--	--	4.0	6.25
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 7	--	--	2.6	3.83
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 7	--	--	0.5	19.16
4-Chloroaniline	10.0 - 10.0	0 / 7	--	--	87.0	0.11
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 7	--	--	NSV	NSV
4-Methylphenol	10.0 - 10.0	0 / 7	--	--	NSV	NSV
4-Nitroaniline	25.0 - 25.0	0 / 7	--	--	NSV	NSV

NSV - No Screening Value

Table 4-23
Step 2 Surface Water Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
4-Nitrophenol	25.0 - 25.0	0 / 7	--	--	261.0	0.10
Acenaphthene	10.0 - 10.0	0 / 7	--	--	904.8	0.01
Acenaphthylene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
Acetophenone	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Anthracene	10.0 - 10.0	0 / 7	--	--	1.3	7.87
Atrazine	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Benzaldehyde	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Benzo(a)anthracene	10.0 - 10.0	0 / 7	--	--	11.0	0.91
Benzo(a)pyrene	10.0 - 10.0	0 / 7	--	--	0.0	410.51
Benzo(b)fluoranthene	10.0 - 10.0	0 / 7	--	--	17.8	0.56
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
Benzo(k)fluoranthene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
Butylbenzylphthalate	10.0 - 10.0	0 / 7	--	--	38.3	0.26
Caprolactam	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Carbazole	10.0 - 10.0	0 / 7	--	--	17.4	0.57
Chrysene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
Di-n-butylphthalate	10.0 - 10.0	0 / 7	--	--	5.9	1.69
Di-n-octylphthalate	10.0 - 10.0	0 / 7	--	--	5.2	1.92
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
Dibenzofuran	10.0 - 10.0	0 / 7	--	--	17.4	0.57
Diethylphthalate	10.0 - 10.0	0 / 7	--	--	132.1	0.08
Dimethyl phthalate	10.0 - 10.0	0 / 7	--	--	574.2	0.02
Fluoranthene	10.0 - 10.0	0 / 7	--	--	27.8	0.36
Fluorene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
Hexachlorobenzene	10.0 - 10.0	0 / 7	--	--	6.4	1.56
Hexachlorobutadiene	10.0 - 10.0	0 / 7	--	--	5.6	1.80
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 7	--	--	1.2	8.21
Hexachloroethane	10.0 - 10.0	0 / 7	--	--	163.6	0.06
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
Isophorone	10.0 - 10.0	0 / 7	--	--	2244.6	0.00
Naphthalene	10.0 - 10.0	0 / 7	--	--	174.0	0.06
Nitrobenzene	10.0 - 10.0	0 / 1	--	--	1162.3	0.01
Pentachlorophenol	25.0 - 25.0	0 / 7	--	--	11.6	2.15
Phenanthrene	10.0 - 10.0	0 / 7	--	--	8.0	1.25
Phenol	10.0 - 10.0	0 / 7	--	--	445.4	0.02
Pyrene	10.0 - 10.0	0 / 7	--	--	52.2	0.19
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 7	--	--	1914.0	0.01
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 7	--	--	4141.2	0.00
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	1 / 7	1	IS11SW01	52.2	0.02
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 7	--	--	NSV	NSV
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 7	--	--	1017.9	0.01
Explosives (UG/L)						

NSV - No Screening Value

Table 4-23
Step 2 Surface Water Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
1,3,5-Trinitrobenzene	0.20 - 0.20	0 / 13	--	--	139.2	0.00
1,3-Dinitrobenzene	0.20 - 0.20	1 / 13	0.075	IS11SW01	278.4	0.00
2,4,6-Trinitrotoluene	0.20 - 0.20	0 / 13	--	--	156.6	0.00
2,4-Dinitrotoluene	0.20 - 0.20	0 / 13	--	--	400.2	0.00
2,6-Dinitrotoluene	0.20 - 0.20	0 / 13	--	--	104.4	0.00
2-Amino-4,6-dinitrotoluene	0.20 - 0.20	0 / 13	--	--	34.8	0.01
2-Nitrotoluene	0.20 - 0.20	0 / 13	--	--	NSV	NSV
3-Nitrotoluene	0.20 - 0.20	0 / 13	--	--	NSV	NSV
4-Amino-2,6-dinitrotoluene	0.20 - 0.20	0 / 13	--	--	NSV	NSV
4-Nitrotoluene	0.20 - 0.20	1 / 13	0.11	IS17SW02	NSV	NSV
Ammonium perchlorate	0.23 - 0.23	3 / 13	3.6	IS11SW04	NSV	NSV
HMX	0.50 - 0.50	2 / 13	0.41	IS11SW06	5742.0	0.00
Nitrobenzene	0.20 - 0.20	0 / 12	--	--	1162.3	0.00
Nitroglycerin	30.0 - 30.0	0 / 13	--	--	NSV	NSV
Nitroguanidine	20.0 - 20.0	0 / 13	--	--	NSV	NSV
PETN	2.5 - 2.5	0 / 13	--	--	NSV	NSV
RDX	0.50 - 0.50	0 / 13	--	--	330.6	0.00
Tetryl	0.20 - 0.20	0 / 13	--	--	NSV	NSV
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	10.0 - 10.0	0 / 7	--	--	5428.8	0.00
1,1,2,2-Tetrachloroethane	10.0 - 10.0	0 / 7	--	--	1084.0	0.01
1,1,2-Trichloro-1,2,2- trifluoroethane	10.0 - 10.0	0 / 7	--	--	NSV	NSV
1,1,2-Trichloroethane	10.0 - 10.0	0 / 7	--	--	5428.8	0.00
1,1-Dichloroethane	10.0 - 10.0	0 / 7	--	--	2784.0	0.00
1,1-Dichloroethene	10.0 - 10.0	0 / 7	--	--	2018.4	0.00
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 7	--	--	87.0	0.11
1,2-Dibromo-3-chloropropane	10.0 - 10.0	0 / 7	--	--	NSV	NSV
1,2-Dibromoethane	10.0 - 10.0	0 / 7	--	--	313.2	0.03
1,2-Dichlorobenzene	10.0 - 10.0	0 / 7	--	--	224.5	0.04
1,2-Dichloroethane	10.0 - 10.0	0 / 7	--	--	1966.2	0.01
1,2-Dichloroethene (total)	10.0 - 10.0	0 / 1	--	--	2018.4	0.00
1,2-Dichloropropane	10.0 - 10.0	0 / 7	--	--	5289.6	0.00
1,3-Dichlorobenzene	10.0 - 10.0	0 / 7	--	--	49.6	0.20
1,4-Dichlorobenzene	10.0 - 10.0	0 / 7	--	--	224.5	0.04
2-Butanone	10.0 - 10.0	0 / 7	--	--	24360.0	0.00
2-Hexanone	10.0 - 10.0	0 / 7	--	--	7447.2	0.00
4-Methyl-2-pentanone	10.0 - 10.0	0 / 7	--	--	8004.0	0.00
Acetone	10.0 - 10.0	0 / 7	--	--	156600.0	0.00
Benzene	10.0 - 10.0	0 / 7	--	--	922.2	0.01
Bromodichloromethane	10.0 - 10.0	0 / 7	--	--	1914.0	0.01
Bromoform	10.0 - 10.0	0 / 7	--	--	556.8	0.02
Bromomethane	10.0 - 10.0	0 / 7	--	--	191.4	0.05

NSV - No Screening Value

Table 4-23
Step 2 Surface Water Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Carbon disulfide	10.0 - 10.0	0 / 7	--	--	3.5	2.87
Carbon tetrachloride	10.0 - 10.0	0 / 7	--	--	6124.8	0.00
Chlorobenzene	10.0 - 10.0	0 / 7	--	--	182.7	0.05
Chloroethane	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Chloroform	10.0 - 10.0	0 / 7	--	--	1418.1	0.01
Chloromethane	10.0 - 10.0	0 / 7	--	--	4698.0	0.00
Cumene	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Cyclohexane	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Dibromochloromethane	10.0 - 10.0	0 / 7	--	--	1914.0	0.01
Dichlorodifluoromethane	10.0 - 10.0	0 / 7	--	--	1914.0	0.01
Ethylbenzene	10.0 - 10.0	0 / 7	--	--	74.8	0.13
Methyl acetate	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Methyl-tert-butyl ether (MTBE)	10.0 - 10.0	1 / 7	1	IS11SW01	NSV	NSV
Methylcyclohexane	10.0 - 10.0	0 / 7	--	--	NSV	NSV
Methylene chloride	10.0 - 10.0	0 / 7	--	--	3828.0	0.00
Styrene	10.0 - 10.0	0 / 7	--	--	419.3	0.02
Tetrachloroethene	10.0 - 10.0	0 / 7	--	--	783.0	0.01
Toluene	10.0 - 10.0	0 / 7	--	--	64.4	0.16
Trichloroethene	10.0 - 10.0	0 / 7	--	--	348.0	0.03
Trichlorofluoromethane	10.0 - 10.0	0 / 7	--	--	1914.0	0.01
Vinyl chloride	10.0 - 10.0	0 / 7	--	--	2018.4	0.00
Xylene, total	10.0 - 10.0	0 / 7	--	--	226.2	0.04
cis-1,2-Dichloroethene	10.0 - 10.0	0 / 7	--	--	2018.4	0.00
cis-1,3-Dichloropropene	10.0 - 10.0	0 / 7	--	--	137.5	0.07
trans-1,2-Dichloroethene	10.0 - 10.0	0 / 7	--	--	2018.4	0.00
trans-1,3-Dichloropropene	10.0 - 10.0	0 / 7	--	--	137.5	0.07

NSV - No Screening Value

Table 4-24
Summary of Hazard Quotients for Food Web Exposures, Step 2 - Sites 11 and17
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		Meadow vole		Raccoon		Red fox		American robin		American kestrel		Great blue heron		Marsh wren	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics																
Arsenic	16.53	1.65	2.28	0.23	2.40	0.24	0.66	0.07	0.18	0.06	0.30	0.10	0.17	0.07	0.36	0.12
Cadmium	134.52	13.45	10.16	1.02	0.45	0.05	8.84	0.88	26.69	1.93	49.91	3.62	0.44	0.03	0.26	0.02
Chromium	0.66	0.07	0.05	<0.01	0.02	<0.01	0.07	<0.01	1.98	0.40	4.56	0.91	0.55	0.11	0.68	0.14
Copper	31.29	24.18	6.61	5.11	1.07	0.83	5.00	3.86	1.88	1.43	5.18	3.95	0.34	0.26	0.51	0.39
Lead	898.78	89.88	112.84	11.28	74.82	7.48	83.26	8.33	1433.92	143.39	912.23	91.22	290.35	29.04	10.60	1.06
Mercury	208.71	41.74	51.07	10.21	0.10	0.06	1.90	1.14	3.95	1.97	6.86	3.43	56.26	5.63	0.12	0.06
Nickel	1.00	0.50	0.04	0.02	<0.01	<0.01	0.07	0.04	0.14	0.10	0.29	0.21	0.13	0.09	0.01	<0.01
Selenium	1.10	0.67	0.50	0.30	0.21	0.13	0.10	0.06	0.13	0.04	0.27	0.08	0.89	0.44	0.59	0.30
Silver	0.48	0.05	0.15	0.02	<0.01	<0.01	0.04	<0.01	0.01	<0.01	0.03	<0.01	0.01	<0.01	<0.01	<0.01
Zinc	19.39	9.70	2.69	1.34	1.83	0.18	13.42	1.34	59.67	6.60	128.34	14.21	4.05	0.45	5.85	0.65
Semivolatile Organic Compounds																
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.17	0.02	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.19	0.02	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	0.10	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.25	0.02	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.08	0.02	0.04	0.01
Hexachlorobenzene	0.08	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.46	0.05	0.92	0.09	2.46	0.25	1.15	0.12
Hexachlorocyclopentadiene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.60	0.06	0.02	<0.01	0.02	<0.01	0.04	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

Table 4-25
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American kestrel	0.114	USEPA 1993	0.01377	allometric equation	0.00882	USEPA 1993
American robin	0.0452	USEPA 1993	0.00741	allometric equation	0.00162	Levey and Karasov 1989
Great blue heron	2.23	Quinney 1982	0.10098	allometric equation	0.39306	allometric equation
Marsh wren	0.01125	Dunning 1993	0.00292	allometric equation	0.00249	USEPA 1993
Mammals						
Meadow vole	0.0428	Silva and Downing 1995	0.00899	USEPA 1993	0.00209	USEPA 1993
Raccoon	5.94	Silva and Downing 1995	0.49209	allometric equation	0.10003	Conover 1989
Red fox	4.06	Silva and Downing 1995	0.34939	allometric equation	0.12308	Sample and Suter 1994
Short-tailed shrew	0.01687	USEPA 1993	0.00376	USEPA 1993	0.00149	USEPA 1993

Table 4-25
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
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Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American kestrel	0	38	60	0	0	0	USEPA 1993	2	Assumed based on diet
American robin	0	95	0	0	0	0	Martin et al. 1951	5	Sample and Suter 1994
Great blue heron	0	0	0	100	0	0	USEPA 1993; Quinney and Smith 1980	0	Sample and Suter 1994
Marsh wren	0	0	0	0	0	95	USEPA 1993	5	Assumed based on diet
Mammals									
Meadow vole	95.6	2	0	0	0	0	USEPA 1993	2.4	Beyer et al. 1994
Raccoon	0	0	0	7	40	43.6	USEPA 1993	9.4	Beyer et al. 1994
Red fox	7	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994

Table 4-26
Step 3 Soil Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Inorganics (MG/KG)							
Aluminum	4.2 - 12.4	43 / 43	25,600	IS11SS260001	8,821	50	176.41
Antimony	0.69 - 3.2	18 / 42	18.9	IS11SS170001	3.62	5	0.72
Arsenic	0.71 - 2.6	42 / 43	42.7	IS11SS260001	8.61	10	0.86
Barium	0.033 - 0.26	43 / 43	367	IS11SS160001	97.0	500	0.19
Beryllium	0.018 - 0.13	7 / 43	0.50	IS17SS100001	0.15	10	0.02
Cadmium	0.056 - 0.29	34 / 43	147	IS11SS270001	16.3	4	4.06
Chromium	0.25 - 1.5	43 / 43	156	IS11SS260001	29.3	0.4	73.24
Cobalt	0.19 - 1.5	41 / 43	29.0	IS17SS060001	9.00	20	0.45
Copper	0.29 - 1.3	43 / 43	4,960	IS11SS240001	413	50	8.27
Cyanide	0.56 - 2.8	14 / 43	0.64	IS17SS020001	0.25	27.5	0.01
Iron	3.6 - 38.6	43 / 43	263,000	IS11SS100001	43,429	200	217.15
Lead	0.29 - 29.2	43 / 43	132,000	IS11SS220001	3,579	50	71.57
Manganese	0.033 - 0.29	43 / 43	1,330	IS11SS100001	314	500	0.63
Mercury	0.056 - 0.65	30 / 43	42.0	IS11SS150001	1.67	0.1	16.68
Nickel	0.43 - 1.3	42 / 43	189	IS11SS150001	29.0	30	0.97
Selenium	0.89 - 3.2	2 / 43	1.6	IS17SS050001	0.70	1	0.70
Silver	0.25 - 2.1	23 / 43	62.5	IS11SS310001	7.25	2	3.63
Thallium	1.2 - 3.9	6 / 43	5.5	IS11SS220001	1.05	1	1.05
Vanadium	0.17 - 1	43 / 43	60.2	IS11SS310001	23.6	2	11.80
Zinc	0.13 - 1.6	43 / 43	10,000	IS11SS100001	1,040	50	20.79
Semivolatile Organic Compounds (UG/KG)							
1,1-Biphenyl	370 - 1,200	0 / 43	--	--	253	NSV	NSV
2,2'-Oxybis(1-chloropropane)	370 - 1,200	0 / 43	--	--	253	NSV	NSV
2,4,5-Trichlorophenol	920 - 3,000	0 / 43	--	--	637	430	1.48
2,4,6-Trichlorophenol	370 - 1,200	0 / 43	--	--	253	580	0.44
2,4-Dichlorophenol	370 - 1,200	0 / 42	--	--	254	13,400	0.02
2,4-Dimethylphenol	370 - 1,200	0 / 43	--	--	253	100	2.53
2,4-Dinitrophenol	920 - 1,500	0 / 11	--	--	550	20,000	0.03
2-Chloronaphthalene	370 - 1,200	0 / 43	--	--	253	2,789	0.09
2-Chlorophenol	370 - 1,200	0 / 43	--	--	253	100	2.53
2-Methylnaphthalene	370 - 1,200	4 / 43	130	IS11SS310001	234	1,730	0.14
2-Methylphenol	370 - 1,200	0 / 43	--	--	253	100	2.53
2-Nitroaniline	920 - 3,000	0 / 43	--	--	637	NSV	NSV
2-Nitrophenol	370 - 1,200	0 / 43	--	--	253	NSV	NSV
3,3'-Dichlorobenzidine	370 - 1,200	0 / 43	--	--	253	NSV	NSV
3-Nitroaniline	920 - 3,000	0 / 43	--	--	637	NSV	NSV
4,6-Dinitro-2-methylphenol	920 - 3,000	0 / 43	--	--	637	NSV	NSV
4-Bromophenyl-phenylether	370 - 1,200	0 / 43	--	--	253	NSV	NSV
4-Chloro-3-methylphenol	370 - 1,200	0 / 43	--	--	253	100	2.53
4-Chloroaniline	370 - 1,200	0 / 43	--	--	253	NSV	NSV
4-Chlorophenyl-phenylether	370 - 1,200	0 / 43	--	--	253	NSV	NSV
4-Methylphenol	370 - 1,200	0 / 43	--	--	253	100	2.53
4-Nitroaniline	920 - 3,000	0 / 43	--	--	637	NSV	NSV
4-Nitrophenol	920 - 3,000	0 / 43	--	--	637	380	1.68
4-Nitrotoluene	250 - 250	2 / 18	250	IS11SS140001	132	NSV	NSV
Acenaphthene	370 - 1,200	4 / 43	250	IS11SS310001	233	2,500	0.09
Acenaphthylene	370 - 1,200	0 / 43	--	--	253	1,730	0.15
Acetophenone	370 - 1,200	17 / 43	760	IS11SS140001	250	NSV	NSV
Anthracene	370 - 1,200	10 / 43	660	IS11SS100001	238	1,730	0.14

NSV - No Screening Value

Table 4-26
Step 3 Soil Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Atrazine	370 - 1,200	0 / 43	--	--	253	NSV	NSV
Benzaldehyde	370 - 1,200	19 / 43	1,100	IS17SS010001	233	NSV	NSV
Benzo(a)anthracene	370 - 1,200	23 / 43	3,300	IS11SS100001	457	1,730	0.26
Benzo(a)pyrene	370 - 1,200	18 / 43	860	IS11SS310001	229	1,730	0.13
Benzo(b)fluoranthene	370 - 1,200	24 / 43	4,300	IS11SS310001	619	1,730	0.36
Benzo(g,h,i)perylene	370 - 1,200	0 / 43	--	--	253	1,730	0.15
Benzo(k)fluoranthene	370 - 1,200	22 / 43	2,200	IS11SS100001	337	1,730	0.19
Butylbenzylphthalate	370 - 1,200	2 / 43	96.0	IS11SS230001	248	NSV	NSV
Caprolactam	370 - 1,200	0 / 43	--	--	253	NSV	NSV
Carbazole	370 - 1,200	4 / 43	210	IS11SS310001	233	NSV	NSV
Chrysene	370 - 1,200	24 / 43	3,500	IS11SS100001	498	1,730	0.29
Di-n-butylphthalate	370 - 1,200	6 / 43	290	IS11SS220001	241	200,000	0.00
Di-n-octylphthalate	370 - 1,200	1 / 43	590	IS11SS250001	260	NSV	NSV
Dibenz(a,h)anthracene	370 - 1,200	13 / 43	590	IS11SS310001	218	1,730	0.13
Dibenzofuran	370 - 1,200	3 / 43	130	IS11SS310001	233	NSV	NSV
Diethylphthalate	370 - 1,200	5 / 43	160	IS11SS160001	222	13,400	0.02
Dimethyl phthalate	370 - 1,200	0 / 43	--	--	253	10,640	0.02
Fluoranthene	370 - 1,200	26 / 43	6,800	IS11SS100001	753	1,730	0.44
Fluorene	370 - 1,200	6 / 43	590	IS11SS250001	236	1,730	0.14
Hexachlorobenzene	370 - 1,200	1 / 43	590	IS11SS250001	260	100,000	0.00
Hexachlorobutadiene	370 - 1,200	1 / 43	590	IS11SS250001	260	NSV	NSV
Hexachlorocyclopentadiene	370 - 1,200	0 / 43	--	--	253	1,000	0.25
Hexachloroethane	370 - 1,200	0 / 43	--	--	253	NSV	NSV
Indeno(1,2,3-cd)pyrene	370 - 1,200	21 / 43	990	IS11SS310001	220	1,730	0.13
Isophorone	370 - 1,200	0 / 43	--	--	253	NSV	NSV
Naphthalene	370 - 1,200	2 / 43	65.0	IS11SS230001	246	1,730	0.14
Nitrobenzene	470 - 600	0 / 5	--	--	261	2,260	0.12
Pentachlorophenol	890 - 2,900	0 / 43	--	--	608	3,000	0.20
Phenanthrene	370 - 1,200	21 / 43	3,100	IS11SS100001	404	1,730	0.23
Phenol	370 - 1,200	2 / 43	160	IS11SS210001	250	1,880	0.13
Pyrene	370 - 1,200	27 / 43	2,400	IS11SS100001	390	1,730	0.23
bis(2-Chloroethoxy)methane	370 - 1,200	0 / 43	--	--	253	NSV	NSV
bis(2-Chloroethyl)ether	370 - 1,200	0 / 43	--	--	253	NSV	NSV
bis(2-Ethylhexyl)phthalate	370 - 1,200	20 / 43	3,300	IS11SS330001	437	16,227	0.03
n-Nitroso-di-n-propylamine	370 - 1,200	0 / 43	--	--	253	NSV	NSV
n-Nitrosodiphenylamine	370 - 1,200	3 / 43	130	IS11SS290001	239	1,090	0.22
Explosives (UG/KG)							
1,3,5-Trinitrobenzene	250 - 250	1 / 43	210	IS17SS150001	127	NSV	NSV
1,3-Dinitrobenzene	250 - 250	2 / 43	46.0	IS17SS040001	121	NSV	NSV
2,4,6-Trinitrotoluene	250 - 250	1 / 43	360	IS11SS260001	130	10,000	0.01
2,4-Dinitrotoluene	250 - 250	1 / 43	150	IS11SS100001	126	NSV	NSV
2,6-Dinitrotoluene	250 - 250	2 / 43	98.0	IS11SS270001	124	NSV	NSV
2-Amino-4,6-dinitrotoluene	250 - 250	1 / 43	130	IS11SS260001	125	80,000	0.00
2-Nitrotoluene	250 - 390	1 / 43	170	IS11SS250001	128	NSV	NSV
3-Nitrotoluene	250 - 250	0 / 43	--	--	125	NSV	NSV
4-Amino-2,6-dinitrotoluene	250 - 1,200	1 / 43	170	IS11SS260001	137	NSV	NSV
4-Nitrotoluene	250 - 630	1 / 25	240	IS17SS070001	137	NSV	NSV
Ammonium perchlorate	4.6 - 100	4 / 43	480,000	IS11SS260001	11,226	NSV	NSV
HMX	500 - 500	3 / 43	3,700	IS11SS260001	373	50,000	0.01
Nitrobenzene	250 - 870	0 / 43	--	--	132	2,260	0.06
Nitroglycerin	1,100 - 3,100	0 / 43	--	--	749	NSV	NSV
Nitroguanidine	100 - 100	1 / 43	40.0	IS17SS040001	49.8	NSV	NSV
PETN	2,500 - 2,500	0 / 43	--	--	1,250	NSV	NSV
RDX	500 - 910	4 / 43	860	IS11SS270001	273	50,000	0.01

NSV - No Screening Value

Table 4-26
Step 3 Soil Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Tetryl	650 - 650	0 / 43	--	--	325	25,000	0.01
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	11.0 - 160	0 / 43	--	--	9.57	300	0.03
1,1,2,2-Tetrachloroethane	11.0 - 160	0 / 43	--	--	9.57	300	0.03
1,1,2-Trichloro-1,2,2- trifluoroethane	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
1,1,2-Trichloroethane	11.0 - 160	0 / 43	--	--	9.57	300	0.03
1,1-Dichloroethane	11.0 - 160	0 / 43	--	--	9.57	300	0.03
1,1-Dichloroethene	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
1,2,4-Trichlorobenzene	11.0 - 160	0 / 43	--	--	9.57	1,270	0.01
1,2-Dibromo-3-chloropropane	11.0 - 160	0 / 31	--	--	9.85	NSV	NSV
1,2-Dibromoethane	11.0 - 160	0 / 43	--	--	9.57	5,000	0.00
1,2-Dichlorobenzene	11.0 - 160	0 / 43	--	--	9.57	100	0.10
1,2-Dichloroethane	11.0 - 160	0 / 43	--	--	9.57	1,083	0.01
1,2-Dichloroethene (total)	12.0 - 14.0	0 / 4	--	--	6.5	300	0.02
1,2-Dichloropropane	11.0 - 160	0 / 43	--	--	9.57	38,800	0.00
1,3-Dichlorobenzene	11.0 - 160	0 / 43	--	--	9.57	100	0.10
1,4-Dichlorobenzene	11.0 - 160	2 / 43	1.7	IS17SS150001	9.35	1,280	0.01
2-Butanone	11.0 - 160	0 / 43	--	--	9.49	NSV	NSV
2-Hexanone	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
4-Methyl-2-pentanone	11.0 - 160	0 / 43	--	--	9.57	10,000	0.00
Acetone	11.0 - 160	5 / 43	65.0	IS11SS340001	8.50	NSV	NSV
Benzene	11.0 - 160	0 / 43	--	--	9.57	284	0.03
Bromodichloromethane	11.0 - 160	0 / 43	--	--	9.57	45,000	0.00
Bromoform	11.0 - 160	0 / 43	--	--	9.57	114,700	0.00
Bromomethane	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Carbon disulfide	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Carbon tetrachloride	11.0 - 160	0 / 43	--	--	9.57	1,000,000	0.00
Chlorobenzene	11.0 - 160	0 / 43	--	--	9.57	2,400	0.00
Chloroethane	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Chloroform	11.0 - 160	0 / 43	--	--	9.57	2,700	0.00
Chloromethane	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Cumene	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Cyclohexane	11.0 - 160	6 / 43	26.0	IS17SS100001	9.77	NSV	NSV
Dibromochloromethane	11.0 - 160	1 / 43	14.0	IS17SS090001	9.73	NSV	NSV
Dichlorodifluoromethane	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Ethylbenzene	11.0 - 160	2 / 43	2.9	IS17SS060001	9.32	13,514	0.00
Methyl acetate	11.0 - 160	11 / 43	24.0	IS11SS180001	8.32	NSV	NSV
Methyl-tert-butyl ether (MTBE)	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Methylcyclohexane	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Methylene chloride	11.0 - 160	0 / 43	--	--	6.63	2,703	0.00
Styrene	11.0 - 160	3 / 43	32.0	IS11SS170001	9.85	27,027	0.00
TPH-gas range	120 - 330	0 / 14	--	--	82.5	NSV	NSV
Tetrachloroethene	11.0 - 160	0 / 43	--	--	9.57	1,083	0.01
Toluene	11.0 - 160	2 / 43	250	IS17SS020001	15.1	35,114	0.00
Trichloroethene	11.0 - 160	5 / 43	25.0	IS17SS070001	8.13	16,200	0.00
Trichlorofluoromethane	11.0 - 160	0 / 43	--	--	9.57	NSV	NSV
Vinyl chloride	11.0 - 160	0 / 43	--	--	9.57	300	0.03
Xylene, total	11.0 - 160	8 / 43	20.0	IS17SS060001	9.66	6,764	0.00
cis-1,2-Dichloroethene	11.0 - 160	0 / 43	--	--	9.57	300	0.03
cis-1,3-Dichloropropene	11.0 - 160	1 / 43	18.0	IS11SS250001	9.78	300	0.03
trans-1,2-Dichloroethene	11.0 - 160	0 / 43	--	--	9.57	300	0.03
trans-1,3-Dichloropropene	11.0 - 160	1 / 43	18.0	IS11SS250001	9.78	300	0.03

NSV - No Screening Value

Table 4-27
Step 3 Sediment Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Inorganics (MG/KG)							
Aluminum	4.6 - 10.7	13 / 13	13,100	IS17SD050001	6,483	18,000	0.36
Antimony	1.1 - 2.4	8 / 13	63.9	IS11SD020001	13.1	150	0.09
Arsenic	0.89 - 2.1	13 / 13	32.7	IS17SD060001	12.1	8.2	1.48
Barium	0.099 - 0.23	13 / 13	169	IS11SD010001	82.7	48.0	1.72
Beryllium	0.049 - 0.11	4 / 13	0.39	IS17SD050001	0.17	NSV	NSV
Cadmium	0.099 - 0.23	11 / 13	18.7	IS17SD060001	3.72	1.2	3.10
Chromium	0.49 - 1.1	13 / 13	69.7	IS11SD040001	28.9	81.0	0.36
Cobalt	0.54 - 1.3	12 / 13	16.8	IS11SD070001	8.58	10.0	0.86
Copper	0.47 - 1.1	13 / 13	757	IS11SD010001	244	34.0	7.18
Cyanide	0.62 - 5.7	1 / 13	0.12	IS11SD040001	1.02	0.10	10.16
Iron	6.7 - 15.5	13 / 13	134,000	IS11SD030001	46,610	188,400	0.25
Lead	0.32 - 17.7	13 / 13	76,400	IS11SD010001	6,261	46.7	134.07
Manganese	0.099 - 0.23	13 / 13	940	IS11SD040001	408	260	1.57
Mercury	0.062 - 0.14	11 / 13	0.53	IS11SD030001	0.19	0.15	1.26
Nickel	0.47 - 1.1	12 / 13	46.4	IS11SD040001	23.3	20.9	1.12
Selenium	1.1 - 2.4	1 / 13	1.7	IS11SD030001	0.82	1	0.82
Silver	0.77 - 1.8	8 / 13	10.9	IS11SD030001	3.85	1	3.85
Thallium	1.3 - 3	2 / 13	4.2	IS11SD010001	1.23	NSV	NSV
Vanadium	0.35 - 0.80	13 / 13	43.4	IS11SD070001	21.5	57.0	0.38
Zinc	0.15 - 0.34	13 / 13	1,910	IS11SD040001	618	150	4.12
Semivolatile Organic Compounds (UG/KG)							
1,1-Biphenyl	420 - 940	0 / 7	--	--	300	NSV	NSV
2,2'-Oxybis(1-chloropropane)	420 - 940	0 / 7	--	--	300	NSV	NSV
2,4,5-Trichlorophenol	1,100 - 2,400	0 / 7	--	--	757	1,307	0.58
2,4,6-Trichlorophenol	420 - 940	0 / 7	--	--	300	914	0.33
2,4-Dichlorophenol	420 - 940	0 / 7	--	--	300	93	3.23
2,4-Dimethylphenol	420 - 940	0 / 7	--	--	300	400	0.75
2,4-Dinitrophenol	1,100 - 2,400	0 / 2	--	--	875	87	10.04
2-Chloronaphthalene	420 - 940	0 / 7	--	--	300	140	2.14
2-Chlorophenol	420 - 940	0 / 7	--	--	300	120	2.50
2-Methylnaphthalene	420 - 940	0 / 7	--	--	300	1,686	0.18
2-Methylphenol	420 - 940	0 / 7	--	--	300	21	14.37
2-Nitroaniline	1,100 - 2,400	0 / 7	--	--	757	2,953	0.26
2-Nitrophenol	420 - 940	0 / 7	--	--	300	154	1.95
3,3'-Dichlorobenzidine	420 - 940	0 / 7	--	--	300	358	0.84
3-Nitroaniline	1,100 - 2,400	0 / 7	--	--	757	414	1.83
4,6-Dinitro-2-methylphenol	1,100 - 2,400	0 / 6	--	--	792	NSV	NSV
4-Bromophenyl-phenylether	420 - 940	0 / 7	--	--	300	2,088	0.14
4-Chloro-3-methylphenol	420 - 940	0 / 7	--	--	300	NSV	NSV
4-Chloroaniline	420 - 940	0 / 7	--	--	300	57	5.24
4-Chlorophenyl-phenylether	420 - 940	0 / 7	--	--	300	NSV	NSV
4-Methylphenol	420 - 940	0 / 7	--	--	300	670	0.45
4-Nitroaniline	1,100 - 2,400	0 / 7	--	--	757	NSV	NSV
4-Nitrophenol	1,100 - 2,400	0 / 7	--	--	757	193	3.92
Acenaphthene	420 - 940	0 / 7	--	--	300	1,079	0.28
Acenaphthylene	420 - 940	0 / 7	--	--	300	44.0	6.82
Acetophenone	420 - 940	0 / 7	--	--	300	NSV	NSV

NSV - No Screening Value

Table 4-27
Step 3 Sediment Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Anthracene	420 - 940	0 / 7	--	--	300	383	0.78
Atrazine	420 - 940	0 / 7	--	--	300	NSV	NSV
Benzaldehyde	420 - 940	0 / 7	--	--	300	NSV	NSV
Benzo(a)anthracene	420 - 940	2 / 7	250	IS11SD020001	269	191	1.40
Benzo(a)pyrene	420 - 940	1 / 7	77.0	IS11SD020001	280	244	1.15
Benzo(b)fluoranthene	420 - 940	3 / 7	400	IS11SD020001	273	221,681	0.00
Benzo(g,h,i)perylene	420 - 940	0 / 7	--	--	300	670	0.45
Benzo(k)fluoranthene	420 - 940	1 / 7	170	IS11SD020001	293	240	1.22
Butylbenzylphthalate	420 - 940	0 / 7	--	--	300	19,140	0.02
Caprolactam	420 - 940	0 / 7	--	--	300	NSV	NSV
Carbazole	420 - 940	0 / 7	--	--	300	588	0.51
Chrysene	420 - 940	3 / 7	370	IS11SD020001	265	384	0.69
Di-n-butylphthalate	420 - 940	0 / 7	--	--	300	2,013	0.15
Di-n-octylphthalate	420 - 940	0 / 7	--	--	300	4,374,522	0.00
Dibenz(a,h)anthracene	420 - 940	1 / 7	55.0	IS11SD020001	276	63.4	4.36
Dibenzofuran	420 - 940	0 / 7	--	--	300	731	0.41
Diethylphthalate	420 - 940	0 / 7	--	--	300	379	0.79
Dimethyl phthalate	420 - 940	0 / 7	--	--	300	200	1.50
Fluoranthene	420 - 940	4 / 7	300	IS11SD020001	218	600	0.36
Fluorene	420 - 940	0 / 7	--	--	300	940	0.32
Hexachlorobenzene	420 - 940	0 / 7	--	--	300	39,496	0.01
Hexachlorobutadiene	420 - 940	0 / 7	--	--	300	2,981	0.10
Hexachlorocyclopentadiene	420 - 940	0 / 7	--	--	300	2,422	0.12
Hexachloroethane	420 - 940	0 / 7	--	--	300	1,740	0.17
Indeno(1,2,3-cd)pyrene	420 - 940	1 / 7	92.0	IS11SD020001	282	600	0.47
Isophorone	420 - 940	0 / 7	--	--	300	1,053	0.28
Naphthalene	420 - 940	0 / 7	--	--	300	418	0.72
Pentachlorophenol	1,000 - 2,300	0 / 7	--	--	729	11,759	0.06
Phenanthrene	420 - 940	2 / 7	79.0	IS11SD020001	242	240	1.01
Phenol	420 - 940	0 / 7	--	--	300	54	5.56
Pyrene	420 - 940	4 / 7	240	IS11SD020001	198	665	0.30
bis(2-Chloroethoxy)methane	420 - 940	0 / 7	--	--	300	105	2.87
bis(2-Chloroethyl)ether	420 - 940	0 / 7	--	--	300	640	0.47
bis(2-Ethylhexyl)phthalate	420 - 940	4 / 7	150	IS11SD030001	195	1,548,600	0.00
n-Nitroso-di-n-propylamine	420 - 940	0 / 7	--	--	300	NSV	NSV
n-Nitrosodiphenylamine	420 - 940	0 / 7	--	--	300	13,010	0.02
Explosives (UG/KG)							
1,3,5-Trinitrobenzene	250 - 250	1 / 13	94.0	IS17SD020001	123	21	5.87
1,3-Dinitrobenzene	250 - 250	1 / 13	69.0	IS17SD020001	121	82	1.48
2,4,6-Trinitrotoluene	250 - 250	2 / 13	100	IS17SD020001	119	157	0.76
2,4-Dinitrotoluene	250 - 250	0 / 13	--	--	125	379	0.33
2,6-Dinitrotoluene	250 - 250	1 / 13	100	IS17SD030001	123	72	1.71
2-Amino-4,6-dinitrotoluene	250 - 250	1 / 13	220	IS17SD050001	132	NSV	NSV
2-Nitrotoluene	250 - 250	0 / 13	--	--	125	NSV	NSV
3-Nitrotoluene	250 - 250	3 / 13	220	IS17SD020001	138	NSV	NSV
4-Amino-2,6-dinitrotoluene	250 - 250	0 / 13	--	--	121	NSV	NSV
4-Nitrotoluene	250 - 250	2 / 13	160	IS11SD060001	125	NSV	NSV
Ammonium perchlorate	4.6 - 4.6	0 / 13	--	--	70.6	NSV	NSV

NSV - No Screening Value

Table 4-27
Step 3 Sediment Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
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Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
HMX	500 - 500	0 / 13	--	--	250	371	0.67
Nitrobenzene	250 - 250	0 / 13	--	--	119	748	0.16
Nitroglycerin	1,200 - 3,000	0 / 13	--	--	785	NSV	NSV
Nitroguanidine	100 - 100	0 / 13	--	--	50.0	NSV	NSV
PETN	2,500 - 2,500	0 / 13	--	--	1,250	NSV	NSV
RDX	500 - 500	0 / 13	--	--	250	17	14.37
Tetryl	650 - 650	0 / 7	--	--	325	NSV	NSV
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	13.0 - 28.0	0 / 7	--	--	9.14	296	0.03
1,1,2,2-Tetrachloroethane	13.0 - 28.0	0 / 7	--	--	9.14	2,426	0.00
1,1,2-Trichloro-1,2,2- trifluoroethane	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
1,1,2-Trichloroethane	13.0 - 28.0	0 / 7	--	--	9.14	2,088	0.00
1,1-Dichloroethane	13.0 - 28.0	0 / 7	--	--	9.14	47	0.19
1,1-Dichloroethene	13.0 - 28.0	0 / 7	--	--	9.14	54	0.17
1,2,4-Trichlorobenzene	13.0 - 28.0	0 / 7	--	--	9.14	16,704	0.00
1,2-Dibromo-3-chloropropane	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
1,2-Dibromoethane	13.0 - 28.0	0 / 7	--	--	9.14	291	0.03
1,2-Dichlorobenzene	13.0 - 28.0	0 / 7	--	--	9.14	574	0.02
1,2-Dichloroethane	13.0 - 28.0	0 / 7	--	--	9.14	435	0.02
1,2-Dichloroethene (total)	14.0 - 28.0	0 / 2	--	--	10.5	696	0.02
1,2-Dichloropropane	13.0 - 28.0	0 / 7	--	--	9.14	4,573	0.00
1,3-Dichlorobenzene	13.0 - 28.0	0 / 7	--	--	9.14	1,368	0.01
1,4-Dichlorobenzene	13.0 - 28.0	0 / 7	--	--	9.14	592	0.02
2-Butanone	13.0 - 28.0	4 / 7	42.0	IS11SD070001	16.6	470	0.04
2-Hexanone	13.0 - 28.0	0 / 7	--	--	9.14	38	0.24
4-Methyl-2-pentanone	13.0 - 28.0	0 / 7	--	--	9.14	57	0.16
Acetone	13.0 - 28.0	3 / 7	130	IS11SD070001	49.4	15	3.26
Benzene	13.0 - 28.0	0 / 7	--	--	9.14	278	0.03
Bromodichloromethane	13.0 - 28.0	0 / 7	--	--	9.14	2,220	0.00
Bromoform	13.0 - 28.0	0 / 7	--	--	9.14	1,131	0.01
Bromomethane	13.0 - 28.0	0 / 7	--	--	9.14	28	0.32
Carbon disulfide	13.0 - 28.0	0 / 7	--	--	9.14	1	6.18
Carbon tetrachloride	13.0 - 28.0	0 / 7	--	--	9.14	82	0.11
Chlorobenzene	13.0 - 28.0	0 / 7	--	--	9.14	713	0.01
Chloroethane	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Chloroform	13.0 - 28.0	0 / 7	--	--	9.14	38	0.24
Chloromethane	13.0 - 28.0	3 / 7	14.0	IS11SD010001	9.93	369	0.03
Cumene	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Cyclohexane	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Dibromochloromethane	13.0 - 28.0	0 / 7	--	--	9.14	2,601	0.00
Dichlorodifluoromethane	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Ethylbenzene	13.0 - 28.0	0 / 7	--	--	9.14	155	0.06
Methyl acetate	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Methyl-tert-butyl ether (MTBE)	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Methylcyclohexane	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Methylene chloride	13.0 - 28.0	0 / 7	--	--	9.14	644	0.01
Styrene	13.0 - 28.0	0 / 7	--	--	9.14	3,257	0.00
Tetrachloroethene	13.0 - 28.0	0 / 7	--	--	9.14	713	0.01

NSV - No Screening Value

Table 4-27
Step 3 Sediment Screening - Sites 11 and 17
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Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Toluene	13.0 - 28.0	1 / 7	5.5	IS11SD050001	8.07	87	0.09
Trichloroethene	13.0 - 28.0	0 / 7	--	--	9.14	383	0.02
Trichlorofluoromethane	13.0 - 28.0	0 / 7	--	--	9.14	NSV	NSV
Vinyl chloride	13.0 - 28.0	0 / 7	--	--	9.14	602	0.02
Xylene, total	13.0 - 28.0	0 / 7	--	--	9.14	278	0.03
cis-1,2-Dichloroethene	13.0 - 28.0	0 / 7	--	--	9.14	1,361	0.01
cis-1,3-Dichloropropene	13.0 - 28.0	0 / 7	--	--	9.14	127	0.07
trans-1,2-Dichloroethene	13.0 - 28.0	0 / 7	--	--	9.14	2,189	0.00
trans-1,3-Dichloropropene	13.0 - 28.0	0 / 7	--	--	9.14	127	0.07

NSV - No Screening Value

Table 4-28
Step 3 Surface Water Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
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Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Dissolved Metals (UG/L)							
Aluminum	18.8 - 18.8	0 / 13	--	--	27.8	87.0	0.32
Antimony	4.3 - 4.3	0 / 13	--	--	2.15	30.0	0.07
Arsenic	3.6 - 3.6	0 / 13	--	--	1.8	36.0	0.05
Barium	0.40 - 0.40	13 / 13	55.7	IS11SW07	28.0	1,000	0.03
Beryllium	0.20 - 0.20	1 / 13	0.31	IS17SW01	0.13	5.3	0.02
Cadmium	0.40 - 0.40	0 / 13	--	--	0.20	1.19	0.17
Chromium	2 - 2	0 / 13	--	--	1.09	11.0	0.10
Cobalt	2.2 - 2.2	0 / 13	--	--	1.1	23.0	0.05
Copper	1.9 - 1.9	7 / 13	5.9	IS11SW07	2.48	3.1	0.80
Iron	27.3 - 27.3	7 / 13	613	IS11SW05	132	1,000	0.13
Lead	1.3 - 1.3	1 / 13	1.3	IS11SW01	0.70	1.0	0.70
Manganese	0.40 - 0.40	6 / 13	88.6	IS11SW06	27.0	10.0	2.70
Mercury	0.10 - 0.10	0 / 13	--	--	0.050	0.77	0.06
Nickel	1.9 - 1.9	4 / 13	17.9	IS17SW01	3.54	8.2	0.43
Selenium	4.3 - 4.3	1 / 13	4.9	IS17SW04	2.36	4.6	0.51
Silver	3.1 - 3.1	0 / 13	--	--	1.55	0.23	6.74
Thallium	5.3 - 5.3	0 / 13	--	--	2.65	40.0	0.07
Vanadium	1.4 - 1.4	0 / 13	--	--	0.70	10,000	0.00
Zinc	0.60 - 1.7	1 / 13	29.9	IS17SW04	9.34	81.0	0.12
Semivolatile Organic Compounds (UG/L)							
1,1-Biphenyl	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 7	--	--	12.5	19.1	0.65
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 7	--	--	5	21.1	0.24
2,4-Dichlorophenol	10.0 - 10.0	0 / 5	--	--	5	8.7	0.57
2,4-Dimethylphenol	10.0 - 10.0	0 / 7	--	--	5	191.4	0.03
2-Chloronaphthalene	10.0 - 10.0	0 / 7	--	--	5	1.3	3.83
2-Chlorophenol	10.0 - 10.0	0 / 7	--	--	5	92.2	0.05
2-Methylnaphthalene	10.0 - 10.0	0 / 7	--	--	5	24.7	0.20
2-Methylphenol	10.0 - 10.0	0 / 7	--	--	5	22.6	0.22
2-Nitroaniline	25.0 - 25.0	0 / 7	--	--	12.5	4002.0	0.00
2-Nitrophenol	10.0 - 10.0	0 / 7	--	--	5	261.0	0.02
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 7	--	--	5	12.7	0.39
3-Nitroaniline	25.0 - 25.0	0 / 7	--	--	12.5	1740.0	0.01
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 7	--	--	12.5	4.0	3.12
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 7	--	--	5	2.6	1.92
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 7	--	--	5	0.5	9.58
4-Chloroaniline	10.0 - 10.0	0 / 7	--	--	5	87.0	0.06
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
4-Methylphenol	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
4-Nitroaniline	25.0 - 25.0	0 / 7	--	--	12.5	NSV	NSV
4-Nitrophenol	25.0 - 25.0	0 / 7	--	--	12.5	261.0	0.05
Acenaphthene	10.0 - 10.0	0 / 7	--	--	5	904.8	0.01
Acenaphthylene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
Acetophenone	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Anthracene	10.0 - 10.0	0 / 7	--	--	5	1.3	3.94
Atrazine	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV

NSV - No Screening Value

Table 4-28
Step 3 Surface Water Screening - Sites 11 and 17
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Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Benzaldehyde	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Benzo(a)anthracene	10.0 - 10.0	0 / 7	--	--	5	11.0	0.46
Benzo(a)pyrene	10.0 - 10.0	0 / 7	--	--	5	0.0	205.25
Benzo(b)fluoranthene	10.0 - 10.0	0 / 7	--	--	5	17.8	0.28
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
Benzo(k)fluoranthene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
Butylbenzylphthalate	10.0 - 10.0	0 / 7	--	--	5	38.3	0.13
Caprolactam	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Carbazole	10.0 - 10.0	0 / 7	--	--	5	17.4	0.29
Chrysene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
Di-n-butylphthalate	10.0 - 10.0	0 / 7	--	--	5	5.9	0.85
Di-n-octylphthalate	10.0 - 10.0	0 / 7	--	--	5	5.2	0.96
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
Dibenzofuran	10.0 - 10.0	0 / 7	--	--	5	17.4	0.29
Diethylphthalate	10.0 - 10.0	0 / 7	--	--	5	132.1	0.04
Dimethyl phthalate	10.0 - 10.0	0 / 7	--	--	5	574.2	0.01
Fluoranthene	10.0 - 10.0	0 / 7	--	--	5	27.8	0.18
Fluorene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
Hexachlorobenzene	10.0 - 10.0	0 / 7	--	--	5	6.4	0.78
Hexachlorobutadiene	10.0 - 10.0	0 / 7	--	--	5	5.6	0.90
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 7	--	--	5	1.2	4.11
Hexachloroethane	10.0 - 10.0	0 / 7	--	--	5	163.6	0.03
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
Isophorone	10.0 - 10.0	0 / 7	--	--	5	2244.6	0.00
Naphthalene	10.0 - 10.0	0 / 7	--	--	5	174.0	0.03
Nitrobenzene	10.0 - 10.0	0 / 1	--	--	5	1162.3	0.00
Pentachlorophenol	25.0 - 25.0	0 / 7	--	--	12.5	11.6	1.07
Phenanthrene	10.0 - 10.0	0 / 7	--	--	5	8.0	0.62
Phenol	10.0 - 10.0	0 / 7	--	--	5	445.4	0.01
Pyrene	10.0 - 10.0	0 / 7	--	--	5	52.2	0.10
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 7	--	--	5	1914.0	0.00
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 7	--	--	5	4141.2	0.00
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	1 / 7	1	IS11SW01	4.43	52.2	0.08
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 7	--	--	5	1017.9	0.00
Explosives (UG/L)							
1,3,5-Trinitrobenzene	0.20 - 0.20	0 / 13	--	--	0.10	139.2	0.00
1,3-Dinitrobenzene	0.20 - 0.20	1 / 13	0.075	IS11SW01	0.098	278.4	0.00
2,4,6-Trinitrotoluene	0.20 - 0.20	0 / 13	--	--	0.10	156.6	0.00
2,4-Dinitrotoluene	0.20 - 0.20	0 / 13	--	--	0.10	400.2	0.00
2,6-Dinitrotoluene	0.20 - 0.20	0 / 13	--	--	0.10	104.4	0.00
2-Amino-4,6-dinitrotoluene	0.20 - 0.20	0 / 13	--	--	0.10	34.8	0.00
2-Nitrotoluene	0.20 - 0.20	0 / 13	--	--	0.10	NSV	NSV
3-Nitrotoluene	0.20 - 0.20	0 / 13	--	--	0.10	NSV	NSV
4-Amino-2,6-dinitrotoluene	0.20 - 0.20	0 / 13	--	--	0.10	NSV	NSV
4-Nitrotoluene	0.20 - 0.20	1 / 13	0.11	IS17SW02	0.10	NSV	NSV
Ammonium perchlorate	0.23 - 0.23	3 / 13	3.6	IS11SW04	2.16	NSV	NSV
HMX	0.50 - 0.50	2 / 13	0.41	IS11SW06	0.27	5742.0	0.00

NSV - No Screening Value

Table 4-28
Step 3 Surface Water Screening - Sites 11 and 17
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Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Nitrobenzene	0.20 - 0.20	0 / 12	--	--	0.10	1162.3	0.00
Nitroglycerin	30.0 - 30.0	0 / 13	--	--	15.0	NSV	NSV
Nitroguanidine	20.0 - 20.0	0 / 13	--	--	10.0	NSV	NSV
PETN	2.5 - 2.5	0 / 13	--	--	1.25	NSV	NSV
RDX	0.50 - 0.50	0 / 13	--	--	0.25	330.6	0.00
Tetryl	0.20 - 0.20	0 / 13	--	--	0.10	NSV	NSV
Volatile Organic Compounds (UG/L)							
1,1,1-Trichloroethane	10.0 - 10.0	0 / 7	--	--	5	5428.8	0.00
1,1,2,2-Tetrachloroethane	10.0 - 10.0	0 / 7	--	--	5	1084.0	0.00
1,1,2-Trichloro-1,2,2- trifluoroethane	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
1,1,2-Trichloroethane	10.0 - 10.0	0 / 7	--	--	5	5428.8	0.00
1,1-Dichloroethane	10.0 - 10.0	0 / 7	--	--	5	2784.0	0.00
1,1-Dichloroethene	10.0 - 10.0	0 / 7	--	--	5	2018.4	0.00
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 7	--	--	5	87.0	0.06
1,2-Dibromo-3-chloropropane	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
1,2-Dibromoethane	10.0 - 10.0	0 / 7	--	--	5	313.2	0.02
1,2-Dichlorobenzene	10.0 - 10.0	0 / 7	--	--	5	224.5	0.02
1,2-Dichloroethane	10.0 - 10.0	0 / 7	--	--	5	1966.2	0.00
1,2-Dichloroethene (total)	10.0 - 10.0	0 / 1	--	--	5	2018.4	0.00
1,2-Dichloropropane	10.0 - 10.0	0 / 7	--	--	5	5289.6	0.00
1,3-Dichlorobenzene	10.0 - 10.0	0 / 7	--	--	5	49.6	0.10
1,4-Dichlorobenzene	10.0 - 10.0	0 / 7	--	--	5	224.5	0.02
2-Butanone	10.0 - 10.0	0 / 7	--	--	5	24360.0	0.00
2-Hexanone	10.0 - 10.0	0 / 7	--	--	5	7447.2	0.00
4-Methyl-2-pentanone	10.0 - 10.0	0 / 7	--	--	5	8004.0	0.00
Acetone	10.0 - 10.0	0 / 7	--	--	5	156600.0	0.00
Benzene	10.0 - 10.0	0 / 7	--	--	5	922.2	0.01
Bromodichloromethane	10.0 - 10.0	0 / 7	--	--	5	1914.0	0.00
Bromoform	10.0 - 10.0	0 / 7	--	--	5	556.8	0.01
Bromomethane	10.0 - 10.0	0 / 7	--	--	5	191.4	0.03
Carbon disulfide	10.0 - 10.0	0 / 7	--	--	5	3.5	1.44
Carbon tetrachloride	10.0 - 10.0	0 / 7	--	--	5	6124.8	0.00
Chlorobenzene	10.0 - 10.0	0 / 7	--	--	5	182.7	0.03
Chloroethane	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Chloroform	10.0 - 10.0	0 / 7	--	--	5	1418.1	0.00
Chloromethane	10.0 - 10.0	0 / 7	--	--	5	4698.0	0.00
Cumene	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Cyclohexane	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Dibromochloromethane	10.0 - 10.0	0 / 7	--	--	5	1914.0	0.00
Dichlorodifluoromethane	10.0 - 10.0	0 / 7	--	--	5	1914.0	0.00
Ethylbenzene	10.0 - 10.0	0 / 7	--	--	5	74.8	0.07
Methyl acetate	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Methyl-tert-butyl ether (MTBE)	10.0 - 10.0	1 / 7	1	IS11SW01	4.43	NSV	NSV
Methylcyclohexane	10.0 - 10.0	0 / 7	--	--	5	NSV	NSV
Methylene chloride	10.0 - 10.0	0 / 7	--	--	3.25	3828.0	0.00
Styrene	10.0 - 10.0	0 / 7	--	--	5	419.3	0.01
Tetrachloroethene	10.0 - 10.0	0 / 7	--	--	5	783.0	0.01
Toluene	10.0 - 10.0	0 / 7	--	--	5	64.4	0.08

NSV - No Screening Value

Table 4-28
Step 3 Surface Water Screening - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Trichloroethene	10.0 - 10.0	0 / 7	--	--	5	348.0	0.01
Trichlorofluoromethane	10.0 - 10.0	0 / 7	--	--	5	1914.0	0.00
Vinyl chloride	10.0 - 10.0	0 / 7	--	--	5	2018.4	0.00
Xylene, total	10.0 - 10.0	0 / 7	--	--	5	226.2	0.02
cis-1,2-Dichloroethene	10.0 - 10.0	0 / 7	--	--	5	2018.4	0.00
cis-1,3-Dichloropropene	10.0 - 10.0	0 / 7	--	--	5	137.5	0.04
trans-1,2-Dichloroethene	10.0 - 10.0	0 / 7	--	--	5	2018.4	0.00
trans-1,3-Dichloropropene	10.0 - 10.0	0 / 7	--	--	5	137.5	0.04

NSV - No Screening Value

Table 4-29

Summary of Hazard Quotients for Food Web Exposures, Step 3A - Sites 11 and 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		Meadow vole		Raccoon		Red fox		American robin		American kestrel		Great blue heron		Marsh wren	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics																
Arsenic	2.08	0.21	0.22	0.02	0.50	0.05	0.09	<0.01	0.04	0.01	0.03	0.01	0.05	0.02	0.36	0.12
Cadmium	9.29	0.93	0.53	0.05	0.05	<0.01	0.64	0.06	2.95	0.21	2.97	0.22	0.07	<0.01	0.26	0.02
Chromium	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.37	0.07	0.46	0.09	0.19	0.04	0.68	0.14
Copper	1.63	1.26	0.26	0.20	0.19	0.15	0.27	0.21	0.16	0.12	0.23	0.18	0.09	0.07	0.51	0.39
Lead	15.22	1.52	1.45	0.14	3.44	0.34	1.47	0.15	38.88	3.89	13.33	1.33	20.07	2.01	10.60	1.06
Mercury	5.18	1.04	0.96	0.19	0.02	0.01	0.05	0.03	0.16	0.08	0.15	0.07	16.98	1.70	0.12	0.06
Nickel	0.10	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.02	0.02	0.05	0.04	0.01	<0.01
Selenium	0.37	0.23	0.17	0.10	0.09	0.05	0.06	0.03	0.08	0.02	0.08	0.02	0.37	0.18	0.59	0.30
Silver	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	1.26	0.63	0.13	0.07	0.33	0.03	0.91	0.09	6.20	0.69	7.19	0.80	1.10	0.12	5.85	0.65
Semivolatile Organic Compounds																
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.04	0.01
Hexachlorobenzene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.20	0.02	0.20	0.02	0.66	0.07	1.15	0.12
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

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LEGEND

- Drainage Ditch
- IR Sites
- Buildings
- Demolished Buildings
- Railroads
- Roads
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)
- Wooded Area
- Dense Wooded Area
- Boundary Between Area A and Area B

-- Area A Sampled July 20, 2000 - August 9, 2000
-- Area B Sampled February 25, 2002 - March 26, 2002

N

70 0 70 140 210 Feet

Figure 4-1
Site 11 - Topography
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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LEGEND

- Soil or Waste Samples
- Surface Water
- Sediment Samples
- Monitoring Wells
- *In Situ* Ground Water
- Road
- Drainage Ditch
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Boundary Between Area A and Area B

-- Area A Sampled July 20, 2000 - August 9, 2000
-- Area B Sampled February 25, 2002 - March 26, 2002

N

70 0 70 140 210 Feet

Figure 4-2
Site 11 Areas A and B - Sampling Locations
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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LEGEND

- Soil Boring
- Drainage Ditch
- IR Sites
- Buildings
- Demolished Buildings
- Railroads
- Roads

5.5 = Estimated Thickness of Waste (feet)

- Contour of Equal Waste Thickness (feet)
- Topographic Contours (5 foot Intervals)
- Topographic Index Contours (1 foot Intervals)
- Wooded Area
- Dense Wooded Area

N

70 0 70 140 210 Feet

Figure 4-3
Site 11 - Estimated Waste Thickness and Areal Extent
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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LEGEND

- Drainage Ditch
- IR Sites
- Buildings
- Demolished Buildings
- Railroads
- Roads
- Monitoring Wells
- Interpolated Groundwater Contour (feet above MSL)
- Inferred Groundwater Contour (feet above MSL)
- Wooded Area
- Dense Wooded Area
- 1.43 = Feet above msl

N

70 0 70 140 210 Feet

Figure 4-4
Site 11 - Groundwater Contour Map
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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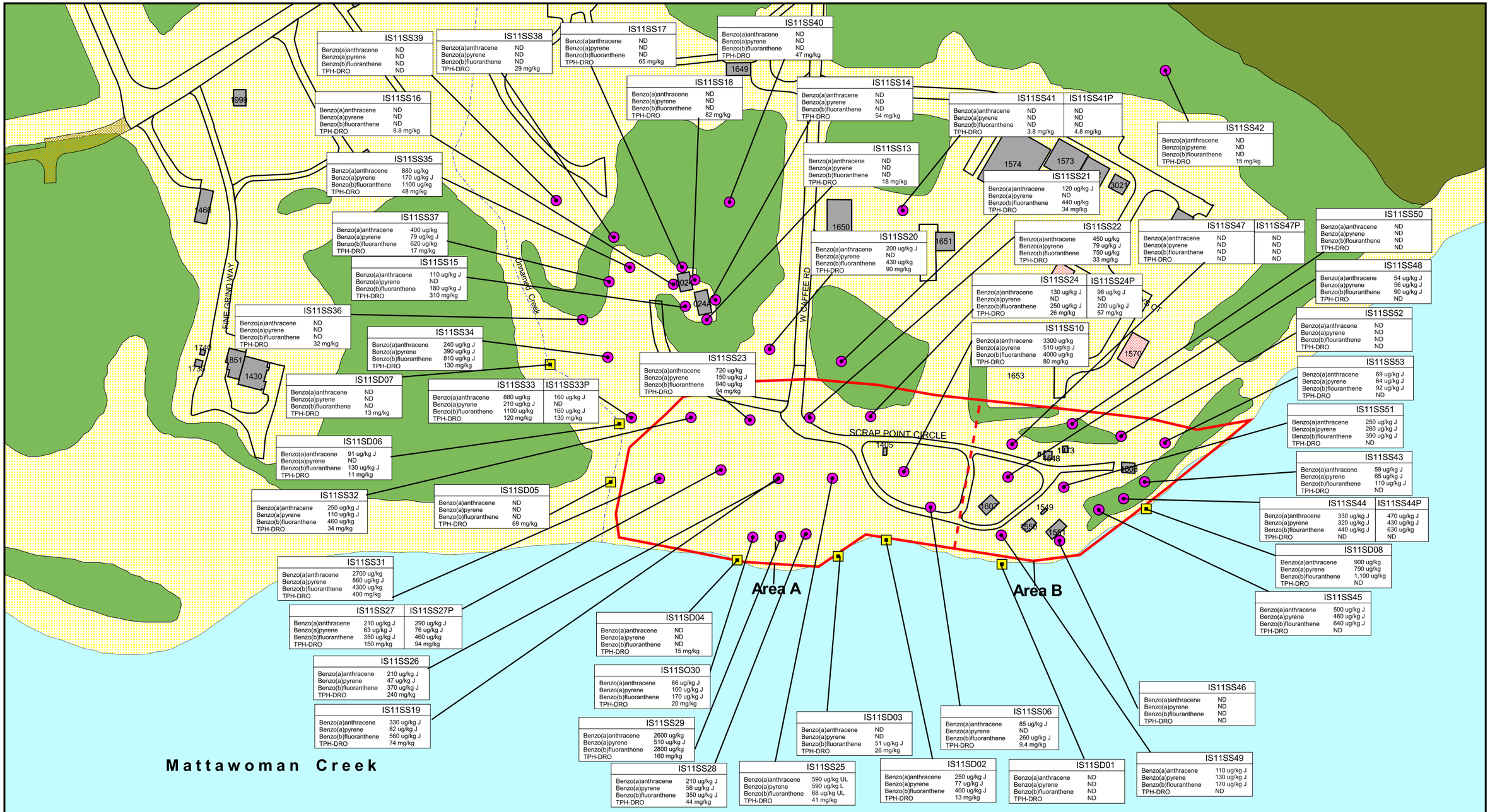

LEGEND

- Surface Soil Samples
- Sediment Samples
- Drainage Ditch
- IR Sites
- Buildings
- Demolished Buildings
- Road
- Wooded Area
- Dense Wooded Area
- ND = Non Detect
- J = Estimated Value Below the Detection Limit
- ug/kg = Micrograms per kilogram
- mg/kg = Milligrams per kilogram
- Boundary Between Area A and Area B
- -- Area A Sampled July 20, 2000 - August 9, 2000
- -- Area B Sampled February 25, 2002 - March 26, 2002

N

80 0 80 160 240 Feet

Figure 4-5
Site 11 Areas A and B - SVOCs and TPH-DRO
In Surface Soil and Sediment
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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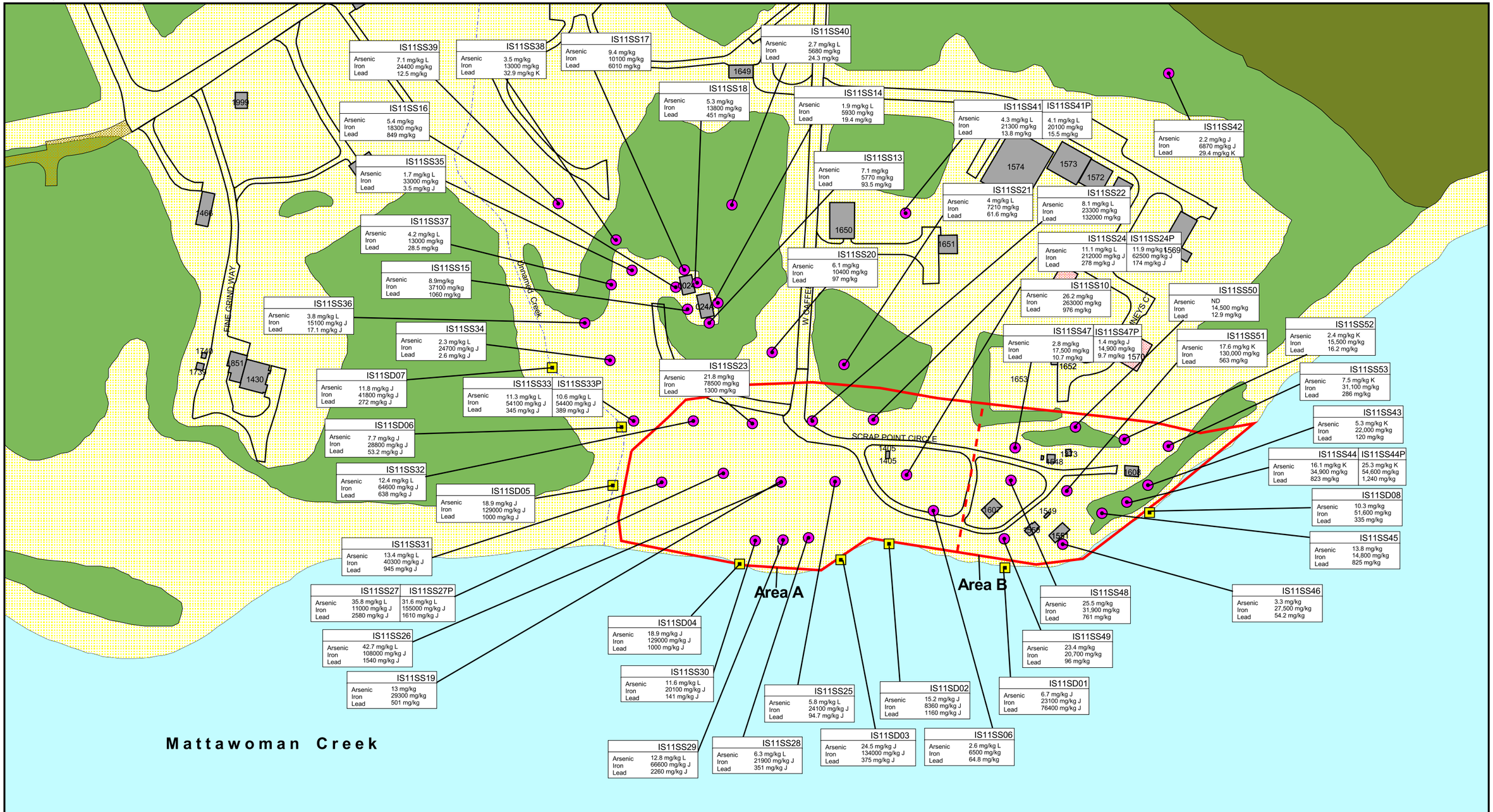

LEGEND

- Surface Soil Samples
- Sediment Samples
- Drainage Ditch
- IR Site Boundary
- Buildings
- Demolished Buildings
- Road
- Wooded Area
- Dense Wooded Area
- L = Biased Low
- J = Estimated Value Below the Detection Limit
- K = Biased High
- mg/kg = Milligrams per kilogram
- Boundary Between Area A and Area B
- -- Area A Sampled July 20, 2000 - August 9, 2000
- -- Area B Sampled February 25, 2002 - March 26, 2002

N

80 0 80 160 240 Feet

Figure 4-6
Site 11 Areas A and B - Arsenic, Iron, and Lead in Surface Soil and Sediment
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr

LEGEND

- Subsurface Soil Samples
- Drainage Ditch
- IR Site Boundary
- Buildings
- Demolished Buildings
- Road
- Wooded Area
- Dense Wooded Area

L = Biased Low

J = Estimated Value Below the Detection Limit

K = Biased High

mg/kg = Milligrams per kilogram

Boundary Between Area A and Area B

-- Area A Sampled July 20, 2000 - August 9, 2000

-- Area B Sampled February 25, 2002 - March 26, 2002

N

70 0 70 140 210 Feet

Figure 4-7

Site 11 Areas A and B - Arsenic, Iron, and Lead in Subsurface Soil and Waste

Sites 11, 13, 17, 21, and 25 Remedial Investigation

NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr

LEGEND

- Subsurface Soil Samples
- Drainage Ditch
- IR Site Boundary
- Buildings
- Demolished Buildings
- Road
- Wooded Area
- Dense Wooded Area

ND = Non Detect

mg/kg = Milligrams per kilogram

Boundary Between Area A and Area B

-- Area A Sampled July 20, 2000 - August 9, 2000

-- Area B Sampled February 25, 2002 - March 26, 2002

N

70 0 70 140 210 Feet

Figure 4-8
Site 11 Areas A and B - TPH-DRO
in Subsurface Soil and Waste
NDWIH, Indian Head, Maryland

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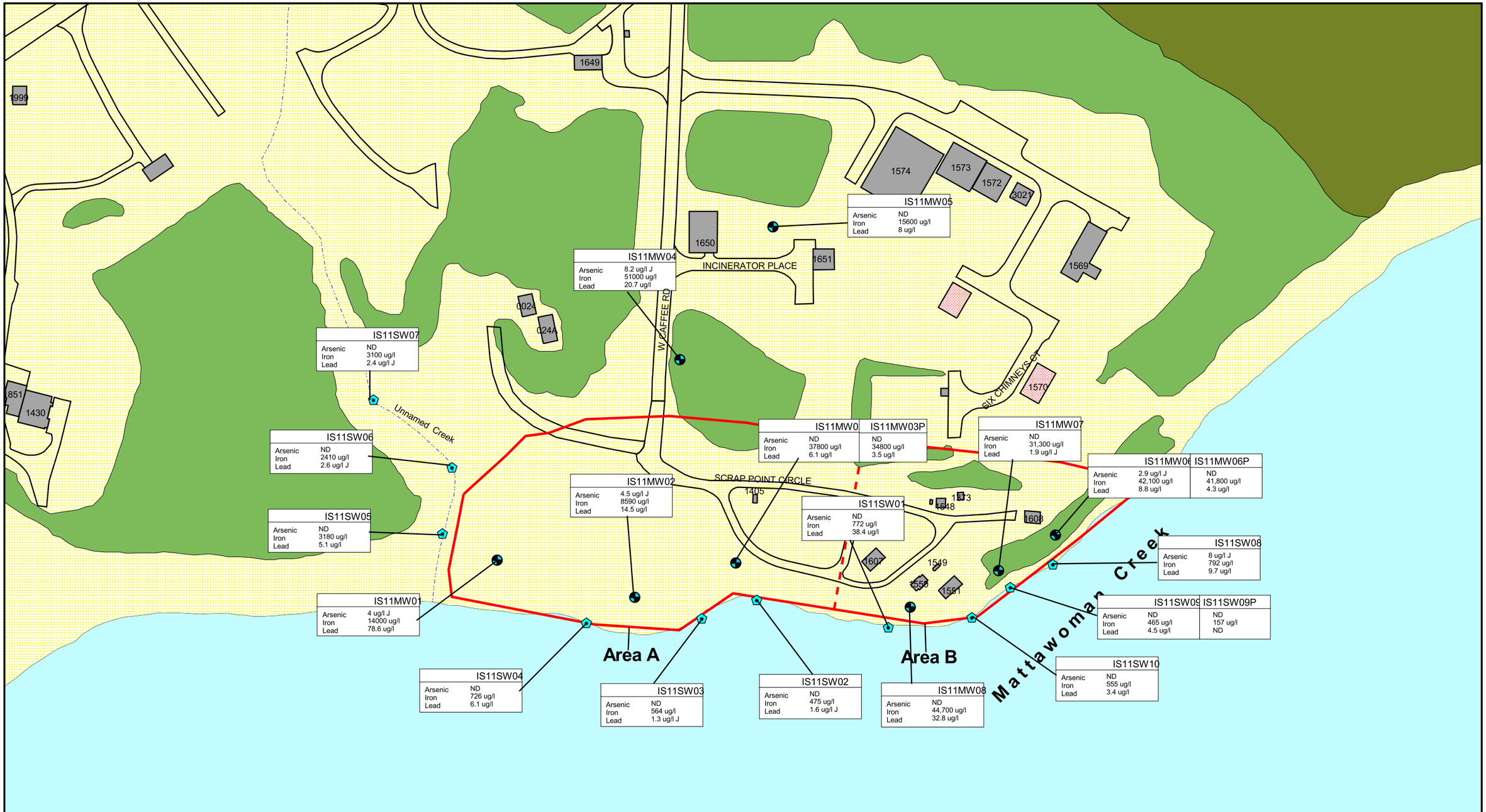

LEGEND

- Surface Water
- Monitoring Wells
- Drainage Ditch
- IR Site Boundary
- Buildings
- Demolished Buildings
- Road
- Wooded Area
- Dense Wooded Area
- ND = Non Detect
- J = Estimated Value Below the Detection Limit
- ug/l = Micrograms per liter
- Boundary Between Area A and Area B
- -- Area A Sampled July 20, 2000 - August 9, 2000
- -- Area B Sampled February 25, 2002 - March 26, 2002

N

70 0 70 140 210 Feet

Figure 4-9
Site 11 Areas A and B - Total Arsenic, Total Iron, and Total Lead in Monitoring Well Groundwater and Surface Water
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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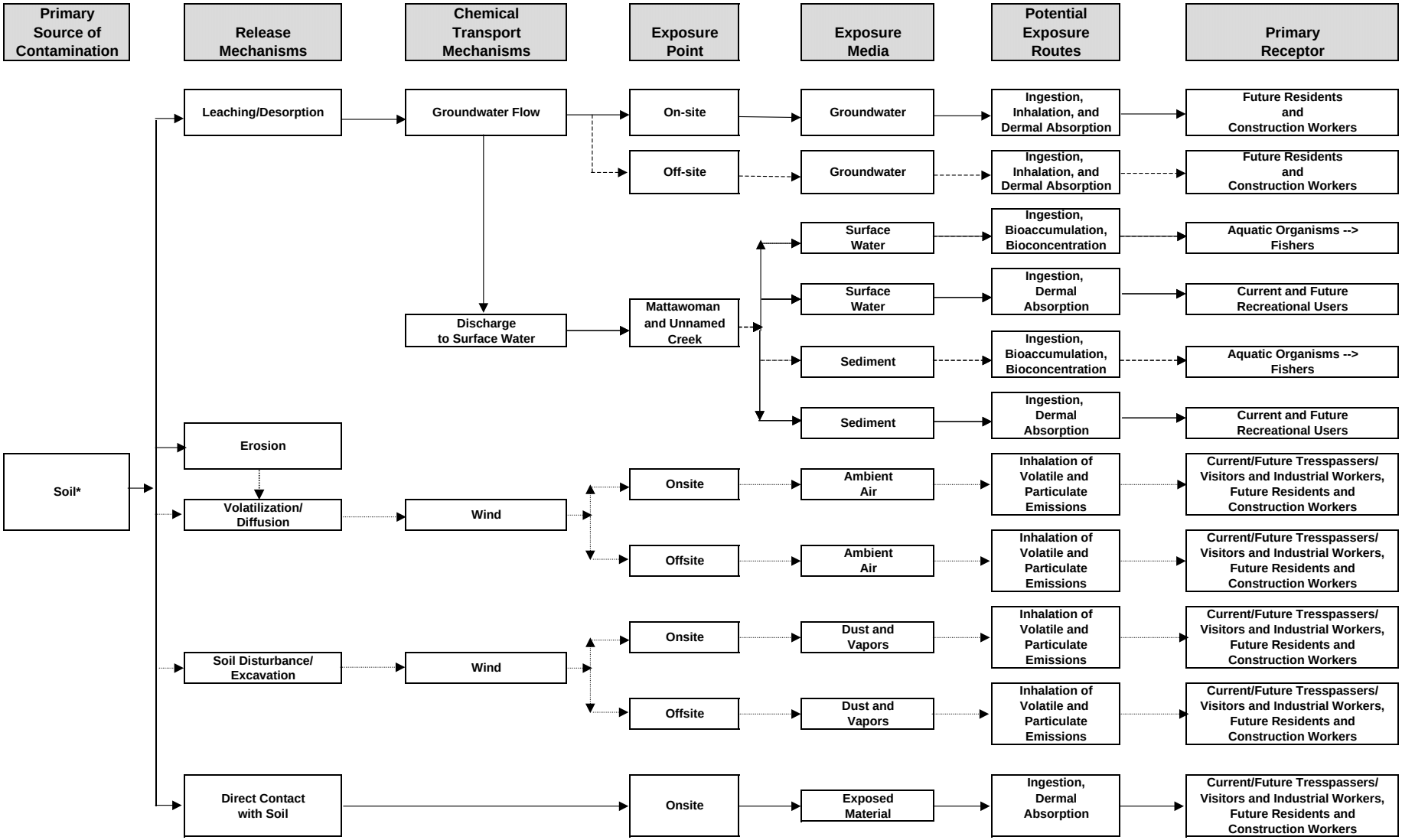

* Current scenario is for surface soil and future scenarios are for surface and subsurface soil combined.

Complete Pathway
Incomplete Pathway
Pathway not evaluated because no CPOCs identified

Figure 4-10
Conceptual Exposure Model for Potential Human Exposures-Site 11
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

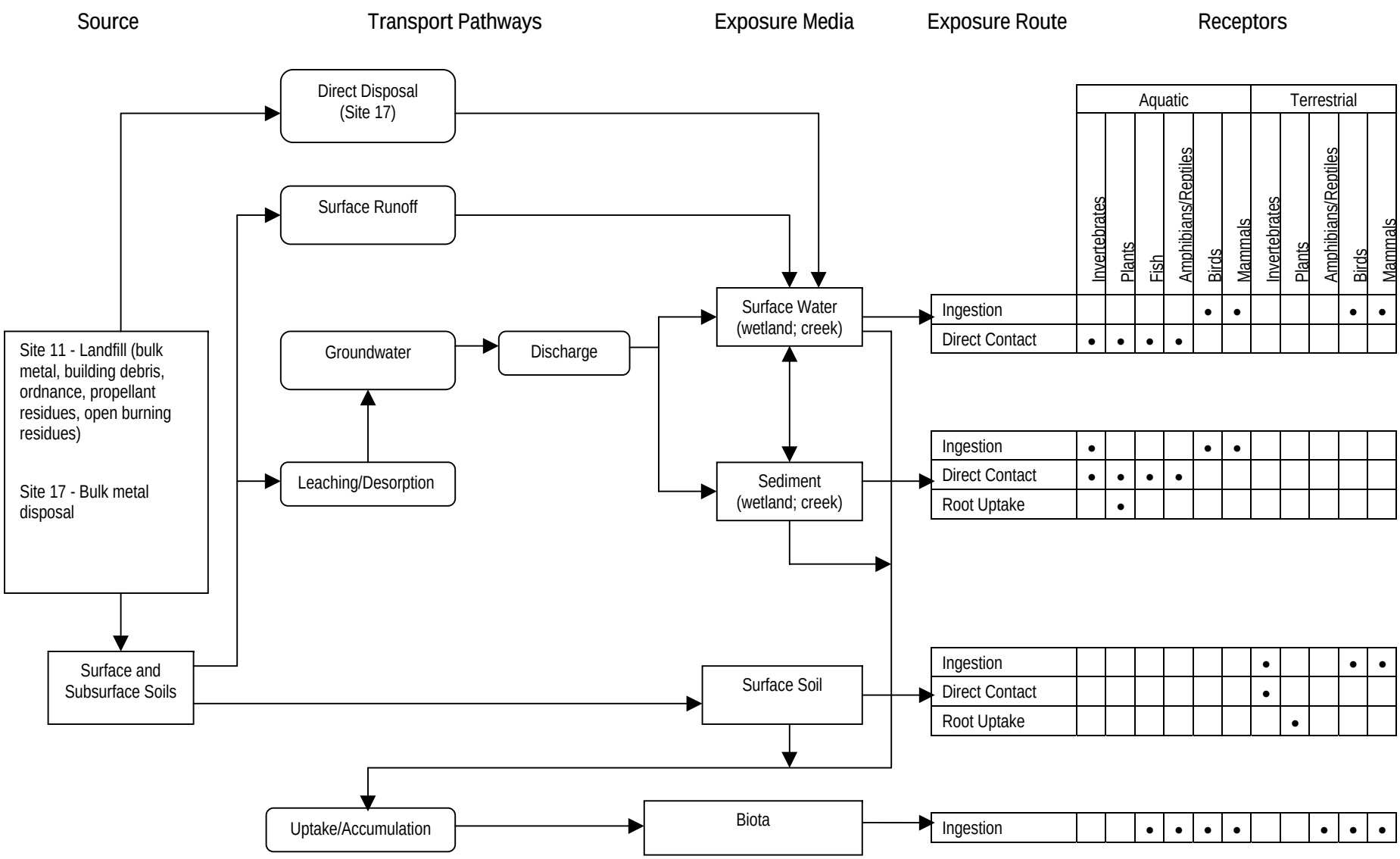

Figure 4-11
Preliminary Conceptual Model for Ecological Risk - Sites 11 and 17
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

SECTION 5

Site 13 Paint Solvents Disposal Ground

An RI was conducted at Site 13, the Paint Solvents Disposal Ground (Figure 5-1). The objective of the RI conducted at Site 13 was to determine whether surface and subsurface soils have been contaminated by solvent disposal. The objective of the RI was met by the activities performed, as discussed in this chapter.

Following the RI, the regulatory agencies recommended that a monitoring well be installed and sampled for low concentration VOCs analysis to reduce any uncertainty regarding VOCs in groundwater. The investigation was conducted between December 2002 and January 2003. The results of the investigation were presented in a technical memorandum provided in Appendix I to this report.

5.1 Investigation Activities

The specific activities undertaken to achieve the stated objective are discussed below. The field activities were conducted between July 17 and 31, 2000. The work consisted of:

- Surface soil sampling
- Subsurface soil sampling

Sampling locations are shown in Figure 5-2.

5.1.1 Surface Soil Sampling

Ten surface soil samples (IS13SS01 through IS13SS10), including one background sample, were collected on July 18 and 31, 2000 at the locations described below and shown in Figure 5-2. Because historical information indicates solvents are the primary contaminants at Site 13, surface soil samples were analyzed for a limited number of parameters (VOCs, SVOCs, TAL inorganics, and TPH). It should be noted that explosives were not sampled for at Site 13. However, three explosives (2,4-dinitrotoluene, 2,6-dinitrotoluene, and nitrobenzene) can be detected as part of the SVOC analysis. For consistency with information from other sites, the three compounds will be treated as explosives in the following discussion.

- **IS13SS01 through IS13SS06**—collected in the area surrounding Building 1753.
- **IS13SS07 through IS13SS09**—collected in the ravine located west of the Building 1753.
- **IS13SS10**—(background sample) collected in an area upslope from Site 13.

5.1.2 Subsurface Soil Sampling

Five subsurface soil samples (IS13SB01 through IS13SB05) were collected on July 17 and 31, 2000, at the locations described below and shown in Figure 5-2. Because historical information indicates solvents are the primary contaminants at Site 13, subsurface soil samples were analyzed for a limited number of parameters (VOCs, SVOCs, TAL inorganics, and TPH).

- **IS13SB01**—collected at the same location as IS13SS01.
- **IS13SB02**—collected at the same location as IS13SS02.
- **IS13SB03**—collected at the same location as IS13SS03.
- **IS13SB04**—collected south Building 1753.
- **IS13SB05**—collected at the same location as IS13SS05.

5.2 Geology

Five boreholes were drilled during the Site 13 RI field activities to obtain geologic information. Boring logs are presented in Appendix A.

Silty clay was encountered in the upper 11 ft of the subsurface. This is underlain by a sandy clay layer or layers (fine- to medium-grained) ranging in thickness from 2 ft to 11 ft. This is underlain by alternating layers of well sorted sand and poorly sorted sandy gravelly silty clay mixtures to a depth of 30 ft bgs. All of these layers are consistent with descriptions of the Quaternary deposits.

5.3 Hydrogeology

As discussed in Section 5.2, the site appears to be immediately underlain by layers of silty and sandy clays, and sands of the Quaternary.

The water table was not encountered during drilling activities conducted at the site and no monitoring wells were installed. In most surficial aquifers, the water table configuration closely resembles the surface topography. Because the site slopes gently to the west, as shown in Figure 5-1, it is likely that this is the general flow direction of groundwater.

5.4 Nature and Extent of Contamination

This section discusses the nature and extent of contamination found in surface and subsurface soil at Site 13. Detected analytical results for all samples analyzed are presented in tables throughout the section. Complete analytical results for all media are provided on the accompanying CD (Appendix L).

The discussion presented below focuses on the contaminants that are most prevalent at Site 13. Some contaminants from each contaminant group (i.e., VOCs, SVOCs, metals, etc.) are discussed. Regulatory and human health-based criteria were not used to select contaminants; however, preference was given to contaminants that are generally recognized to pose the greatest risks to human health and the environment.

The focus on this "short list" of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus this discussion. The baseline human health risk assessment and ecological risk assessment presented in Sections 5.6 and 5.7, respectively, of this chapter formally screen and evaluate all chemicals analyzed for in the various media at Site 13 in accordance with established EPA Region III guidance.

In order to identify metals that may be of potential concern at Site 13, the data for inorganic analytes were compared to data presented in the Draft Background Investigation Report

(BIR) prepared by Brown and Root Environmental (B&RE, 1997a). The BIR was conducted to establish a facilitywide background database to be used for current and future investigations. Samples were collected for the various media from areas outside the sites known to be impacted from facility operations. The facilitywide background statistics for each media are presented in Appendix E.

Sampling results for inorganic analytes in various media at Site 13 were compared to background concentrations as follows:

- Maximum detected concentrations for data collected during this investigation (provided in Appendix F) were compared to the UCLs of the facilitywide background data.
- For analytes found to have maximum concentrations above the facilitywide UCLs, site-specific background maximum detected concentrations were compared to the UCLs of the facilitywide background data.
- Where, based on the analysis described above, analytes were found above background and considered site-related, the facilitywide background means were compared to the sampling means.

In some instances, where an inorganic analyte is discussed in one medium (e.g., surface soil), the analyte may be discussed in another medium (e.g. subsurface soil) even if the concentrations in the second medium do not exceed background. This is to allow a more complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a compound in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used; (2) if a compound was detected in a sample and a corresponding duplicate, the higher of the two values was used; and (3) samples collected upslope for the purpose of evaluating site-specific background conditions are excluded from the descriptive statistics and following discussion except with respect to whether or not the observed concentrations of certain analytes may be site-related.

5.4.1 Surface Soil

Surface soil sampling activities conducted at Site 13 consisted of nine samples (IS13SS01 through IS13SS09) and one site-specific background sample (IS13SS10) collected at locations shown in Figure 5-2. Note that the samples collected within the defined limits of the site (i.e., the red line in the figures) were collected only in the eastern part of the site because this was considered to be the most likely location where disposal occurred. Construction has occurred that might have affected the impacted areas. The results of the surface soil sampling are presented in Table 5-1.

5.4.1.1 VOCs and SVOCs

Five VOCs were detected in the surface soil borings at Site 13 (Table 5-1 and Figure 5-3): 1,1,2–trichloroethane (1,1,2-TCA), acetone, methyl acetate, methylene chloride, and toluene:

- 1,1,2-TCA was detected with a concentration of 20 µg/kg but only in sample IS13SS07. Acetone was detected with a concentration of 37 µg/kg but only in sample IS13SS02.

- Methyl acetate was detected in the surface soil in five samples: IS13SS01, IS13SS02, IS13SS03, IS13SS06, and IS13SS09. Concentrations ranged from 2.4 µg/kg in sample IS13SS06 to 33 µg/kg in sample IS13SS02. Methyl acetate concentrations detected in the surface soil are presented in Figure 5-3.
- Methylene chloride was detected with a concentration of 2.1 µg/kg but only in sample IS13SS02.
- Toluene was detected with concentrations of 3.1 µg/kg in sample IS13SS07 and 1.6 µg/kg in sample IS13SS09.

Thirteen SVOCs were detected in the surface soil samples at Site 13 (Table 5-1). Surface soil samples IS13SS01, located west of Building 870, and IS13SS05, located south of Building 870, each had nine SVOC detections. The following four SVOCs were selected for further discussion: acetophenone, benzaldehyde, fluoranthene, and pyrene (Figure 5-3) because of their frequency of detections and high concentrations.

Acetophenone was detected in the surface soil in seven samples: IS13SS01, IS13SS02, IS13SS03, IS13SS06, IS13SS07, IS13SS08, and IS13SS09. Concentrations ranged from 92 µg/kg in sample IS13SS09 to 570 µg/kg in sample IS13SS02.

Benzaldehyde was detected in the surface soil in five samples: IS13SS01, IS13SS02, IS13SS03, IS13SS06, and IS13SS09. Concentrations ranged from 66 µg/kg in sample IS13SS09 to 410 µg/kg in sample IS13SS02.

Fluoranthene was detected in the surface soil in six samples: IS13SS01, IS13SS04, IS13SS05, IS13SS06, IS13SS08, and IS13SS09. Concentrations ranged from 46 µg/kg in sample IS13SS06 to 380 µg/kg in sample IS13SS05.

Pyrene was detected in the surface soil in four samples: IS13SS01, IS13SS04, IS13SS05, and IS13SS06. Concentrations ranged from 110 µg/kg in sample IS13SS04 to 210 µg/kg in sample IS13SS01.

The locations of the highest concentrations of these VOCs and SVOCs generally coincide with the distribution of the remaining VOCs and SVOCs. The number and concentrations of VOC and SVOC detections are greatest in the samples collected closest to Building 1753 (e.g., samples IS13SS01 and IS13SS02) and tend to decrease in the samples collected further from Building 1753. Note that none of these VOCs or SVOCs were detected in the site-related background sample (IS13SS10); therefore, all are considered to be site-related.

5.4.1.2 TAL Inorganics

Eighteen inorganic analytes were detected in the surface soils at Site 13 (Table 5-1). Sixteen metals had one or more detected concentrations which exceeded the facilitywide background 95 percent UCL (Table F-2 in Appendix F): arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, vanadium, and zinc. This discussion focuses on arsenic (Figure 5-4) because of its frequency of detections, degree of exceedance above background, and general risk concern.

Arsenic was detected in all nine surface soil samples. Concentrations in the surface soil ranged from 3.4 mg/kg in sample IS13SS06, located south of Building 1753, to 11 mg/kg in

IS13SS05, located southeast of Building 1753. The calculated mean concentration of 6.7 mg/kg is greater than three times the facilitywide background mean of 2.18 mg/kg. Additionally, all nine arsenic detections exceeded the background 95 percent UCL of 2.56 mg/kg. The site-specific background sample contained arsenic at 5.1 mg/kg; therefore, the arsenic at the site may be site-related.

5.4.1.3 Explosives

2, 6-Dinitrotoluene was detected in two surface soil samples (IS13SS02 and IS13SS03) at concentrations of 600 µg/kg and 540 µg/kg, respectively (Table 5-1 and Figure 5-3).

5.4.1.4 Total Petroleum Hydrocarbons

TPH DRO were detected in the surface soil in all nine samples (Table 5-1). Concentrations ranged from 9.9 mg/kg in sample IS13SS05 to 1,400 mg/kg in sample IS13SS02. The distribution of TPH DRO concentrations is presented in Figure 5-3. The highest detection was just west of Building 1753.

TPH GRO were detected in the surface soil sample in only one sample (IS13SS09) at a concentration of 30 mg/kg (Table 5-1).

5.4.2 Subsurface Soil

Subsurface soil sampling activities conducted at Site 13 consisted of five samples (IS13SB01 through IS13SB05). Note that the samples collected within the defined limits of the site (i.e., the red line in the figures) were collected only in the eastern part of the site because this was considered to be the most likely location where disposal occurred. The results of the subsurface soil sampling are presented in Table 5-2.

5.4.2.1 VOCs and SVOCs

One VOC (methylene chloride) was detected in the subsurface soil at Site 13 (Table 5-2 and Figure 5-5). Sample IS13SB04 contained 1.2 µg/kg of methylene chloride.

Two SVOCs were detected in the subsurface soil samples at Site 13 (Table 5-2): diethlyphalate in sample IS13SB01, at a concentration of 310 µg/kg, and pyrene in sample IS13SB03 at a concentration of 83 µg/kg (Figure 5-5).

5.4.2.2 Inorganics

Sixteen inorganic analytes were detected in the subsurface soil at Site 13 (Table 5-2). This discussion focuses on arsenic as it was the only inorganic detected above the facilitywide background 95 percent UCL in the subsurface soil (Table F-2 in Appendix F). The arsenic distribution is presented in Figure 5-6. The areal distribution of several other inorganics are shown in Figure 5-6 because of their widespread distribution but are not discussed in detail.

Arsenic was detected in four of the subsurface soil samples. Concentrations in the subsurface soil ranged from 0.97 mg/kg in IS13SB02, collected west of Building 1753, to 12.8 mg/kg in IS13SB04, collected south of Building 1753. The calculated mean concentration of 5.11 mg/kg was slightly greater than the background mean of 4.8 mg/kg.

Additionally, two of the arsenic detections exceeded the background 95 percent UCL of 7.6 mg/kg.

Sample IS13SB04 contained the largest number of maximum values of inorganics at the site.

5.4.2.3 Total Petroleum Hydrocarbons

TPH GRO was detected once in the subsurface soil in sample IS13SB05, collected southeast of Building 1753, at a concentration of 66,000 µg/kg (Table 5-2 and Figure 5-5).

5.5 Fate and Transport

The fate and transport of chemicals in surface and subsurface soil at Site 13 are discussed in this section. The fate and transport are described to support the HHRA and ERA and to aid in defining remedial alternatives. At the end of the section is a summary of the conceptual model of fate and transport at Site 13.

5.5.1 Contaminant Fate

Analytes will adsorb onto and desorb from solid material at the site. Such sorption will be a function of the partitioning coefficient of the analyte and will be greater for most SVOCs and many metals than for VOCs and some SVOCs and metals. Analytes, particularly metals, also may be dissolved from the solids while they are in contact with water. For the majority of the contaminants at the site, adsorption will significantly reduce the rate of migration through the subsurface. Most of the commonly occurring contaminants at Site 13 are metals; therefore, adsorption is expected to be a major fate process at the site. Analytes, particularly metals, also may dissolve from the solids while they are in contact with water. As a result, contaminants could transfer from surface soil to subsurface soil and from sediment to surface water.

Few VOCs were detected at the site. Therefore, volatilization is not expected to be a significant fate process at the site. The same is true for VOCs and SVOCs that could be subject to microbial degradation.

Some of the metals at the site could vary in their migration behavior with change in valence state. This is particularly true for arsenic, which will become more mobile in its lower valence state, and chromium, which will become more mobile in its higher valence state.

Bioaccumulation is the process by which contaminants are ingested by ecological receptors and concentrated within the tissues of those receptors. Because of the wooded nature of the site, it is likely that ecological receptors (e.g., mammals) visit the area on a regular basis. While foraging, these receptors may ingest contaminated surface soil. Those compounds with a tendency to associate with the soil, such as SVOCs (e.g., fluoranthene) and inorganics (e.g., arsenic and mercury) may accumulate in these ecological receptors over time.

5.5.2 Contaminant Migration

This section discusses the possible source areas and potential mechanisms for contaminant release and migration from the source areas at Site 13. The discussion is organized by media within the site that may contribute to contaminant movement.

Fundamental to describing fate and transport at the site are the concepts of contaminant mobility and persistence and the physical processes within the subsurface, which are described in Section 3.5, and the site hydrogeology, which is described in Section 5.2.

5.5.2.1 Source Areas

The original source of contamination at the site reportedly was disposal of chemicals on the ground. Such activities no longer occur. Now, the soil contaminated by the disposal may serve as source material. Based on the chemical and physical data gathered for the site and information provided for Site 13, the following current source areas have been identified:

- A topographically depressed area located in the woods behind the Building 870, where solvents reportedly were disposed of.
- Surface soil behind Building 870, where paint equipment cleaning operations took place.

Although contaminants occur at low concentrations at most sampled locations, contamination was detected at the highest concentrations generally in samples IS13SS01, IS13SS02, and IS13SS05.

5.5.2.2 Releases from Soil to the Atmosphere

Wind erosion and vehicular traffic are typically the primary mechanisms for the release of contaminants from soil to the atmosphere. Most of the site is forested and not accessible to vehicular traffic. VOCs were detected in surface soils at Site 13; however, all of the detected concentrations were low. Therefore, release from soil to the atmosphere does not appear to be a significant transport process at Site 13

5.5.2.3 Transport from Surface Soil to Subsurface Soil or from One Area to Another

The primary mechanisms for the release of contaminants from surface soil to subsurface soil or from one area to another are infiltration, runoff, and soil erosion caused by runoff.

Immediately behind the paint shed, there is a steep but short slope. Beyond that drop in elevation, which is between sample locations IS13SS/SB01, IS13SS/SB02, and IS13SS/SB03 and the paint shed, the land slopes very gently away from the paint shed. There are two shallow swales that drain water away from the site. Because of the shallowness of the slope, it is unlikely that the site would generate substantial amounts of surface runoff. Infiltration is more likely to occur.

The majority of the organics detected at the site are SVOCs, such as fluoranthene. Fluoranthene has a high partition coefficient, indicating that it will tend to remain sorbed to the soil and will resist transport, either horizontally or vertically, away from the source area. The VOCs detected at the site, such as methyl acetate, have a greater tendency to dissolve and should be more mobile than the SVOCs. However, because there were only three organic contaminant detections in the five subsurface soil samples collected, it appears that vertical leaching of organic contaminants is not a significant transport pathway at Site 13.

Inorganic contaminants associated with surface soil may also dissolve into the surrounding soil water (water present in the unsaturated zone). Arsenic was observed in both surface and subsurface soils, including the Site 13 background surface soil sample, at levels higher than the facilitywide background levels. Mercury was observed in several surface soil

samples but none of the subsurface soil samples. Cadmium was observed in both IS13SS01 and IS13SB01. Therefore, the vertical leaching inorganic contaminants appears to be occurring to some extent.

At Site 13, the gently sloping, vegetated terrain would not promote erosion. When erosion would occur, the eroded surface soil would tend to be deposited along the flat portions of the two drainage swales. Any adsorbed contaminants associated with the eroded soil will be transported in this manner. Because contaminants tend to associate with finer particulates, and because finer particulates are more easily suspended and transported, this transport process could be a means of contaminant movement away from the paint shed. In particular, SVOCs such as fluoranthene, because of their tendency to adsorb, could be transported in this manner. Inorganics also may be transported in this manner.

While the majority of the SVOC detections was observed directly to the south and west of the paint shed, some SVOCs, such as fluoranthene and acetophenone, were observed in surface soil samples collected along the two drainage swales. These data suggest that contaminants are being transported at Site 13 via surface soil erosion. With respect to inorganic contaminants, both cadmium and mercury were observed in the surface soil samples directly to the south and west of the paint shed. Cadmium was observed in one of the drainage swale samples while mercury was detected in two of the drainage swale samples. These data suggest that inorganic contaminants are also being transported via soil erosion.

5.5.2.4 Releases from Soil to Sediment and Surface Water

The discussion on movement of soil to the drainage swales presented in Section 5.5.2.3 describes how contaminants in soil might be released to sediment. There is no surface water at the site except during storm events, during which there may be some flow in the drainage swales. However, the assumption is that such water would infiltrate quickly into the ground and will not stand for any significant length of time.

5.5.2.5 Releases from Soil to Groundwater

Percolation of both rainfall and snowmelt is the primary mechanism for the transport of contaminants from soil to groundwater.

The concentrations of all compounds observed in surface soil and subsurface soil samples from Site 13 were compared against the soil screening levels with a dilution and attenuation factor of 20. All of the observed concentrations were below the screening levels, indicating that the potential for these soils to serve as a source of groundwater contamination is low. Based on these results, it was determined that this transport pathway was not a significant process at the site and no groundwater samples were collected at the site.

5.5.2.6 Migration of Contaminants in Groundwater

Because it was determined that the contaminant levels in the surface and subsurface soils did not pose a potential threat to groundwater, no groundwater sampling occurred at Site 13. This transport mechanism is not considered to be significant for Site 13.

5.5.2.7 Releases from Groundwater to Surface Water

Because it was determined that the contaminant levels in the surface and subsurface soils did not pose a potential threat to groundwater, this transport mechanism was not considered to be significant for Site 13.

5.5.3 Conceptual Site Model

The above fate and transport discussions may be summarized into a conceptual site model that describes the fate and transport mechanisms at Site 13. This conceptual site model is provided in Table 5-3.

5.6 Baseline Human Health Risk Assessment

This section presents the results of the HHRA for Site 13, the Paint Solvents Disposal Ground.

5.6.1 Data Summary

The only data collected at Site 13 were collected during the RI. The RI data that were used in the risk assessment are presented in this section. Table 5-4 lists the samples that were used to estimate potential exposure and risks in each medium for Site 13. Figure 5-2 identifies the sampling locations for surface and subsurface soil.

Eleven surface soil samples (including two duplicate samples) were collected in July 2000 and analyzed for VOCs, SVOCs, explosives, and inorganics (Figure 5-2). Five subsurface soil samples were collected in July 2000 and analyzed for the same parameters as the surface soil samples. One surface soil sample was collected from a background location and was not used to evaluate the risks associated with exposure to site soil.

The full set of data used for the HHRA is presented in Appendix G.2a. Appendix G.2b includes the detected constituents only, and Appendix G.2c is the sample statistics. The sample statistics include frequency of detection, minimum and maximum detected values, normal and lognormal arithmetic mean, normal and lognormal standard deviation, results of W-test, and 95 percent UCL based on the normal and lognormal distribution.

5.6.2 Identification of Chemicals of Potential Concern

Table 5-5 lists the COPCs retained for Site 13. Six metals, aluminum, arsenic, chromium, iron, manganese, and vanadium, were retained as COPCs for the current surface soil and the future soil. The chemical characteristics of the future soil were estimated by pooling the results of the analyses for the surface soil and subsurface soil.

5.6.3 Exposure Assessment

The site-specific exposure assessment includes the information necessary to develop the exposure scenarios applicable for Site 13. This assessment includes identifying the exposure setting, the current and future site use, the potentially exposed populations, and the potential exposure pathways.

5.6.3.1 Exposure Setting

Site 13, the Paint Shop (Building 870), was constructed in 1953 and remains in operation today. Approximately 50 ft to the south and west of the building the terrain slopes down into a wooded area. Two drainage swales radiate from the foot of this slope to the northwest and southwest of Building 870. The drainage swales contain water only during storm-runoff events. The nearest potable water wells are Well 2, 1,800 ft north, and Well 7, 1,950 ft southeast of the site. An asphalt drive surrounds the Paint Shop.

The water table is recharged by precipitation that infiltrates the ground surface. Although boreholes were dug to depths of 30 ft below ground surface, no groundwater was encountered. It is hypothesized that the majority of precipitation runs off the site through the two drainage swales that convey water to the northwest and southwest.

5.6.3.2 Potentially Exposed Populations

Site 13 is an unfenced wooded area behind the Paint Shop (Building 870), and there are no plans for future development of the area. Because there are no current uses of the site, the only current receptor that is expected at Site 13 is the trespasser/visitor. The risk assessment considered both an adult trespasser/visitor and an adolescent trespasser/visitor.

The projected future use of the site is consistent with current activities (unused wooded area). Therefore, the trespasser/visitor is included for evaluation under the future use scenario. It is also conservatively assumed that the site could be developed and used for industrial and/or residential activities in the future. It is not expected that the site will be developed for residential use, however, the residential scenario is conservatively included in this evaluation, per Navy policy. Therefore, the receptors in the future use scenarios include the construction worker, industrial worker, adult resident, and child resident, in addition to the adult and adolescent trespasser/visitor.

5.6.3.3 Potential Exposure Pathways

A complete exposure pathway has five elements: a source, a mechanism for release and migration, an environmental transport medium, a point of potential human contact, and a route of intake. These elements as they apply to Site 13 are discussed below.

Contaminant Sources The Paint Shop was used to paint various items by hand using aerosol sprays or paint spray booths. According to the 1983 IAS, between 1953 and 1979, approximately 115 gallons per year of kerosene, mineral spirits, lacquer thinners, and solvents may have been deposited in a depressed area located in the woods behind the Paint Shop. It is also estimated that approximately one percent of the 3,380 gallons of paint used annually may have been washed off during paint equipment cleaning operations, which took place over bare soil areas behind Building 870. Based on historical use, the potential contaminants were hypothesized to be VOCs and SVOCs associated with painting operations.

Release and Transport Mechanisms The dominant transport mechanisms at Site 13 appear to be surface runoff and erosion, with minor amounts of vertical leaching to subsurface soils. The second phase of fieldwork, in which groundwater wells were to be installed and sampled, was not conducted at this site. Per discussions and consensus with the Indian Head Installation Restoration Team (IHIRT) on August 30 and 31, 2000, it was agreed that

groundwater sampling was unwarranted at Site 13 for the following reasons: (1) SVOCs exceeding the SSLs in surface soil samples were not detected in corresponding subsurface soil samples; (2) depth to groundwater at the site is greater than 30 ft and soils are relatively impermeable; (3) site topography will tend to cause surface water to runoff rather than to infiltrate; (4) VOCs and SVOCs did not exceed residential RBCs at any location; and (5) there were only a few constituents (one VOC, one SVOC, one explosive, and three metals) detected at maximum concentrations exceeding SSLs in surface and subsurface soil samples. Therefore, the soil to groundwater transport pathway is not considered a significant transport pathway at Site 13.

The transfer of COPCs to air from soil through volatilization and fugitive dust emissions was also considered to be a potential transport mechanism for the HHRA. However, no chemicals were retained as COPCs for this pathway.

Potential Exposure Points and Exposure Routes Exposure points are locations where humans could contact contamination. The onsite exposure points include the surface and subsurface soil. Although contaminants may be transported offsite via surface runoff to the drainage swales, the transport process would dilute the contaminant concentration. The risk associated with offsite contaminant movement would be less than the risk from the onsite contaminants. Therefore, the risk assessment considered only onsite exposure points. Because of the low potential for groundwater contamination by the subsurface soils, neither onsite nor offsite exposure to groundwater was considered in the HHRA. Only incidental ingestion of and dermal contact with soil were considered to be potential exposure routes.

Potential exposure routes were evaluated for current site use and potential future site use. Existing and potential exposure pathways are illustrated in the conceptual exposure model (Figure 5-7). Exposure scenarios and potentially complete pathways of exposure evaluated in this risk assessment are presented in Table 5-6 and Appendix G.2d, Table 1.

Current Exposure Routes The only medium of potential concern currently accessible at the site is surface soil. Based on current site use, potential receptors include adolescent and adult trespassers/visitors. The current land use exposure routes for quantitative evaluation are:

- Trespasser/visitor (adolescent and adult): incidental ingestion of and dermal contact with surface soil.

Future Exposure Routes As discussed above, although unlikely, potential future site use may be industrial or residential. Future industrial workers, trespassers, residents, and/or construction workers may be exposed to the future surface soil.

In summary, the future land use exposure routes are:

- Industrial Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).
- Trespassers/Visitors (adolescent and adult): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).
- Resident (adult and child): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).

- Construction Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).

All of the chemicals detected in the soil samples were screened against RBCs. Only those chemicals for which the maximum detected concentration exceeded the RBC were quantitatively evaluated in the risk assessment. The results of the screening process are summarized in Appendix G.2d, Tables 2.1 through 2.4. The exposure concentrations used to calculate potential risks to each of the receptors are presented in Appendix G.2d, Tables 3.1 and 3.2. Because the estimated ambient air concentrations of contaminants released by the soil are below their corresponding RBCs, the risk from inhalation was not quantified. The exposure parameters and equations used to calculate the risks are presented in Appendix G.2d, Tables 4.1 through 4.18.

5.6.4 Risk Characterization

Risks were evaluated for all of the complete exposure pathways identified in Section 5.6.3. The calculated risks are discussed below. All receptors and pathways were evaluated for the RME situation. If the excess lifetime cancer risk exceeded 10^{-4} or the HI exceeded 1.0 for the RME, then the CT exposure was evaluated for that particular receptor and land use scenario. If the HI exceeded 1.0 but the excess lifetime cancer risk was less than 10^{-4}, only the hazard analysis was performed, and vice versa.

5.6.4.1 Soil

Risks were evaluated for exposure to surface soil for current scenarios. For the future exposure scenarios, the soil concentration was estimated by pooling the results from the analysis of surface soil samples and subsurface soil samples. This approach is based on the assumption that any construction or excavation activities at the site may result in the surface soil mixing with the underlying subsurface soil.

Surface Soil RME risk estimates for current exposure to surface soil were calculated for an adolescent trespasser/visitor and an adult trespasser/visitor under current site use (Appendix G.2d Tables 7.1.RME and 7.2.RME for noncarcinogenic hazards, and Tables 8.1.RME and 8.2.RME for carcinogenic risks). The risks are summarized in Table 5-7. Exposure to surface soil via incidental ingestion and dermal contact was evaluated. As stated in Section 5.6.3, the risk associated with the inhalation of fugitive emissions from the surface soil was not quantified because all of the detected concentrations were below the applicable screening levels (Appendix G.1d, Table 2.2).

The noncarcinogenic hazard posed by ingestion of and dermal contact with the six COPCs in surface soil to the adolescent trespasser/visitor is estimated to be a HI of 0.073, substantially less than the HI of 1.0 that is considered to be protective of human health. The carcinogenic risk for this exposure scenario is $6x10^{-7}$, which is below the USEPA target risk of 10^{-4} to 10^{-6}.

Exposure to Site 13 surface soil does not pose risks above target USEPA risk levels to the adult trespasser/visitor. The HI is 0.063, and the total excess lifetime cancer risk is $1x10^{-6}$.

Combined Surface and Subsurface Soil RME risk estimates for future exposure to combined surface and subsurface soil were calculated for an adult and child resident, a construction

worker, an industrial worker, and an adolescent and adult trespasser/visitor under potential future site use (Appendix G.2d, Tables 7.3.RME through 7.8.RME, and Tables 8.3.RME through 8.7.RME, and summarized in Tables 5-7 and 5-8). It was assumed that these receptors would be exposed to soil through incidental ingestion and dermal contact. As with the current use scenario, the risk associated with the inhalation of fugitive emissions from the soil was not quantified because all of the detected concentrations were below the applicable screening level (Appendix G.2d, Table 2.4).

The HI for future adult residents is estimated to be 0.51, which is less than the USEPA benchmark of 1.0. At 2.3, the HI for future child residents exceeds the USEPA benchmark value. The majority of this hazard results from ingestion of iron and, to a lesser extent, ingestion of vanadium, manganese, and arsenic, and dermal contact with vanadium. None of the constituents pose individual hazard quotients above 1.0, and when separated by target organ/effects, there are no hazards above 1.0 for an individual target organ/effect.

Under the future use scenario, the carcinogenic risk to the future lifetime resident is estimated to be $2x10^{-5}$, which is within the USEPA target risk range of 10^{-4} to 10^{-6}.

Noncarcinogenic hazards and carcinogenic risks were estimated for potential future construction workers at Site 13. The RME HI for this scenario is 0.83, while the RME excess lifetime cancer risk is $9x10^{-7}$. The HI is below the USEPA benchmark value and the cancer risk is below the USEPA target risk range.

At $6x10^{-6}$, the cancer risk for future industrial workers at Site 13 is within the USEPA target risk range of 10^{-4} to 10^{-6}. The HI for future industrial workers is 0.43, which is below the USEPA benchmark value of 1.0.

Under the future use scenario, the HI for the adolescent trespasser/visitor is estimated to be 0.065. At $5x10^{-7}$, the estimated carcinogenic risk is less than the USEPA target risk range. The risks associated with the future use of the site by the adult trespasser/visitor are a HI of 0.055 and an excess lifetime cancer risk of $1x\ 0^{-6}$, both below USEPA target levels.

CT noncarcinogenic hazard were calculated for the future residential child because the RME noncarcinogenic hazard exceeds 1.0 (Appendix G.2d, Tables 7.9.CT). The CT HI is 0.57, which is less than the USEPA benchmark value of 1.0.

5.6.4.2 Summary of Total Risks Across Pathways and Media

Table 5-7 and Appendix G.2d, Tables 9.1.RME through 9.9.RME summarize the RME potential noncarcinogenic hazards and carcinogenic risks to each receptor. Potential RME risks were summarized for a current adolescent trespasser/visitor, current adult trespasser/visitor, future adult resident, future child resident, future lifetime resident, future construction worker, future industrial worker, future adult trespasser/visitor, and future adolescent trespasser/visitor. Only one receptor, the future child resident, was characterized by a health risk that warranted analysis of the CT exposure situation. The CT HI for the future child resident is presented in Appendix G.2d, Table 9.10.CT. Because none of the RME excess lifetime cancer risks exceeded 10^{-4}, no analysis of CT carcinogenic risk was performed. Appendix G2.d, Table 10.1.RME shows only those COPCs that contributed a hazard greater than 0.1 for the scenario with a total HI greater than 1.0.

The risk assessment results may be summarized as follows:

- **Current Trespasser/Visitor, Adolescent** (Appendix G.2d, Table 9.1.RME): HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Current Trespasser/Visitor, Adult** (Appendix G.2d, Table 9.2.RME): HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Future Resident, Adult** (Appendix G.2d, Table 9.3.RME): HI is less than 1.0. No unacceptable noncarcinogenic health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Resident, Child** (Appendix G.2d, Table 9.4.RME): HI exceeds 1.0; however, hazard indices for individual target organs do not exceed 1.0. The CT future child resident has a HI that is below the USEPA benchmark value (Appendix G.2d, Table 9.10.CT). No unacceptable noncarcinogenic health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Lifetime Resident** (Appendix G.2d, Table 9.5.RME): The carcinogenic risk posed by the Site 13 COPCs to the age-adjusted future lifetime resident is within the target USEPA risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Construction Worker** (Appendix G.2d, Table 9.6.RME): Both noncarcinogenic hazards and carcinogenic risks are below USEPA action levels. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Industrial Worker** (Appendix G.2d, Table 9.7.RME): HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Trespasser/Visitor, Adolescent** (Appendix G.2d, Table 9.8.RME): HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Trespasser/Visitor, Adult** (Appendix G.2d, Table 9.9.RME): HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.

5.7 Ecological Risk Assessment (Steps 1–3A)

5.7.1 Screening Problem Formulation

Problem formulation involves preparing descriptions of environmental setting, sources, fate and transport of site chemicals, chemical ecotoxicity, and potential receptors. This information is used to build the conceptual model. The conceptual model includes a discussion of exposure pathways, as well as assessment and measurement endpoints.

5.7.1.1 Environmental Setting

Site 13 is the Paint Solvents Disposal Ground. It includes areas downslope of Building 870 (the Paint Shop) and Building 1753 (Figure 5-1). The Paint Shop was constructed in 1953 and operated until 1999. It was used to paint various items by hand using aerosol sprays or paint spray booths. The paint shop is still in operation. About 50 ft to the south and west of the Building 870, the terrain slopes down into a wooded area. Two drainage swales radiate from the foot of this slope to the northwest and southwest of Building 870. The drainage swales contain water only during storm water runoff events.

According to the 1983 Initial Assessment Study (IAS), between 1953 and 1979, approximately 115 gallons per year of kerosene, mineral spirits, lacquer thinners, and solvents may have been deposited in a depressed area located in the woods west of the Paint Shop. It is also estimated that approximately one percent of the 3,380 gallons of paint used annually may have been washed off during paint equipment cleaning operations at Building 870. A historical site investigation document indicated that there was an area of stressed vegetation (20 ft by 20 ft) behind Building 1753. In a subsequent document (the 1988 Phase II RCRA Facility Assessment), the assessment team could not find an area of stressed vegetation.

Site 13 is bordered to the west by a mixed hardwood and pine forest. The forest is dominated by white oak (*Quercus alba*) and tulip tree (*Liriodendron tulipfera*). The understory is dominated by red maple (*A. rubrum*) and American holly (*I. opaca*).

5.7.1.2 Summary of Available Analytical Data

Ten surface soil samples were collected at the site as part of the RI (Figure 5-1). Note that, in the following discussion, the samples designations have been truncated for ease of reference (e.g., IS13SS04 is referred to SS04). One of the samples collected (SS10) was a background surface soil sample from an upslope location east of Building 870. The samples were analyzed for full TCL organics, TAL inorganics, TPH, TOC, and pH. Three of the soil samples (SS04, SS05, and SS06) were collected from west or due south of Building 1753. The remaining six samples were collected immediately behind Building 1753 (SS01, SS02, and SS03) or in the northwest (SS08 and SS09) and southwest (SS07) drainage swales that convey stormwater away from the site. After the data were collected, the locations where two of the surface soil samples were collected (SS04 and SS05) were disturbed by construction equipment. However, the data from those two samples were still expected to be representative of the highest concentrations in the local area.

5.7.1.3 Ecotoxicity and Potential Receptors

Chromium and lead were likely key inorganic constituents in the paint used at the site. Chromium has not been observed to biomagnify, and concentrations are usually highest at lower trophic levels (Eisler, 1986). The toxicity of chromium varies widely among organisms and is dependent on form. For wildlife, adverse effects have been reported at 5.1 mg and 10.0 mg of Cr (VI) and Cr (III), respectively, per kilogram of diet (Eisler, 1986). A 3-month study on the effects of hexavalent chromium on survival in rats indicated adverse effects at a dose of 131.4 mg/kg/day. This dose was considered to be a chronic LOAEL (Sample et al., 1996). A chronic NOAEL of 13.14 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 0.1.

Lead in soil could also be of ecological concern at Site 13. In the terrestrial environment, lead has been demonstrated to be toxic to birds, mammals, reptiles, and amphibians. Lead poisoning in birds is particularly well documented, but most lead poisoning in wild birds results from ingestion of lead pellets. In contrast, lead poisoning of birds, such as raptors, from biologically incorporated lead is considered unlikely. Lead is known to be toxic to mammals, but information on the effects on wild species is limited. Toxic effects include mortality, reduced growth and reproduction, alterations of blood chemistry, lesions, and behavioral changes. Terrestrial vegetation also may be affected by elevated lead concentrations. Demonstrated effects include reduced photosynthesis, mitosis, and water absorption. Lead, however, appears to bind tightly to moist soil, nonacidic soil, and substantial amounts of lead typically need to accumulate before effects on plants are observed. Lead does not biomagnify to a great extent in food chains, although bioaccumulation in plants and animals has been extensively documented (Wixson and Davis, 1993, Eisler, 1988).

Receptors potentially exposed to soil chemicals at Site 13 include organisms that have significant direct contact with soil or consume prey that live in the soil or leaf litter. At Site 13, these could include plants, soil invertebrates, and birds or mammals that consume plants and invertebrates. If chemicals that biomagnify are present, top consumers such as raptors or foxes could also be exposed to potentially significant levels of chemicals in their diet.

5.7.1.4 Preliminary Conceptual Model

Information on the habitat features and the fate and transport of the chemicals detected at the site were used to build the preliminary conceptual model (Figure 5-8). The conceptual model addresses complete exposure pathways, receptors, and endpoints.

Exposure Pathways. The soils at Site 13 are known to have been impacted by past disposal activities. Soil invertebrates and terrestrial plants are potentially exposed to chemicals in surface soils located west and south of Building 1753. Chemical disposed of behind Building 1753 may have been carried downslope via the swales that extend northwest and southwest from the site. Soil samples were collected from these swales to evaluate that potential transport pathway.

Key exposure routes for organisms inhabiting the area include ingestion of chemicals adsorbed to soil (invertebrates) and direct contact with chemicals in the soil (invertebrates and plants). Other organisms that forage in the area are also potentially exposed to chemicals by direct contact, incidental ingestion of soil, and ingestion of invertebrates and/or plants that have accumulated body burdens. Drinking water exposures are not considered because there is no permanent source of freshwater at the site.

Assessment and Measurement Endpoints The conclusion of the problem formulation includes the selection of assessment and measurement endpoints, based on the preliminary conceptual model. Based on the habitat and types of chemicals present, seven assessment endpoints were chosen to evaluate the potential risk to ecological receptor populations from chemicals spilled or disposed of at Site 13. Each assessment endpoint and corresponding representative species or community is described below.

1. ***Growth, survival, and reproduction of soil invertebrate communities —*** Soil invertebrates, such as earthworms, promote soil fertility by breaking down organic matter and releasing nutrients. They also improve aeration, drainage, and aggregation of soil, and serve as a forage base for many terrestrial species. The soils at the site will support fewer insectivorous birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of soil invertebrate communities.

2. ***Growth, survival, and reproduction of terrestrial plant communities —***Plants provide food, cover, and nesting material for many animals. The soils at the site will support fewer birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of plants.

3. ***Growth, survival, and reproduction of avian terrestrial insectivores*** – These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. A juvenile American robin (*Turdus migratorius*) was chosen to represent this assessment endpoint. Robins live in a variety of habitats, including woodlands, swamps, suburbs, and parks. Robins forage on the ground in open areas, along edge habitats, or along the edges of streams. They forage along the ground for ground-dwelling invertebrates and search for fruit and foliage-dwelling insects in low tree branches (USEPA, 1993). While growing in the nest, earthworms constitute the majority of the diet of the juvenile robin.

4. ***Growth, survival, and reproduction of mammalian terrestrial insectivores—***These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. Short-tailed shrew (*Blarina brevicauda*) was chosen to represent this assessment endpoint. Short-tailed shrews live in a wide variety of habitats and need cool, moist conditions (Randolf, 1973). They eat insects, worms, snails, and other invertebrates (Robinson and Brodie, 1982).

5. ***Growth, survival, and reproduction of avian terrestrial carnivores*** – These receptors are top level predators and are susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial food chains. The red-tailed hawk (*Buteo jamaicensis*) was chosen to represent this endpoint**.** Red-tailed hawks nest primarily in woodlands. They feed in open country on a wide variety of small- to medium-sized prey (USEPA, 1993).

6. ***Growth, survival, and reproduction of omnivorous terrestrial mammals —*** These receptors are second order consumers and thus are susceptible to exposure to bioaccumulative chemicals. The white-footed mouse (*Peromyscus leucopus*) was chosen to represent this endpoint. White-footed mice serve as a prey for carnivorous birds and mammals.

7. ***Growth, survival, and reproduction of carnivorous terrestrial mammals —*** These receptors are top level consumers and are thus most susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial foodchains. The gray fox (*Urocyon cinereoargenteus*) was chosen to represent this endpoint.

Although potentially complete exposure pathways exist for reptiles and amphibians, they were not specifically selected as receptors because information on the toxicological effects of chemicals on adult amphibians and reptiles via ingestion is limited. The assessment indirectly evaluates these groups because there are receptors included in the assessment that have similar diets to reptiles and amphibians (such as the shrew).

The corresponding measurement endpoints associated with each assessment endpoint were defined as follows:

Assessment Endpoints		Measurement Endpoints
Growth, survival, and reproduction of soil invertebrate communities.	⇨	Comparison of HQs for soil invertebrates to a target HQ of 1. Medium-specific HQs are calculated for individual chemicals by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of soil invertebrates.
Growth, survival, and reproduction of terrestrial plant communities.	⇨	Comparison of HQs for terrestrial plants to a target HQ of 1. Medium-specific HQs are calculated for individual chemicals by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of terrestrial plants.
Growth, survival, and reproduction of avian terrestrial insectivores.	⇨	Comparison of HQs for robin to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of mammalian terrestrial insectivores.	⇨	Comparison of HQs for short-tailed shrew to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of avian terrestrial carnivores.	⇨	Comparison of HQs for red-tailed hawk to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of omnivorous mammals.	⇨	Comparison of HQs for white-footed mouse to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.
Growth, survival, and reproduction of carnivorous terrestrial mammals.	⇨	Comparison of HQs for gray fox to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOAELs.

5.7.2 Analysis

The ecological exposure estimation was conducted as described in Section 3.3.2. Site-specific modifications are addressed below.

5.7.2.1 Site-Specific Ecological Effects Evaluation

The TOC-adjustable soil screening values were adjusted using the average soil percent TOC of 9.4 percent.

5.7.2.2 Site-Specific Ecological Exposure Estimation

Exposure parameters (i.e., ingestion rates and dietary composition) for each receptor species are presented in Table 5-9. The diet of the American robin is for a 7-day old hatchling. It includes earthworms and soil, but no plant material.

5.7.3 Screening-Level Risk Calculations

The SERA indicated that some inorganics detected at the site may impact the growth, survival and/or reproduction of soil invertebrates, plants, insectivorous birds and mammals, and carnivorous mammals (Tables 5-10 and 5-11). Preliminary COPCs for soil invertebrates and plants included multiple chemicals from all classes. The majority of these preliminary COPCs were chemicals that were not detected but had maximum detection limits in excess of screening values, or chemicals for which no medium-specific screening value was available. Preliminary COPCs for food chain effects included arsenic, cadmium, lead, mercury, and zinc, and a few organic compounds for which no reference toxicity values were available. Due to the identification of preliminary COPCs, the risk assessment process was continued to Step 3A.

5.7.4 Refinement of Conservative Exposure Assumptions (Step 3A)

In Step 3A, exposure assumptions are refined and risk estimates (i.e., HQs) are recalculated. Risk is again characterized and uncertainties associated with the conclusions are described. If re-evaluation of the conservative exposure assumptions supports an acceptable risk determination then the site may exit the ecological risk assessment process (CNO, 1999).

5.7.4.1 Exposure Assumption Refinements

The results of Steps 1 and 2 (i.e., the SERA) indicated that, based on a set of conservative assumptions, there are multiple chemicals that may pose a risk to several receptor communities/species used in the screening assessment. The set of preliminary COPCs includes chemicals with HQs in excess of 1 and chemicals for which assessment data were unavailable.

Assumptions and methods that were modified for the calculation of medium-specific and food chain hazard quotients are listed below, along with justification for each modification.

- Maximum chemical concentrations were replaced by average chemical concentrations. For individual mammalian and avian receptors, average chemical concentrations provide a better estimate of the likely level of chemical exposure because each of the receptors would be expected to forage in several different areas of the site, and, in many cases, off the site. With adequate spatial coverage, central tendency measures are appropriate for evaluating impacts to populations of soil invertebrates and plants. While locations of maximum concentration may be important to individuals, the average value at the site can be more instructive with regard to the level of impact that might be expected at the population level.

- Central tendency estimates for body weight and ingestion rate were used to develop exposure estimates, rather than minimum body weights and maximum ingestion rates. The use of central tendency parameters is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.

Exposure parameters for each species are presented in Table 5-12.

5.7.4.2 Refined Risk Calculations

For soil invertebrates and plants, the mean concentrations of seven metals (aluminum, chromium, iron, lead, mercury, vanadium, and zinc) exceeded soil screening values (Table 5-13). HQs ranged from 1.5 to 131.

Refined risk calculations for food chain receptors are shown in Table 5-14. There were no exceedances of LOAEL-based HQs. For NOAEL-based HQs, the only exceedance was for arsenic for the short-tailed shrew (HQ = 1.6).

5.7.4.3 Risk Characterization

The concentrations of aluminum, arsenic, chromium, iron, mercury, and vanadium exceeded soil screening values. The question that must be answered is the following: Do the concentrations of released-related inorganics in site soils pose an unacceptable risk to populations of plants and soil invertebrates at the site? Weights of evidence are discussed below.

Background Comparisons. Of the inorganics with concentrations in excess of screening values, aluminum, chromium, iron, and vanadium were present at concentrations that are consistent with NDWIH background levels (B&RE, 1997), as demonstrated below.

Inorganic	Site Average (mg/kg) (n = 9)	Surface Soil Background Average (mg/kg) (n = 12 or 14)	Ratio
Aluminum	6,537	7,874	0.8
Chromium	14.7	12	1.2
Iron	11,762	10,290	1.1
Lead	76.9	20	3.8
Mercury	0.224	0.043	5.2
Vanadium	25.1	19.2	1.3
Zinc	118	18.1	6.5

Distribution of Contamination. Lead, mercury, and zinc are the only inorganic COPCs present at higher concentrations than those found at background locations at the base. The areal extent of these contaminants is limited. Sample location SS02 had the maximum mercury concentration, while sample location SS04 and SS05 had the maximum and second highest concentrations, respectively, of both lead and zinc. None of these samples is located in the swales. All are clustered around Building 1753. Concentrations decline away from the building. Of lead, mercury, and zinc, only mercury exceeded its screening values in samples SS07 and SS09, the furthest downslope samples. The pattern and level of mercury concentrations in the soil (i.e., low-level and widespread) suggest it may not be site-related.

The surface soil sampling (0 to 6 in.) has adequately characterized the concentrations of inorganics in the soil column. There is a 3- to 4-in. organic layer underlain by fine grained and compact soil. It is unlikely that contaminants have moved vertically in significant quantities.

In addition, the impact of Site 13 on downgradient ecological systems has likely been minimal. Site 13 is a small paint shop that has not likely contributed in a significant way to contaminant levels in the Mattawoman Creek. The strength of this contaminant source is not great, and there is no direct migration pathway to the Mattawoman Creek. The hydrologic route from Site 13 to the creek is lengthy and low velocity, with many depositional area along the pathway. The stream eventually discharges to a water body adjacent to Town Gut Landfill.

Toxicological Evaluation The average lead concentration was 76.9 mg/kg, greater than the direct contact screening value of 50 mg/kg. This site concentration is unlikely to represent the potential for a significant impact. The screening value was obtained from a study reported in Efroymson et al. (1997a). In the study, red oak seedlings were exposed to 50 mg/kg lead administered as lead chloride, a soluble salt. This level of exposure reduced seedling weight. It is unlikely that the lead in the soil at Site 13 is present solely in the form of a salt. Most of the lead compounds used as pigments in paint are insoluble (Merck, 1989). The bioavailability of lead in insoluble compounds would likely be lower than would be expected in a soluble salt such as lead chloride. In addition, downgradient samples, located in the adjacent forested areas, had lead concentrations that were lower than the screening value of 50 mg/kg. Based on the weight of evidence, the observed lead concentrations at the site would not be expected to pose a significant risk to plants. In addition, the lead at the site would not be expected to adversely impact soil invertebrates. Efroymson et al. (1997b) provides a screening benchmark for toxicity of lead to earthworms of 500 mg/kg. This is greater than the average at the site (76.9 mg/kg).

The average mercury concentration on the site was 0.22 mg/kg. The screening value of 0.1 mg/kg was obtained from Efroymson et al. (1997b). In the study, earthworms were exposed to 0.5 mg/kg mercuric chloride ($HgCl_2$). Survival and cocoon reproduction were reduced, but the number of juveniles produced was not affected. In developing a screening level, Efroymson et al. (1997b) applied a safety factor of 5 to this study, resulting in a screening value of 0.1 mg/kg. As for lead, the mercury in the laboratory test was applied as a soluble salt. Mercuric chloride is highly toxic (Merck, 1989). Because the average concentration at the site is below the concentration that produced an effect in the study and because divalent forms usually do not exist as ionic species in nature (Stein et al., 1996), the observed mercury concentrations at Site 13 are not expected to pose a significant risk to soil invertebrates. In addition, the average mercury concentration at the site is lower than the 0.3 mg/kg screening benchmark for toxicity to plants provided by Efroymson et al. (1997a).

The average zinc concentration was 118 mg/kg. The screening level of 50 mg/kg was obtained from a study summarized in Efroymson et al. (1997a). The screening value is equivalent to a 10th percentile Lowest Observed Effect Concentration (LOEC) (based on several plant studies). The 50 percentile (akin to an Effects Range-Median [ER-M]) would be 250 mg/kg. As for the lead and mercury, the common form used in the laboratory studies was a soluble form of zinc called zinc sulfate ($ZnSO_4$), which allowed the zinc to be readily bioavailable. Overall, zinc is not expected to pose a significant risk to populations of plants

at Site 13. The screening value is conservatively based on a soluble form of zinc, and the only exceedances of the zinc screening values were for samples near Building 1753 (samples SS01 through SS05), in what would be considered habitat of marginal value. Downgradient samples, located in the adjacent forested area, were below the 50 mg/kg screening value. In addition, zinc at the site is not expected to pose a significant risk to soil invertebrates. The average site concentration of 118 mg/kg is less than the screening benchmark of 200 mg/kg for earthworms provided by Efroymson et al. (1997b).

Condition of the Vegetative Community An additional site investigation activity was conducted to assess whether the historically documented 400-ft^2 area of stressed vegetation west of Building 1753 is still present. On May 14, 2002, a CH2M HILL environmental specialist visited the area. There was no stressed vegetation and saplings were growing within the area suspected to be historically bare. With respect to vegetation density, the area behind Building 1753 is no different than the majority of the surrounding forest. No invertebrates were found in the soil in the suspect area. However, invertebrates were also absent in other nearby areas not impacted by the site.

5.7.4.4 Uncertainty

There is uncertainty associated with the fact that there were some chemicals that were not detected, but had mean concentrations (based on one-half the detection limits) that exceeded direct contact screening values. These occurrences were limited (5 percent of the cases). Of these, the average detection limit to site average ratio was low at 2.4.

Screening values were also not available for some organics. The majority of these occurrences were for compounds that were not detected. The relatively few detections of SVOCs, VOCs, and explosives tended to be at low concentrations, and, for those with screening values, HQs were all less than 1. Overall, the frequency of detection and magnitude of detections clearly indicated that organics are not of concern at the site. As such, the lack of screening values for some organics carries only a limited amount of uncertainty.

The few unavailable ingestion-based screening values were associated with compounds that were not detected at the site.

There is also some uncertainty associated with the toxicological evaluation in the risk characterization section. While some hypotheses about the form of a contaminant (e.g., insoluble or soluble) at the site can be generated relative to the form used in the toxicity testing effort from which the screening values were generated, the form at the site is unknown unless tested. While the weight of these discussions in risk management may not be great, consideration of the applicability of the screening values to the site is important.

5.7.4.5 Risk Conclusion

The results of the risk assessment indicate that chemicals in the soil at Site 13 pose minimal risk to ecological receptors. Supporting evidence is as follows:

There were no LOAEL-based HQs in excess of 1 for upper trophic level for the average exposure case;

Concentrations of several of the metals that exceeded screening values were comparable to background;

The areal extent of concentrations in excess of screening values is small.

Toxicity evaluations for the three metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely; and

The historically documented area of stressed vegetation is not currently present.

5.8 Summary and Conclusions

5.8.1 General

An RI was conducted at Site 13 (Paint Solvents Disposal Ground). The objective of the RI was to determine whether surface and subsurface soils have been contaminated by solvent disposal. Field activities were conducted between July 17 and July 31, 2000. The work consisted of surface and subsurface soil sampling.

Silty clay was encountered in the shallow subsurface. This is underlain by a sandy clay layer or layers followed by alternating layers of well sorted sand and poorly sorted sandy gravelly silty clay mixtures to a depth of 30 ft bgs. All of these layers are consistent with descriptions of the Quaternary deposits.

The water table was not encountered during drilling activities conducted at the site; however configuration of the water table likely resembles the surface topography. Because the site slopes gently to the west it is likely that this is the general flow direction of groundwater.

The RI objective was met. No evidence of significant solvent disposal was detected. The presence of some inorganics at concentrations above background levels suggest contamination by materials other than solvents.

5.8.2 Nature and Extent of Contamination

Arsenic, barium, cadmium, copper and mercury were detected in all nine of the surface soil samples and exceeded the facilitywide background 95 percent UCL with one or more detections. The presence of these metals in most of the samples and the exceedances of the facilitywide background 95 percent UCL may be indicative of past land use, although for some it may only indicate elevated background levels.

Barium and copper were detected in all five, arsenic was detected in four, and cadmium was detected in one of the five subsurface soil samples. Arsenic was the only metal with a detection to exceed the facilitywide background 95 percent UCL in the subsurface soil. The lack of metal detections in the subsurface soils that exceeded the facilitywide background 95 percent UCL may indicate that those exceedances from the surface soils are related to past land use. The presence of arsenic in nearly every sample may be indicative of elevated background levels.

TPH DRO was detected in all nine of the surface soil samples, with the highest concentrations in the woods west of Building 1753. TPH GRO was detected in one surface soil sample and one subsurface soil sample. These detections are likely a result of past land use.

Thirteen SVOCs and five VOCs were detected in the surface soil. SVOCs were detected in low levels in all nine samples, while VOCs were detected at low levels in six samples. Two SVOCs and one VOC were each detected once below their Practical Quantitation Limits (PQLs) in the subsurface soil. These SVOC and VOC detections are likely a result of past land use.

2, 6-Dinitrotoluene was detected in two surface soil samples located west and southwest of Building 1753 just inside the woods. These detections are likely indicative of past land use.

5.8.3 Human Health Risk Assessment

The risk assessment indicates that there are no potential unacceptable human health hazards or risks to current or potential future receptors who may contact Site 13 soil. Only one receptor, the future child resident, had a calculated hazard above USEPA's target level. Arsenic, chromium, iron, and manganese are the dominant contributors to this health hazard (Appendix G.2d, Table 10.1.RME). When the hazard is separated by target organ, however, there are no hazards greater than 1.0 to a target organ. Additionally, the health hazard posed to the future CT child resident is within the acceptable range (Appendix G.2d, Table 9.10.CT).

Therefore, it does not appear that exposure to site soil would result in a significant health risk to any of the potential receptors at Site 13. Additionally, based on the historic use of the site, the presence of the inorganic constituents chromium, iron, and manganese at Site 13 may not be related to past land use. The concentrations of chromium and manganese in the site soil appear to be similar to the concentrations detected in the background sample. The concentration of iron in site soil appears to be greater than the concentration detected in the background sample. The comparison between the site soil concentration and the background soil concentration is qualitative. A statistical comparison could not be made between the two data sets as only one background soil sample was analyzed, which is a statistical limitation on the background data set..

Although arsenic poses a carcinogenic risk greater than 10^{-5} to the future lifetime resident, at $2x10^{-5}$, the estimated risk is within the target range of 10^{-4} to 10^{-6} (Appendix G.2d, Table 9.5.RME).

5.8.4 Ecological Risk Assessment

The results of the risk assessment indicate that chemicals in the soil at Site 13 pose minimal risk to ecological receptors. Supporting evidence is as follows:

There were no LOAEL-based HQs in excess of 1 for upper trophic level for the average exposure case.

Concentrations of several of the metals that exceeded screening values were comparable to background.

Toxicity evaluations for the three metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely.

Concentrations of the same three metals decrease with distance from the site.

5.9 Conclusions

Human health or ecological risks were not identified in soil at levels that require remediation. Consequently, no further action was recommended for this site. The EPA and MDE, however, recommended that a monitoring well be installed and sampled to assess impact to groundwater. Appendix I provides the technical memorandum, in which the results indicate that operations at Building 870 have not impacted groundwater and have only minimally impacted soil. These results confirm the initial recommendation for no further action for Site 13. The Navy with the EPA and MDE concur with the recommendation for no further action.

5.10 References

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Table 5-1
Detected Compounds in Site 13 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS13SO01		IS13SO02	IS13SO03	IS13SO04A	IS13SO05		IS13SO06
Sample ID	IS13SS010001	IS13SS010001P	IS13SS020001	IS13SS030001	IS13SS040001	IS13SS050001	IS13SS050001P	IS13SS060001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/31/00	07/31/00	07/31/00	07/18/00
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,2-Trichloroethane								
Acetone			37					
Methyl acetate		7.2 J	33 J	14 J				2.4 J
Methylene chloride			2.1 J					
Toluene								
Semi-volatile Organic Compounds (UG/KG)								
Acetophenone	220 J	520	570	330 J				120 J
Benzaldehyde	170 J	290 J	410 J	240 J				100 J
Benzo(a)anthracene							180 L	
Benzo(a)pyrene		67 J			52 J		41 L	
Benzo(b)fluoranthene		66 J			95 J	47 J	320 L	
Benzo(k)fluoranthene							110 L	
Chrysene		69 J			52 J	40 J	240 L	
Fluoranthene		58 J			55 J	56 J	380 L	46 J
Indeno(1,2,3-cd)pyrene		52 J			43 J			
Phenanthrene							120 L	
Phenol		110 J	150 J					
Pyrene	97 J	210 J			110 J		200 L	140 J
bis(2-Ethylhexyl)phthalate					220 J		110 L	
Explosives (UG/KG)								
2,6-Dinitrotoluene			600	540				
Total Metals (MG/KG)								
Aluminum	5,120	4,100	3,580	3,990	8,490	6,510	6,470	9,170
Arsenic	4.5 L	6.4 L	8.1 L	5.7 L	6.3	11	10.6	3.4 L
Barium	40.6 J	58.7 J	37.7 J	67	55.4	105	71.4	26.3 J
Cadmium	0.21 J	0.34 J	0.38 J	0.58 J	0.82 J	1 J	1.3	
Calcium	695 J	1,200 J	693 J	1,500 J	2,110	4,660	2,250	235
Chromium	11.7	11.8	14.7	10.2	29.8	22.7	24.3	11.7 L
Cobalt	8 L	14.7 L	4.9 L	14.3 L	7.2 J	5.9 J	6.4 J	3.2 J
Copper	7.7	11.7	9.1	7.2 J	14.5	17	17.4	5.8 J

J - Estimated Value
K - Biased high
L - Biased low
I - A peak was found in the diphenyl ether channel. The presence of interferences in indicated.

Table 5-1
Detected Compounds in Site 13 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS13SO01				IS13SO02		IS13SO03		IS13SO04A		IS13SO05				IS13SO06	
Sample ID	IS13SS010001		IS13SS010001P		IS13SS020001		IS13SS030001		IS13SS040001		IS13SS050001		IS13SS050001P		IS13SS060001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/31/00		07/31/00		07/31/00		07/18/00	
Chemical Name																
Iron	8,430		11,800		16,800		7,150		13,000	J	13,900	J	15,000	J	11,700	J
Lead	47.1		84		71.4		59.1		211	K	112	K	153	K	13.2	J
Magnesium	378	J	366	J	262	J	478	J	1,510	J	2,030	J	2,550	J	521	J
Manganese	285		600		154		326		214	J	119	J	130	J	64.7	L
Mercury	0.18	L	0.17	L	0.58	L	0.27	L	0.23		0.14		0.14			
Nickel	4.2	J	5	J	5.1	J	6.6	J	12.8		33.8	J	34.2		4.5	J
Potassium	230	J	235	J	243	J	287	J	372	J	382	J	386	J	389	J
Selenium																
Vanadium	20		23.3		34.6		25.7		23.6		24.7		26		21.8	
Zinc	61	J	91.9	J	39.2	J	150	J	444	J	247	J	164	J	22.2	J
Wet Chemistry (MG/KG)																
% Moisture	22.7		34.5		42.1		30.3		21.7		17.6		18		14.8	
% Solids	64.8		68		60.3		70.8		79.4		81.7		82.1		86.2	
Total organic carbon (TOC)	72,900		33,400		247,000		113,000		14,900		26,300		36,200		26,000	
pH	5.8		5.9		4.6		4.8		6.8		6.8		6.7		5.2	
Total Petroleum Hydrocarbons (MG/KG)																
TPH-diesel range	60		70		1,400		110		22		9.9		16		27	
Total petroleum hydrocarbons (TPH)																

J - Estimated Value
K - Biased high
L - Biased low
I - A peak was found in the diphenyl ether channel. The presence of interferences in indicated.

Table 5-1
Detected Compounds in Site 13 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,2-Trichloroethane	20	I						
Acetone								
Methyl acetate					2.8	J		
Methylene chloride								
Toluene	3.1	J			1.6	J		
Semi-volatile Organic Compounds (UG/KG)								
Acetophenone	94	L	120	J	92	J		
Benzaldehyde					66	J		
Benzo(a)anthracene								
Benzo(a)pyrene								
Benzo(b)fluoranthene								
Benzo(k)fluoranthene								
Chrysene								
Fluoranthene			50	J	55	J		
Indeno(1,2,3-cd)pyrene								
Phenanthrene								
Phenol								
Pyrene								
bis(2-Ethylhexyl)phthalate			47	J				
Explosives (UG/KG)								
2,6-Dinitrotoluene								
Total Metals (MG/KG)								
Aluminum	7,080		8,550		6,340		6,370	J
Arsenic	5.7	L	4.1	L	10.1	L	5.1	L
Barium	30.9	J	23.9	J	21.1	J	29.3	J
Cadmium					0.21	J		
Calcium	269	J	193		173	J	2,420	
Chromium	11	L	9.1	L	9.6		28.9	L
Cobalt	3.4	J	7.2	J	2.8	L	2.6	J
Copper	7	J	5.4	J	9.7		4.1	J

J - Estimated Value
K - Biased high
L - Biased low
I - A peak was found in the diphenyl ether channel. The presence of interferences in indicated.

Table 5-1
Detected Compounds in Site 13 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
Iron	8,550	J	11,900	J	9,960		20,800	J
Lead	36	J	22.9	L	41.7		9.6	J
Magnesium	340	J	429	J	345	J	1,990	
Manganese	50.1	L	157	L	29.6		95.1	L
Mercury	0.27	J	0.12	J	0.2	L		
Nickel	4.9	J	3.5	J	6.3	J	3.4	J
Potassium	285	J	226	J	321	J	2,620	
Selenium					1.4	L		
Vanadium	23.2		19.7		27.8		20.4	
Zinc	29.7	J	16.5	J	23.4	J	28.3	J
Wet Chemistry (MG/KG)								
% Moisture	48.7		17.6		30.3		32.2	
% Solids	57.4		83		59.9		76	
Total organic carbon (TOC)	165,000		49,600		127,000		7,490	
pH	4.8		4.9		4.5		7	
Total Petroleum Hydrocarbons (MG/KG)								
TPH-diesel range	110		300		30		7.1	
Total petroleum hydrocarbons (TPH)					30			

J - Estimated Value
K - Biased high
L - Biased low
I - A peak was found in the diphenyl ether channel. The presence of interferences in indicated.

Table 5-2
Detected Compounds in Site 13 Subsurface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS13SO01		IS13SO02		IS13SO03		IS13SO04B		IS13SO05	
Sample ID	IS13SB011920		IS13SB021719		IS13SB032527		IS13SB042830		IS13SB052425	
Sample Date	07/17/00		07/31/00		07/31/00		07/31/00		07/31/00	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
Methylene chloride							1.2	J		
Semi-volatile Organic Compounds (UG/KG)										
Diethylphthalate	310	J								
Pyrene					83	J				
Total Metals (MG/KG)										
Aluminum	3,970		3,680		1,330		5,820		4,590	
Arsenic	2	L	0.97	J			12.8		9.4	
Barium	13.5	J	14.3	J	5.8	J	25.5	J	15.6	J
Cadmium	0.2	J								
Calcium							74.9	J		
Chromium	5.3		4.7		4.4		26.8		32.1	
Cobalt	5.3	L	2.8	J	2.5	J	3.7	J	3.6	
Copper	8.8		5.3	J	2.6	J	8.3		6.7	
Iron	13,800		10,600	J	2,790	J	31,400	J	24,900	J
Lead	3.4		4.1	K	1.2	K	7.1	K	4.6	K
Magnesium	362	J	332	J	150	J	152	J	172	J
Manganese	67.6		62.6	J	30.8	J	96.2	J	69.5	J
Nickel	6.5	J	3.5	J	2.1	J	6.1	J	5.6	J
Potassium	468	J	398	J	153	J	336	J	346	J
Vanadium	17.7		12.2		5.6	J	18.8		15	
Zinc	25.1	J	12.6	J	5.9	J	16.8	J	16.7	J
Wet Chemistry (MG/KG)										
% Moisture	5.6		7.2		7.2		11.5		12.6	
% Solids	94.7									
pH	5.8									
Total Petroleum Hydrocarbons (MG/KG)										
TPH-gas range									66	

J - Estimated Value
K - Biased high
L - Biased low

TABLE 5-3
Conceptual Site Model for Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Surface Soil:
• Transport of organic and inorganic contaminants via erosion and deposition in the drainage swales. Once deposited as sediment, limited desorption and dissolution into surface water for short distances downstream. • Limited leaching of organic and inorganic contaminants from the surface soil to the subsurface soil via the infiltration of precipitation. • Some bioaccumulation of inorganic and organic compounds in ecological receptors. • Very slow biodegradation of organic compounds.
Subsurface Soil:
• Limited leaching of inorganic contaminants to the groundwater via the infiltration of precipitation.

Table 5-4
Summary of Data Quantitatively Used in Risk Assessment-Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Medium	Date of Sampling	Sample Locations	Parameters
Soil			
Subsurface Soil (Below 2 feet)	07/17/2000	IS13SB011920	EXPLO, METAL, SVOA, VOA
	07/31/2000	IS13SB021719	METAL, SVOA, VOA
	07/31/2000	IS13SB032527	EXPLO, METAL, SVOA, VOA
	07/31/2000	IS13SB042830	EXPLO, METAL, SVOA, VOA
	07/31/2000	IS13SB052425	EXPLO, METAL, SVOA, VOA
Surface Soil (0 to 6 inches)	07/18/2000	IS13SS010001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS13SS010001P	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS13SS020001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS13SS030001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS13SS060001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS13SS070001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS13SS080001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS13SS090001	EXPLO, METAL, SVOA, VOA
	07/31/2000	IS13SS040001	METAL, SVOA, VOA
	07/31/2000	IS13SS050001	METAL, SVOA, VOA
	07/31/2000	IS13SS050001P	METAL, SVOA, VOA
Background Soil			
Surface Soil (0 to 6 inches)	07/18/2000	IS13SS100001	EXPLO, METAL, SVOA, VOA

Table 5-5
Summary of Chemicals of Potential Concern for the HHRA-Site 13 (based on comparison to RBCs)
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Soil	
Surface Soil	**Surface and Subsurface**
Aluminum	Aluminum
Arsenic	Arsenic
Chromium	Chromium
Iron	Iron
Manganese	Manganese
Vanadium	Vanadium

Table 5-6
Exposure Pathways-Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Exposure Route	Current		Future					
		Trespasser/ Visitor		Construction Worker	Industrial Worker	Trespasser/ Visitor		Resident	
		Adult	Adolescents			Adult	Adolescents	Adult	Child
Surface Soil									
	Ingestion	X	X						
	Dermal	X	X						
	Inhalation	NC	NC						
Combined Surface and Subsurface Soil									
	Ingestion			X	X	X	X	X	X
	Dermal			X	X	X	X	X	X
	Inhalation			NC	NC	NC	NC	NC	NC

X Quantitative evaluation (if COPCs selected for pathway).

NC No COPCs retained for this pathway, therefore, not evaluated quantitatively.

Table 5-7
Summary of RME Cancer Risks and Hazard Indices-Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current Trespasser/Visitor Adolescent	Surface Soil	Ingestion	4.9E-07				0.041	
		Dermal Contact	7.5E-08				0.032	
		Inhalation	NA				NA	
		Total	5.7E-07				0.073	
	All Media	Total	5.7E-07				0.073	
Current Trespasser/Visitor Adult	Surface Soil	Ingestion	9.5E-07				0.030	
		Dermal Contact	2.1E-07				0.033	
		Inhalation	NA				NA	
		Total	1.2E-06				0.063	
	All Media	Total	1.2E-06				0.063	
Future Resident Adult	Soil*	Ingestion	NA				0.20	
		Dermal Contact	NA				0.31	
		Inhalation	NA				NA	
		Total	NA				0.51	
	All Media	Total	NA				0.51	
Future Resident Child	Soil*	Ingestion	NA				1.8	
		Dermal Contact	NA				0.41	
		Inhalation	NA				NA	
		Total	NA				2.3	
	All Media	Total	NA				2.3	
Future Resident Child/Adult	Soil*	Ingestion	1.9E-05		Arsenic		NA	
		Dermal Contact	3.0E-06			Arsenic	NA	
		Inhalation	NA				NA	
		Total	2.2E-05		Arsenic		NA	
	All Media	Total	2.2E-05				NA	
Future Construction Worker Adult	Soil*	Ingestion	8.0E-07				0.65	
		Dermal Contact	6.4E-08				0.18	
		Inhalation	NA				NA	
		Total	8.6E-07				0.83	
	All Media	Total	8.6E-07				0.83	
Future Industrial Worker Adult	Soil*	Ingestion	4.2E-06			Arsenic	0.14	
		Dermal Contact	2.1E-06			Arsenic	0.29	
		Inhalation	NA				NA	
		Total	6.3E-06				0.43	
	All Media	Total	6.3E-06				0.43	
Future Trespasser/Visitor Adolescent	Soil*	Ingestion	4.3E-07				0.040	
		Dermal Contact	6.5E-08				0.025	
		Inhalation	NA				NA	
		Total	4.9E-07				0.065	
	All Media	Total	4.9E-07				0.065	
Future Trespasser/Visitor Adult	Soil*	Ingestion	8.3E-07				0.029	
		Dermal Contact	1.8E-07				0.026	
		Inhalation	NA				NA	
		Total	1.0E-06			Arsenic	0.055	
	All Media	Total	1.0E-06				0.055	

NA - Not applicable, pathway incomplete.
PERC = Tetrachloroethene
TCE = Trichloroethene
VC = Vinyl chloride

Table 5-8
Summary of CT Cancer Risks and Hazard Indices-Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future	Soil*	Ingestion	NA				0.41	
Resident		Dermal Contact	NA				0.16	
Child		Inhalation	NA				NA	
		Total	NA				0.57	
	All Media	Total	NA				0.57	

NA - Not applicable, pathway incomplete.
PERC = Tetrachloroethene
TCE = Trichloroethene
VC = Vinyl chloride

Table 5-9
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American robin	0.0452	USEPA 1993	0.01287	allometric equation	0.00761	Levey and Karasov 1989
Red-tailed hawk	0.957	USEPA 1993	0.06796	allometric equation	0.03952	Sample and Suter 1994
Mammals						
Gray fox	3.34	Silva and Downing 1995	0.44636	allometric equation	0.27185	allometric equation
Short-tailed shrew	0.01331	USEPA 1993	0.00475	USEPA 1993	0.00189	USEPA 1993
White-footed mouse	0.0141	Silva and Downing 1995	0.00915	Sample and Suter 1994	0.00073	Sample and Suter 1994

Table 5-9
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American robin	0	95	0	0	0	0	Martin et al. 1951	5	Sample and Suter 1994
Red-tailed hawk	0	0	100	0	0	0	USEPA 1993; Sample and Suter 1994	0	Sample and Suter 1994
Mammals									
Gray fox	32	6	59.2	0	0	0	NISC 1996	2.8	Beyer et al. 1994 (red fox)
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994
White-footed mouse	51	47	0	0	0	0	Martin et al. 1951; Sample and Suter 1994	2	Beyer et al. 1994

Table 5-10
Step 2 Soil Screening - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Inorganics (MG/KG)						
Aluminum	4.4 - 7.3	9 / 9	9,170	IS13SS060001	50	183.40
Antimony	1 - 1.7	0 / 9	--	--	5	0.34
Arsenic	0.85 - 1.4	9 / 9	11.0	IS13SS050001	10	1.10
Barium	0.094 - 0.16	9 / 9	105	IS13SS050001	500	0.21
Beryllium	0.047 - 0.078	0 / 9	--	--	10	0.01
Cadmium	0.094 - 0.16	6 / 9	1.3	IS13SS050001	4	0.33
Chromium	0.47 - 0.78	9 / 9	29.8	IS13SS040001	0.4	74.50
Cobalt	0.52 - 0.86	9 / 9	14.7	IS13SS010001	20	0.74
Copper	0.45 - 0.74	9 / 9	17.4	IS13SS050001	50	0.35
Cyanide	0.59 - 0.98	0 / 7	--	--	27.5	0.04
Iron	6.4 - 10.7	9 / 9	16,800	IS13SS020001	200	84.00
Lead	0.31 - 0.51	9 / 9	211	IS13SS040001	50	4.22
Manganese	0.094 - 0.16	9 / 9	600	IS13SS010001	500	1.20
Mercury	0.059 - 0.098	8 / 9	0.58	IS13SS020001	0.1	5.80
Nickel	0.45 - 0.74	9 / 9	34.2	IS13SS050001	30	1.14
Selenium	1 - 1.7	1 / 9	1.4	IS13SS090001	1	1.40
Silver	0.73 - 1.2	0 / 9	--	--	2	0.60
Thallium	1.2 - 2.1	0 / 9	--	--	1	2.10
Vanadium	0.33 - 0.55	9 / 9	34.6	IS13SS020001	2	17.30
Zinc	0.14 - 0.23	9 / 9	444	IS13SS040001	50	8.88
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	390 - 640	0 / 9	--	--	NSV	NSV
2,2'-Oxybis(1-chloropropane)	390 - 640	0 / 9	--	--	NSV	NSV
2,4,5-Trichlorophenol	970 - 1,600	0 / 9	--	--	430	3.72
2,4,6-Trichlorophenol	390 - 640	0 / 9	--	--	580	1.10
2,4-Dichlorophenol	390 - 640	0 / 9	--	--	13,400	0.05
2,4-Dimethylphenol	390 - 640	0 / 9	--	--	100	6.40
2,4-Dinitrophenol	1,000 - 1,000	0 / 1	--	--	20,000	0.05
2,4-Dinitrotoluene	400 - 420	0 / 2	--	--	NSV	NSV
2,6-Dinitrotoluene	400 - 420	0 / 2	--	--	NSV	NSV
2-Chloronaphthalene	390 - 640	0 / 9	--	--	4,886	0.13
2-Chlorophenol	390 - 640	0 / 9	--	--	100	6.40
2-Methylnaphthalene	390 - 640	0 / 9	--	--	1,730	0.37
2-Methylphenol	390 - 640	0 / 9	--	--	100	6.40
2-Nitroaniline	970 - 1,600	0 / 9	--	--	NSV	NSV
2-Nitrophenol	390 - 640	0 / 9	--	--	NSV	NSV
3,3'-Dichlorobenzidine	390 - 640	0 / 9	--	--	NSV	NSV
3-Nitroaniline	970 -	0 / 9	--	--	NSV	NSV
4,6-Dinitro-2-methylphenol	970 - 1,600	0 / 9	--	--	NSV	NSV
4-Bromophenyl-phenylether	390 - 640	0 / 9	--	--	NSV	NSV

NSV - No Screening Value

Table 5-10
Step 2 Soil Screening - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
4-Chloro-3-methylphenol	390 - 640	0 / 9	--	--	100	6.40
4-Chloroaniline	390 - 640	0 / 9	--	--	NSV	NSV
4-Chlorophenyl-phenylether	390 - 640	0 / 9	--	--	NSV	NSV
4-Methylphenol	390 - 640	0 / 9	--	--	100	6.40
4-Nitroaniline	970 - 1,600	0 / 9	--	--	NSV	NSV
4-Nitrophenol	970 - 1,600	0 / 9	--	--	380	4.21
Acenaphthene	390 - 640	0 / 9	--	--	2,500	0.26
Acenaphthylene	390 - 640	0 / 9	--	--	1,730	0.37
Acetophenone	390 - 640	7 / 9	570	IS13SS020001	NSV	NSV
Anthracene	390 - 640	0 / 9	--	--	1,730	0.37
Atrazine	390 - 640	0 / 9	--	--	NSV	NSV
Benzaldehyde	390 - 640	5 / 9	410	IS13SS020001	NSV	NSV
Benzo(a)anthracene	390 - 640	1 / 9	180	IS13SS050001	1,730	0.10
Benzo(a)pyrene	390 - 640	3 / 9	67.0	IS13SS010001	1,730	0.04
Benzo(b)fluoranthene	390 - 640	3 / 9	320	IS13SS050001	1,730	0.18
Benzo(g,h,i)perylene	390 - 640	0 / 9	--	--	1,730	0.37
Benzo(k)fluoranthene	390 - 640	1 / 9	110	IS13SS050001	1,730	0.06
Butylbenzylphthalate	390 - 640	0 / 9	--	--	NSV	NSV
Caprolactam	390 - 640	0 / 9	--	--	NSV	NSV
Carbazole	390 - 640	0 / 9	--	--	NSV	NSV
Chrysene	390 - 640	3 / 9	240	IS13SS050001	1,730	0.14
Di-n-butylphthalate	390 - 640	0 / 9	--	--	200,000	0.00
Di-n-octylphthalate	390 - 640	0 / 9	--	--	NSV	NSV
Dibenz(a,h)anthracene	390 - 640	0 / 9	--	--	1,730	0.37
Dibenzofuran	390 - 640	0 / 9	--	--	NSV	NSV
Diethylphthalate	390 - 640	0 / 9	--	--	13,400	0.05
Dimethyl phthalate	390 - 640	0 / 9	--	--	10,640	0.06
Fluoranthene	390 - 640	6 / 9	380	IS13SS050001	1,730	0.22
Fluorene	390 - 640	0 / 9	--	--	1,730	0.37
Hexachlorobenzene	390 - 640	0 / 9	--	--	100,000	0.01
Hexachlorobutadiene	390 - 640	0 / 9	--	--	NSV	NSV
Hexachlorocyclopentadiene	390 - 640	0 / 9	--	--	1,000	0.64
Hexachloroethane	390 - 640	0 / 9	--	--	NSV	NSV
Indeno(1,2,3-cd)pyrene	390 - 640	2 / 9	52.0	IS13SS010001	1,730	0.03
Isophorone	390 - 640	0 / 9	--	--	NSV	NSV
Naphthalene	390 - 640	0 / 9	--	--	1,730	0.37
Nitrobenzene	400 - 420	0 / 2	--	--	2,260	0.19
Pentachlorophenol	940 - 1,600	0 / 9	--	--	3,000	0.53
Phenanthrene	390 - 640	1 / 9	120	IS13SS050001	1,730	0.07
Phenol	390 - 640	2 / 9	150	IS13SS020001	1,880	0.08
Pyrene	390 - 640	4 / 9	210	IS13SS010001	1,730	0.12

NSV - No Screening Value

Table 5-10
Step 2 Soil Screening - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
bis(2-Chloroethoxy)methane	390 - 640	0 / 9	--	--	NSV	NSV
bis(2-Chloroethyl)ether	390 - 640	0 / 9	--	--	NSV	NSV
bis(2-Ethylhexyl)phthalate	390 - 640	3 / 9	220	IS13SS040001	28,427	0.01
n-Nitroso-di-n-propylamine	390 - 640	0 / 9	--	--	NSV	NSV
n-Nitrosodiphenylamine	390 - 640	0 / 9	--	--	1,090	0.59
Explosives (UG/KG)						
2,4-Dinitrotoluene	390 - 640	0 / 7	--	--	NSV	NSV
2,6-Dinitrotoluene	390 - 640	2 / 7	600	IS13SS020001	NSV	NSV
Nitrobenzene	390 - 640	0 / 7	--	--	2,260	0.28
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	12.0 - 20.0	0 / 9	--	--	300	0.07
1,1,2,2-Tetrachloroethane	12.0 - 20.0	0 / 9	--	--	300	0.07
1,1,2-Trichloro-1,2,2- trifluoroethane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
1,1,2-Trichloroethane	12.0 - 20.0	1 / 9	20.0	IS13SS070001	300	0.07
1,1-Dichloroethane	12.0 - 20.0	0 / 9	--	--	300	0.07
1,1-Dichloroethene	12.0 - 20.0	0 / 9	--	--	NSV	NSV
1,2,4-Trichlorobenzene	12.0 - 20.0	0 / 9	--	--	1,270	0.02
1,2-Dibromo-3-chloropropane	12.0 - 20.0	0 / 3	--	--	NSV	NSV
1,2-Dibromoethane	12.0 - 20.0	0 / 9	--	--	5,000	0.00
1,2-Dichlorobenzene	12.0 - 20.0	0 / 9	--	--	100	0.20
1,2-Dichloroethane	12.0 - 20.0	0 / 9	--	--	1,897	0.01
1,2-Dichloroethene (total)	14.0 - 14.0	0 / 1	--	--	300	0.05
1,2-Dichloropropane	12.0 - 20.0	0 / 9	--	--	38,800	0.00
1,3-Dichlorobenzene	12.0 - 20.0	0 / 9	--	--	100	0.20
1,4-Dichlorobenzene	12.0 - 20.0	0 / 9	--	--	1,280	0.02
2-Butanone	12.0 - 20.0	0 / 9	--	--	NSV	NSV
2-Hexanone	12.0 - 20.0	0 / 9	--	--	NSV	NSV
4-Methyl-2-pentanone	12.0 - 20.0	0 / 9	--	--	10,000	0.00
Acetone	12.0 - 20.0	1 / 9	37.0	IS13SS020001	NSV	NSV
Benzene	12.0 - 20.0	0 / 9	--	--	497	0.04
Bromodichloromethane	12.0 - 20.0	0 / 9	--	--	45,000	0.00
Bromoform	12.0 - 20.0	0 / 9	--	--	114,700	0.00
Bromomethane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Carbon disulfide	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Carbon tetrachloride	12.0 - 20.0	0 / 9	--	--	1,000,000	0.00
Chlorobenzene	12.0 - 20.0	0 / 9	--	--	2,400	0.01
Chloroethane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Chloroform	12.0 - 20.0	0 / 9	--	--	4,730	0.00
Chloromethane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Cumene	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Cyclohexane	12.0 - 20.0	0 / 9	--	--	NSV	NSV

NSV - No Screening Value

Table 5-10
Step 2 Soil Screening - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Dibromochloromethane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Dichlorodifluoromethane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Ethylbenzene	12.0 - 20.0	0 / 9	--	--	23,674	0.00
Methyl acetate	12.0 - 20.0	5 / 9	33.0	IS13SS020001	NSV	NSV
Methyl-tert-butyl ether (MTBE)	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Methylcyclohexane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Methylene chloride	12.0 - 20.0	1 / 9	2.1	IS13SS020001	4,735	0.00
Styrene	12.0 - 20.0	0 / 9	--	--	47,347	0.00
TPH-gas range	120 - 200	0 / 3	--	--	NSV	NSV
Tetrachloroethene	12.0 - 20.0	0 / 9	--	--	1,897	0.01
Toluene	12.0 - 20.0	2 / 9	3.1	IS13SS070001	61,514	0.00
Trichloroethene	12.0 - 20.0	0 / 9	--	--	28,380	0.00
Trichlorofluoromethane	12.0 - 20.0	0 / 9	--	--	NSV	NSV
Vinyl chloride	12.0 - 20.0	0 / 9	--	--	300	0.07
Xylene, total	12.0 - 20.0	0 / 9	--	--	11,849	0.00
cis-1,2-Dichloroethene	12.0 - 20.0	0 / 9	--	--	300	0.07
cis-1,3-Dichloropropene	12.0 - 20.0	0 / 9	--	--	300	0.07
trans-1,2-Dichloroethene	12.0 - 20.0	0 / 9	--	--	300	0.07
trans-1,3-Dichloropropene	12.0 - 20.0	0 / 9	--	--	300	0.07

NSV - No Screening Value

Table 5-11
Summary of Hazard Quotients for Food Web Exposures, Step 2- Site 13
Site 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		White-footed mouse		Gray fox		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	4.26	0.43	0.73	0.07	0.41	0.04	0.22	0.07	<0.01	<0.01
Cadmium	1.19	0.12	0.26	0.03	0.16	0.02	1.11	0.08	<0.01	<0.01
Chromium	0.13	0.01	0.02	<0.01	0.02	<0.01	1.78	0.36	0.13	0.03
Copper	0.11	0.08	0.02	0.02	0.03	0.02	0.03	0.02	<0.01	<0.01
Lead	1.44	0.14	0.25	0.03	0.23	0.02	10.74	1.07	0.11	0.01
Mercury	2.88	0.58	0.71	0.14	0.08	0.05	0.26	0.13	<0.01	<0.01
Nickel	0.18	0.09	0.04	0.02	0.02	0.01	0.12	0.09	<0.01	<0.01
Selenium	0.96	0.58	0.28	0.17	0.22	0.13	0.53	0.15	0.02	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.86	0.43	0.20	0.10	1.08	0.11	12.41	1.37	0.51	0.06
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.01	<0.01	<0.01
Hexachlorobenzene	0.09	<0.01	0.02	<0.01	<0.01	<0.01	2.23	0.22	0.03	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.33	0.03	0.07	<0.01	0.04	<0.01	0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

Table 5-12
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American robin	0.0452	Sample and Suter 1994	0.00741	allometric equation	0.00162	Levey and Karasov 1989
Red-tailed hawk	1.126	Sample and Suter 1994	0.06388	allometric equation	0.03603	Sample and Suter 1994
Mammals						
Gray fox	4.21	Silva and Downing 1995	0.36098	allometric equation	0.22393	allometric equation
Short-tailed shrew	0.01687	USEPA 1993	0.00376	USEPA 1993	0.00149	USEPA 1993
White-footed mouse	0.0208	Silva and Downing 1995	0.00624	Sample and Suter 1994	0.00050	Sample and Suter 1994

Table 5-12
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
IHDIV-NSWC
Indian Head, Maryland

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American robin	0	95	0	0	0	0	0	5	Martin et al. 1951
Red-tailed hawk	0	0	100	0	0	0	USEPA 1993; Sample and Suter 1994	0	Sample and Suter 1994
Mammals									
Gray fox	32	6	59.2	0	0	0	NISC 1996	2.8	Beyer et al. 1994 (red fox)
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994
White-footed mouse	51	47	0	0	0	0	Martin et al. 1951; Sample and Suter 1994	2	Beyer et al. 1994

Table 5-13
Step 3 Soil Screening - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Inorganics (MG/KG)							
Aluminum	4.4 - 7.3	9 / 9	9,170	IS13SS060001	6,537	50	130.73
Antimony	1 - 1.7	0 / 9	--	--	0.62	5	0.12
Arsenic	0.85 - 1.4	9 / 9	11.0	IS13SS050001	6.76	10	0.68
Barium	0.094 - 0.16	9 / 9	105	IS13SS050001	47.3	500	0.09
Beryllium	0.047 - 0.078	0 / 9	--	--	0.047	10	0.00
Cadmium	0.094 - 0.16	6 / 9	1.3	IS13SS050001	0.43	4	0.11
Chromium	0.47 - 0.78	9 / 9	29.8	IS13SS040001	14.7	0.4	36.72
Cobalt	0.52 - 0.86	9 / 9	14.7	IS13SS010001	7.12	20	0.36
Copper	0.45 - 0.74	9 / 9	17.4	IS13SS050001	9.76	50	0.20
Cyanide	0.59 - 0.98	0 / 7	--	--	0.30	27.5	0.01
Iron	6.4 - 10.7	9 / 9	16,800	IS13SS020001	11,762	200	58.81
Lead	0.31 - 0.51	9 / 9	211	IS13SS040001	76.9	50	1.54
Manganese	0.094 - 0.16	9 / 9	600	IS13SS010001	192	500	0.38
Mercury	0.059 - 0.098	8 / 9	0.58	IS13SS020001	0.22	0.1	2.24
Nickel	0.45 - 0.74	9 / 9	34.2	IS13SS050001	9.21	30	0.31
Selenium	1 - 1.7	1 / 9	1.4	IS13SS090001	0.71	1	0.71
Silver	0.73 - 1.2	0 / 9	--	--	0.45	2	0.22
Thallium	1.2 - 2.1	0 / 9	--	--	0.78	1	0.78
Vanadium	0.33 - 0.55	9 / 9	34.6	IS13SS020001	25.1	2	12.54
Zinc	0.14 - 0.23	9 / 9	444	IS13SS040001	118	50	2.36
Semivolatile Organic Compounds (UG/KG)							
1,1-Biphenyl	390 - 640	0 / 9	--	--	237	NSV	NSV
2,2'-Oxybis(1-chloropropane)	390 - 640	0 / 9	--	--	237	NSV	NSV
2,4,5-Trichlorophenol	970 - 1,600	0 / 9	--	--	598	430	1.39
2,4,6-Trichlorophenol	390 - 640	0 / 9	--	--	237	580	0.41
2,4-Dichlorophenol	390 - 640	0 / 9	--	--	237	13,400	0.02
2,4-Dimethylphenol	390 - 640	0 / 9	--	--	237	100	2.37
2,4-Dinitrophenol	1,000 - 1,000	0 / 1	--	--	500	20,000	0.03
2,4-Dinitrotoluene	400 - 420	0 / 2	--	--	205	NSV	NSV
2,6-Dinitrotoluene	400 - 420	0 / 2	--	--	205	NSV	NSV
2-Chloronaphthalene	390 - 640	0 / 9	--	--	237	4,886	0.05
2-Chlorophenol	390 - 640	0 / 9	--	--	237	100	2.37
2-Methylnaphthalene	390 - 640	0 / 9	--	--	237	1,730	0.14
2-Methylphenol	390 - 640	0 / 9	--	--	237	100	2.37
2-Nitroaniline	970 - 1,600	0 / 9	--	--	598	NSV	NSV
2-Nitrophenol	390 - 640	0 / 9	--	--	237	NSV	NSV
3,3'-Dichlorobenzidine	390 - 640	0 / 9	--	--	237	NSV	NSV
3-Nitroaniline	970 -	0 / 9	--	--	598	NSV	NSV
4,6-Dinitro-2-methylphenol	970 - 1,600	0 / 9	--	--	598	NSV	NSV
4-Bromophenyl-phenylether	390 - 640	0 / 9	--	--	237	NSV	NSV
4-Chloro-3-methylphenol	390 - 640	0 / 9	--	--	237	100	2.37
4-Chloroaniline	390 - 640	0 / 9	--	--	237	NSV	NSV
4-Chlorophenyl-phenylether	390 - 640	0 / 9	--	--	237	NSV	NSV
4-Methylphenol	390 - 640	0 / 9	--	--	237	100	2.37
4-Nitroaniline	970 - 1,600	0 / 9	--	--	598	NSV	NSV
4-Nitrophenol	970 - 1,600	0 / 9	--	--	598	380	1.57
Acenaphthene	390 - 640	0 / 9	--	--	237	2,500	0.09

NSV - No Screening Value

Table 5-13
Step 3 Soil Screening - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Acenaphthylene	390 - 640	0 / 9	--	--	237	1,730	0.14
Acetophenone	390 - 640	7 / 9	570	IS13SS020001	251	NSV	NSV
Anthracene	390 - 640	0 / 9	--	--	237	1,730	0.14
Atrazine	390 - 640	0 / 9	--	--	237	NSV	NSV
Benzaldehyde	390 - 640	5 / 9	410	IS13SS020001	226	NSV	NSV
Benzo(a)anthracene	390 - 640	1 / 9	180	IS13SS050001	234	1,730	0.14
Benzo(a)pyrene	390 - 640	3 / 9	67.0	IS13SS010001	181	1,730	0.10
Benzo(b)fluoranthene	390 - 640	3 / 9	320	IS13SS050001	217	1,730	0.13
Benzo(g,h,i)perylene	390 - 640	0 / 9	--	--	237	1,730	0.14
Benzo(k)fluoranthene	390 - 640	1 / 9	110	IS13SS050001	227	1,730	0.13
Butylbenzylphthalate	390 - 640	0 / 9	--	--	237	NSV	NSV
Caprolactam	390 - 640	0 / 9	--	--	237	NSV	NSV
Carbazole	390 - 640	0 / 9	--	--	237	NSV	NSV
Chrysene	390 - 640	3 / 9	240	IS13SS050001	203	1,730	0.12
Di-n-butylphthalate	390 - 640	0 / 9	--	--	237	200,000	0.00
Di-n-octylphthalate	390 - 640	0 / 9	--	--	237	NSV	NSV
Dibenz(a,h)anthracene	390 - 640	0 / 9	--	--	237	1,730	0.14
Dibenzofuran	390 - 640	0 / 9	--	--	237	NSV	NSV
Diethylphthalate	390 - 640	0 / 9	--	--	224	13,400	0.02
Dimethyl phthalate	390 - 640	0 / 9	--	--	237	10,640	0.02
Fluoranthene	390 - 640	6 / 9	380	IS13SS050001	165	1,730	0.10
Fluorene	390 - 640	0 / 9	--	--	237	1,730	0.14
Hexachlorobenzene	390 - 640	0 / 9	--	--	237	100,000	0.00
Hexachlorobutadiene	390 - 640	0 / 9	--	--	237	NSV	NSV
Hexachlorocyclopentadiene	390 - 640	0 / 9	--	--	237	1,000	0.24
Hexachloroethane	390 - 640	0 / 9	--	--	237	NSV	NSV
Indeno(1,2,3-cd)pyrene	390 - 640	2 / 9	52.0	IS13SS010001	196	1,730	0.11
Isophorone	390 - 640	0 / 9	--	--	237	NSV	NSV
Naphthalene	390 - 640	0 / 9	--	--	237	1,730	0.14
Nitrobenzene	400 - 420	0 / 2	--	--	205	2,260	0.09
Pentachlorophenol	940 - 1,600	0 / 9	--	--	572	3,000	0.19
Phenanthrene	390 - 640	1 / 9	120	IS13SS050001	228	1,730	0.13
Phenol	390 - 640	2 / 9	150	IS13SS020001	206	1,880	0.11
Pyrene	390 - 640	4 / 9	210	IS13SS010001	215	1,730	0.12
bis(2-Chloroethoxy)methane	390 - 640	0 / 9	--	--	237	NSV	NSV
bis(2-Chloroethyl)ether	390 - 640	0 / 9	--	--	237	NSV	NSV
bis(2-Ethylhexyl)phthalate	390 - 640	3 / 9	220	IS13SS040001	211	28,427	0.01
n-Nitroso-di-n-propylamine	390 - 640	0 / 9	--	--	237	NSV	NSV
n-Nitrosodiphenylamine	390 - 640	0 / 9	--	--	237	1,090	0.22
Explosives (UG/KG)							
2,4-Dinitrotoluene	390 - 640	0 / 7	--	--	246	NSV	NSV
2,6-Dinitrotoluene	390 - 640	2 / 7	600	IS13SS020001	334	NSV	NSV
Nitrobenzene	390 - 640	0 / 7	--	--	246	2,260	0.11
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02
1,1,2,2-Tetrachloroethane	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02
1,1,2-Trichloro-1,2,2- trifluoroethane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
1,1,2-Trichloroethane	12.0 - 20.0	1 / 9	20.0	IS13SS070001	8.28	300	0.03

NSV - No Screening Value

Table 5-13
Step 3 Soil Screening - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
1,1-Dichloroethane	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02
1,1-Dichloroethene	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
1,2,4-Trichlorobenzene	12.0 - 20.0	0 / 9	--	--	7.17	1,270	0.01
1,2-Dibromo-3-chloropropane	12.0 - 20.0	0 / 3	--	--	7.33	NSV	NSV
1,2-Dibromoethane	12.0 - 20.0	0 / 9	--	--	7.17	5,000	0.00
1,2-Dichlorobenzene	12.0 - 20.0	0 / 9	--	--	7.17	100	0.07
1,2-Dichloroethane	12.0 - 20.0	0 / 9	--	--	7.17	1,897	0.00
1,2-Dichloroethene (total)	14.0 - 14.0	0 / 1	--	--	7	300	0.02
1,2-Dichloropropane	12.0 - 20.0	0 / 9	--	--	7.17	38,800	0.00
1,3-Dichlorobenzene	12.0 - 20.0	0 / 9	--	--	7.17	100	0.07
1,4-Dichlorobenzene	12.0 - 20.0	0 / 9	--	--	7.17	1,280	0.01
2-Butanone	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
2-Hexanone	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
4-Methyl-2-pentanone	12.0 - 20.0	0 / 9	--	--	7.17	10,000	0.00
Acetone	12.0 - 20.0	1 / 9	37.0	IS13SS020001	8.06	NSV	NSV
Benzene	12.0 - 20.0	0 / 9	--	--	7.17	497	0.01
Bromodichloromethane	12.0 - 20.0	0 / 9	--	--	7.17	45,000	0.00
Bromoform	12.0 - 20.0	0 / 9	--	--	7.17	114,700	0.00
Bromomethane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Carbon disulfide	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Carbon tetrachloride	12.0 - 20.0	0 / 9	--	--	7.17	1,000,000	0.00
Chlorobenzene	12.0 - 20.0	0 / 9	--	--	7.17	2,400	0.00
Chloroethane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Chloroform	12.0 - 20.0	0 / 9	--	--	7.17	4,730	0.00
Chloromethane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Cumene	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Cyclohexane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Dibromochloromethane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Dichlorodifluoromethane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Ethylbenzene	12.0 - 20.0	0 / 9	--	--	7.17	23,674	0.00
Methyl acetate	12.0 - 20.0	5 / 9	33.0	IS13SS020001	9.188888889	NSV	NSV
Methyl-tert-butyl ether (MTBE)	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Methylcyclohexane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Methylene chloride	12.0 - 20.0	1 / 9	2.1	IS13SS020001	5.12	4,735	0.00
Styrene	12.0 - 20.0	0 / 9	--	--	7.17	47,347	0.00
TPH-gas range	120 - 200	0 / 3	--	--	73.3	NSV	NSV
Tetrachloroethene	12.0 - 20.0	0 / 9	--	--	7.17	1,897	0.00
Toluene	12.0 - 20.0	2 / 9	3.1	IS13SS070001	5.8	61,514	0.00
Trichloroethene	12.0 - 20.0	0 / 9	--	--	7.17	28,380	0.00
Trichlorofluoromethane	12.0 - 20.0	0 / 9	--	--	7.17	NSV	NSV
Vinyl chloride	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02
Xylene, total	12.0 - 20.0	0 / 9	--	--	7.17	11,849	0.00
cis-1,2-Dichloroethene	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02
cis-1,3-Dichloropropene	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02
trans-1,2-Dichloroethene	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02
trans-1,3-Dichloropropene	12.0 - 20.0	0 / 9	--	--	7.17	300	0.02

NSV - No Screening Value

Table 5-14
Summary of Hazard Quotients for Food Web Exposures, Step 3A - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		White-footed mouse		Gray fox		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	1.63	0.16	0.21	0.02	0.16	0.02	0.03	<0.01	<0.01	<0.01
Cadmium	0.25	0.02	0.04	<0.01	0.03	<0.01	0.08	<0.01	<0.01	<0.01
Chromium	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	0.04	0.05	0.01
Copper	0.04	0.03	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	0.33	0.03	0.04	<0.01	0.05	<0.01	0.84	0.08	0.03	<0.01
Mercury	0.70	0.14	0.13	0.03	0.02	0.01	0.02	0.01	<0.01	<0.01
Nickel	0.03	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.30	0.18	0.07	0.04	0.07	0.04	0.06	0.02	<0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.14	0.07	0.02	0.01	0.19	0.02	0.71	0.08	0.10	0.01
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	4.00
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.18	0.02	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.07	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

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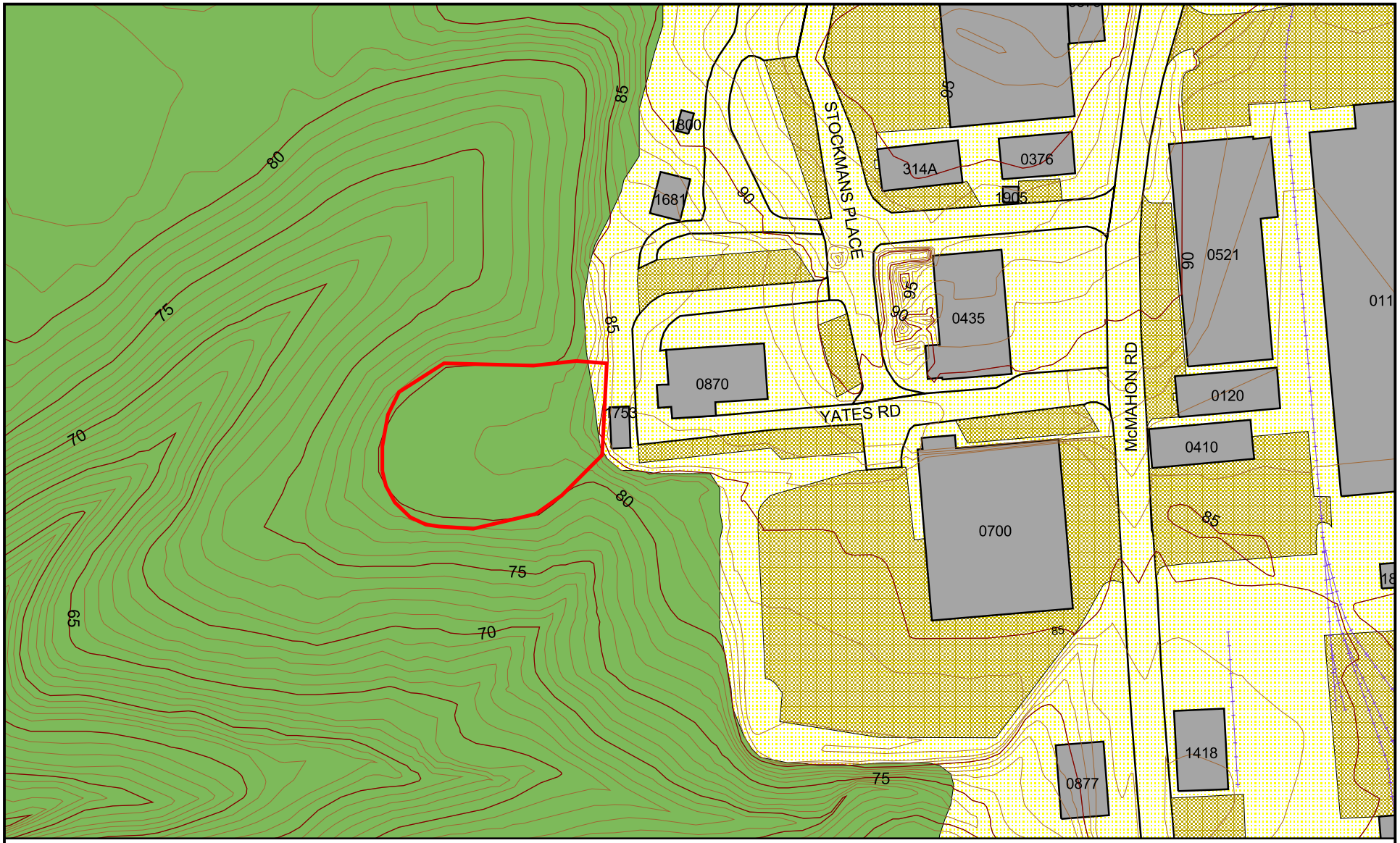

LEGEND

- Wooded Area
- IR Site Boundary
- Buildings
- Parking Area
- Road
- Railroads
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)

N

50 0 50 100 Feet

Figure 5-1
Site 13 Topography
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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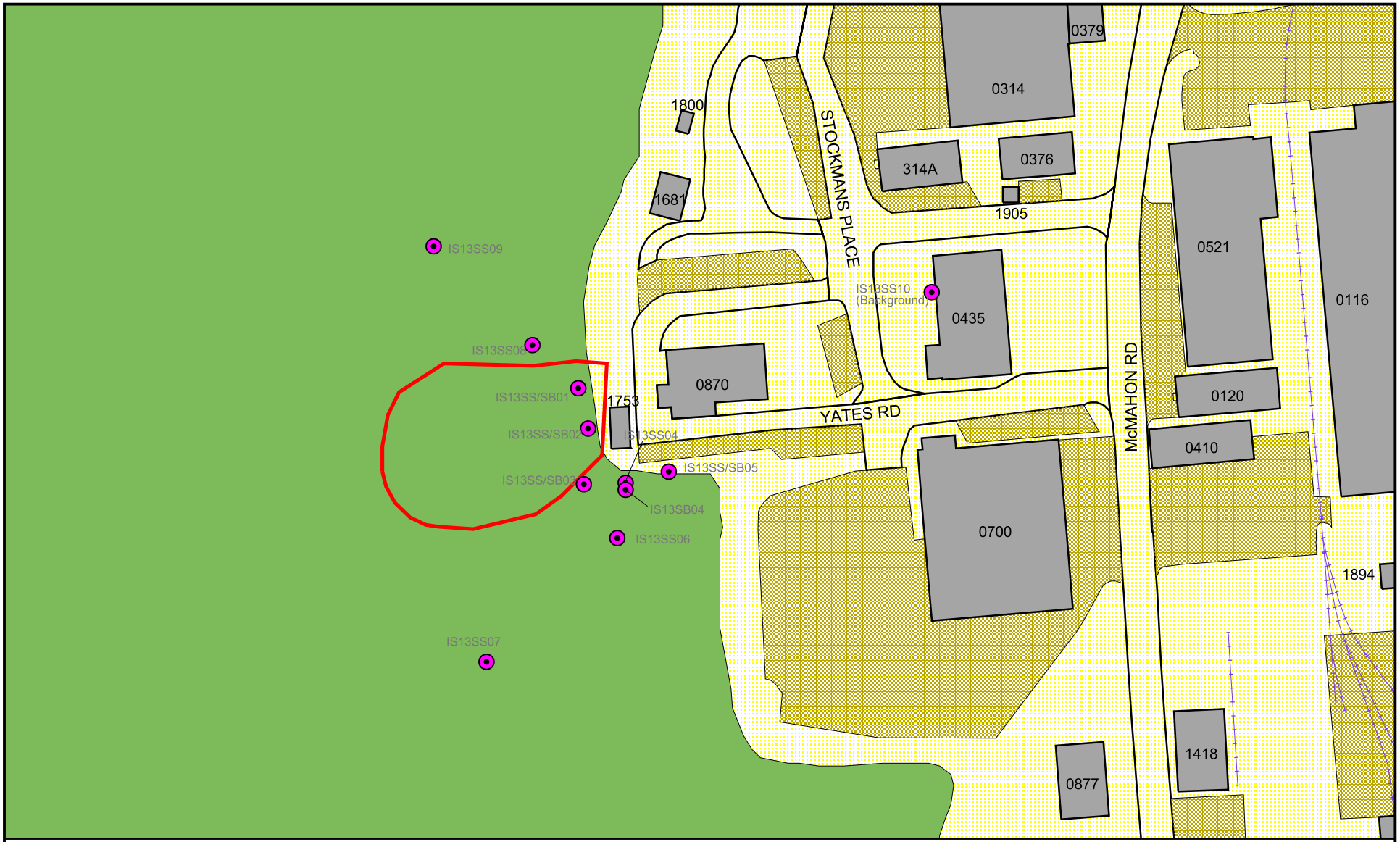

LEGEND

- Soil
- IR Site Boundary
- Buildings
- Parking Area
- Road
- Railroads
- Wooded Area

N

50 0 50 100 Feet

Figure 5-2
Site 13 Sampling Locations
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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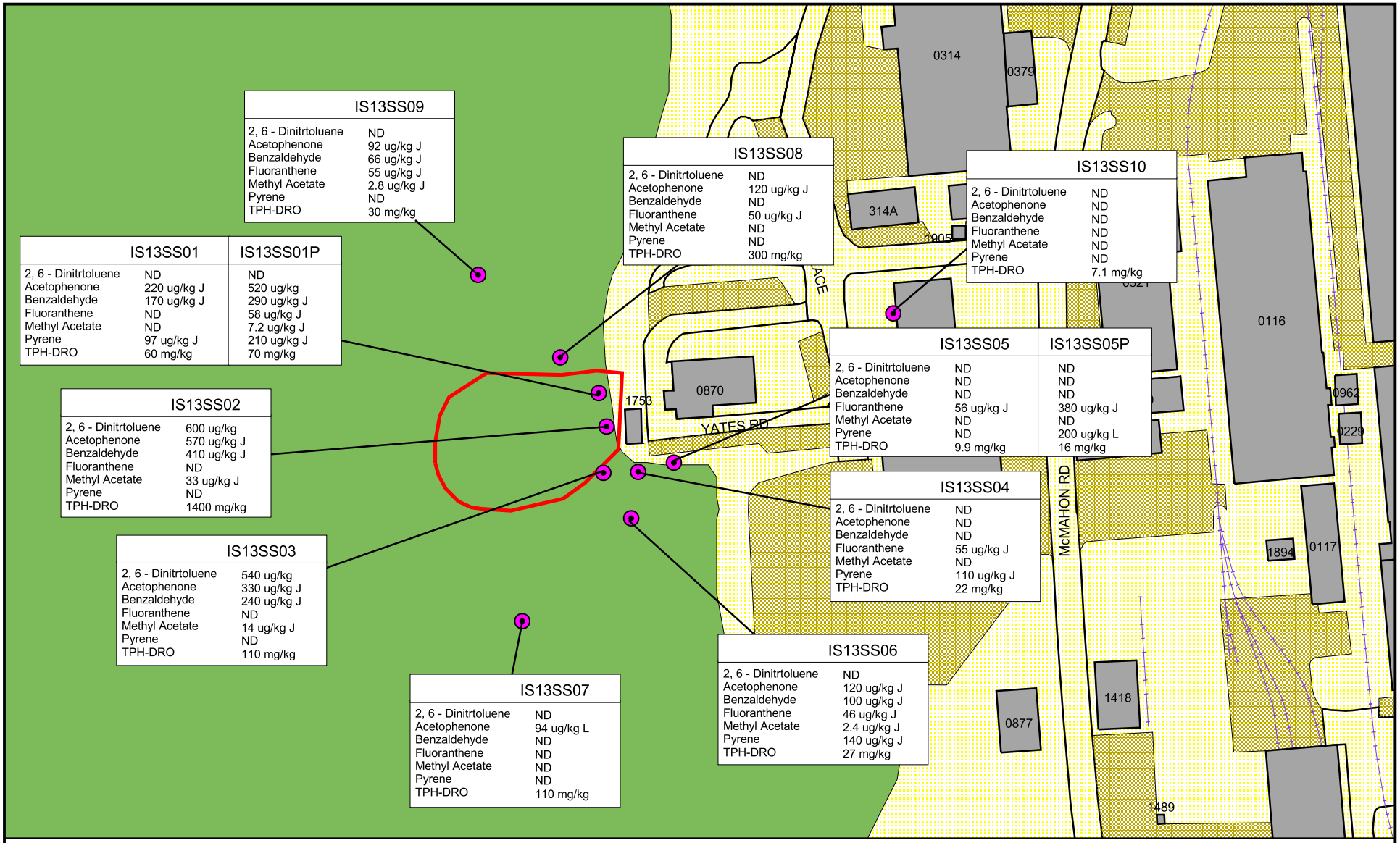

Figure 5-3
Site 13 - VOCs, SVOCs, TPH-DRO, and Explosives in Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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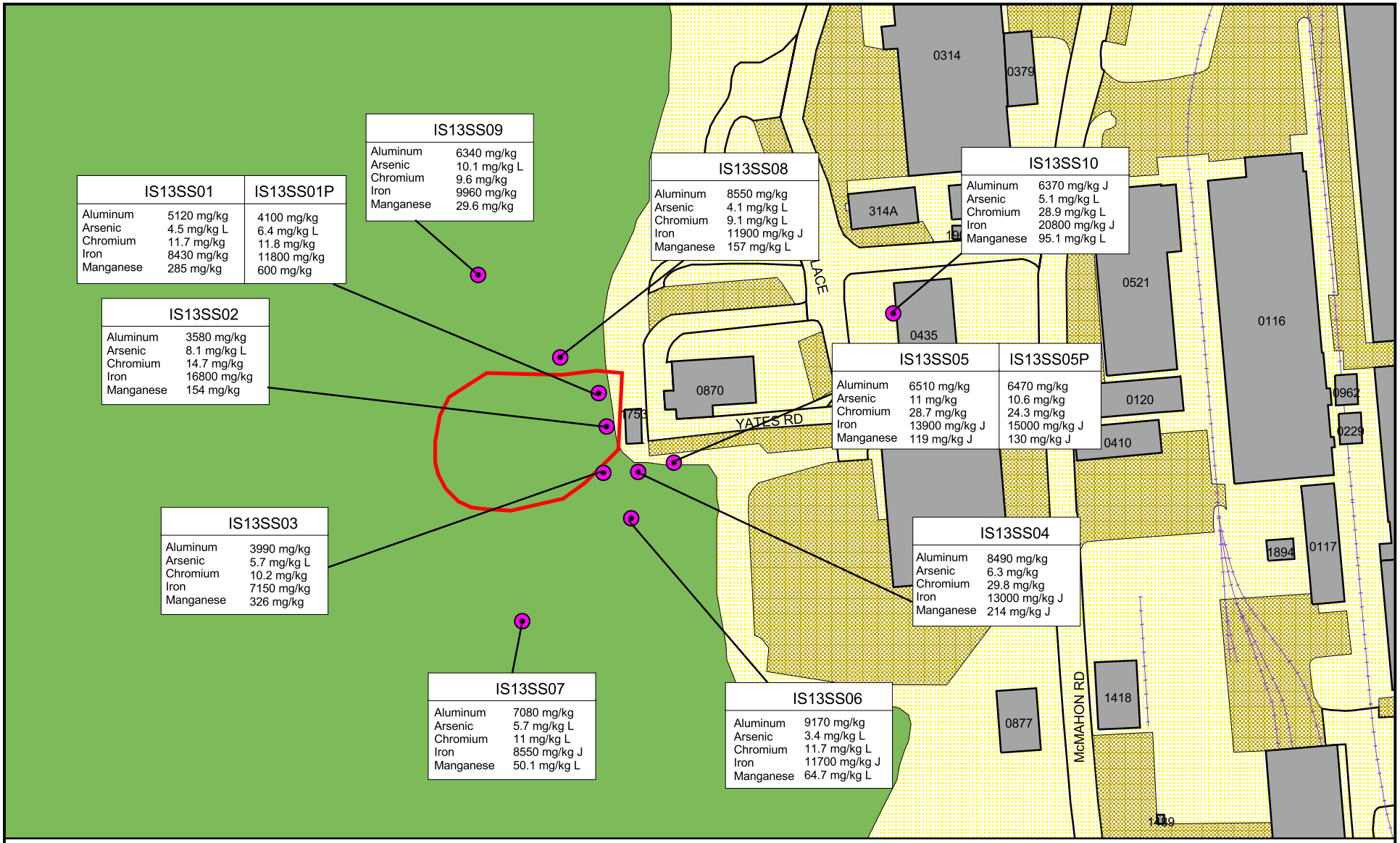

LEGEND

- Soil
- IR Site Boundary
- Buildings
- Parking Area
- Road
- Railroads
- Wooded Area

ND = Non Detect
J = Estimated Value Below the Detection Limit
L = Biased Low
mg/kg = Milligrams per kilogram

N

60 0 60 120 Feet

Figure 5-4
Site 13 - Selected Metals in Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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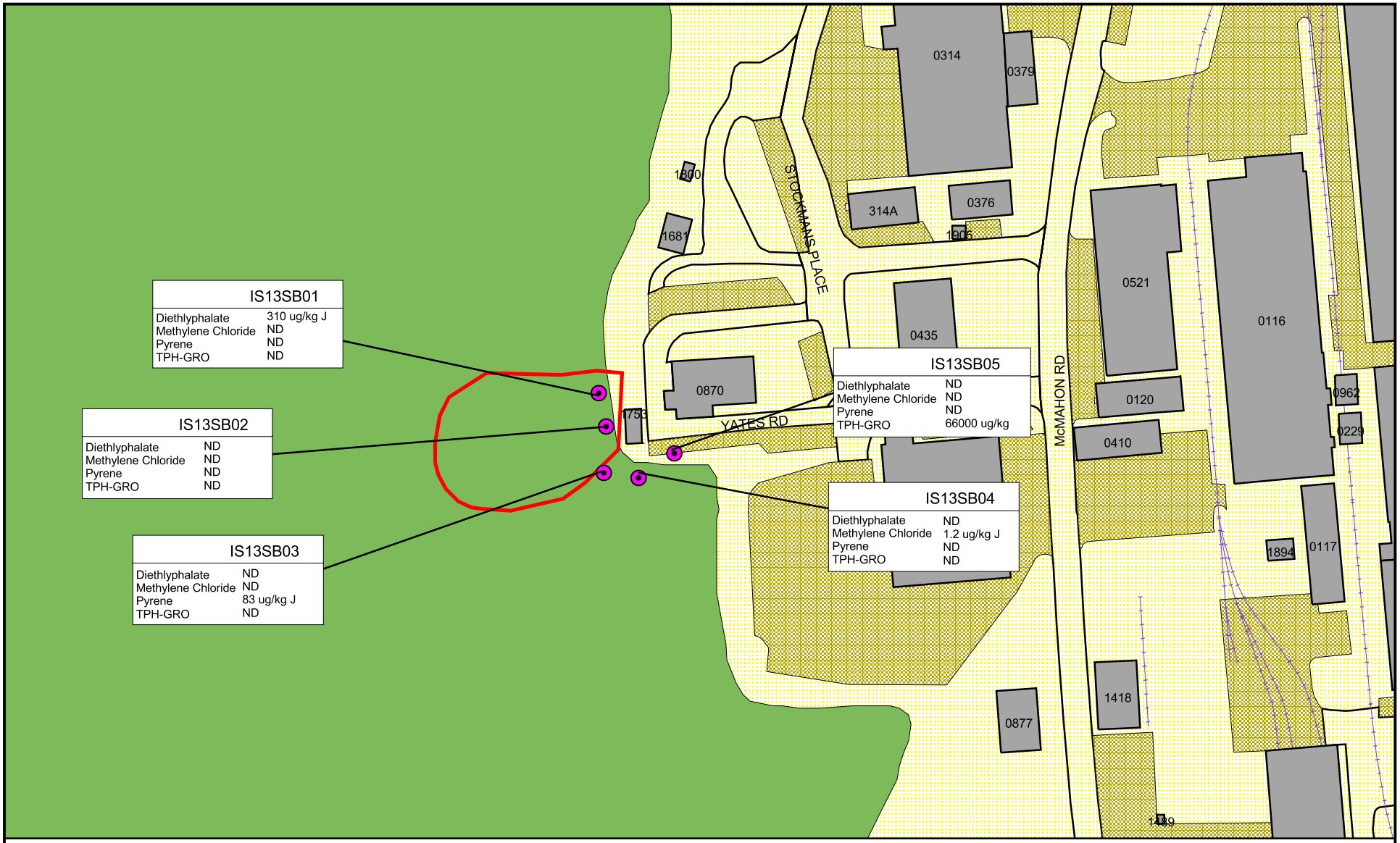

LEGEND

- Soil
- IR Site Boundary
- Buildings
- Parking Area
- Road
- Railroads
- Wooded Area

ND = Non Detect

J = Estimated Value Below the Detection Limit

ug/kg = Micrograms per kilogram

N

60 0 60 120 Feet

Figure 5-5
Site 13 - VOCs, SVOCs and TPH-GRO
In Subsurface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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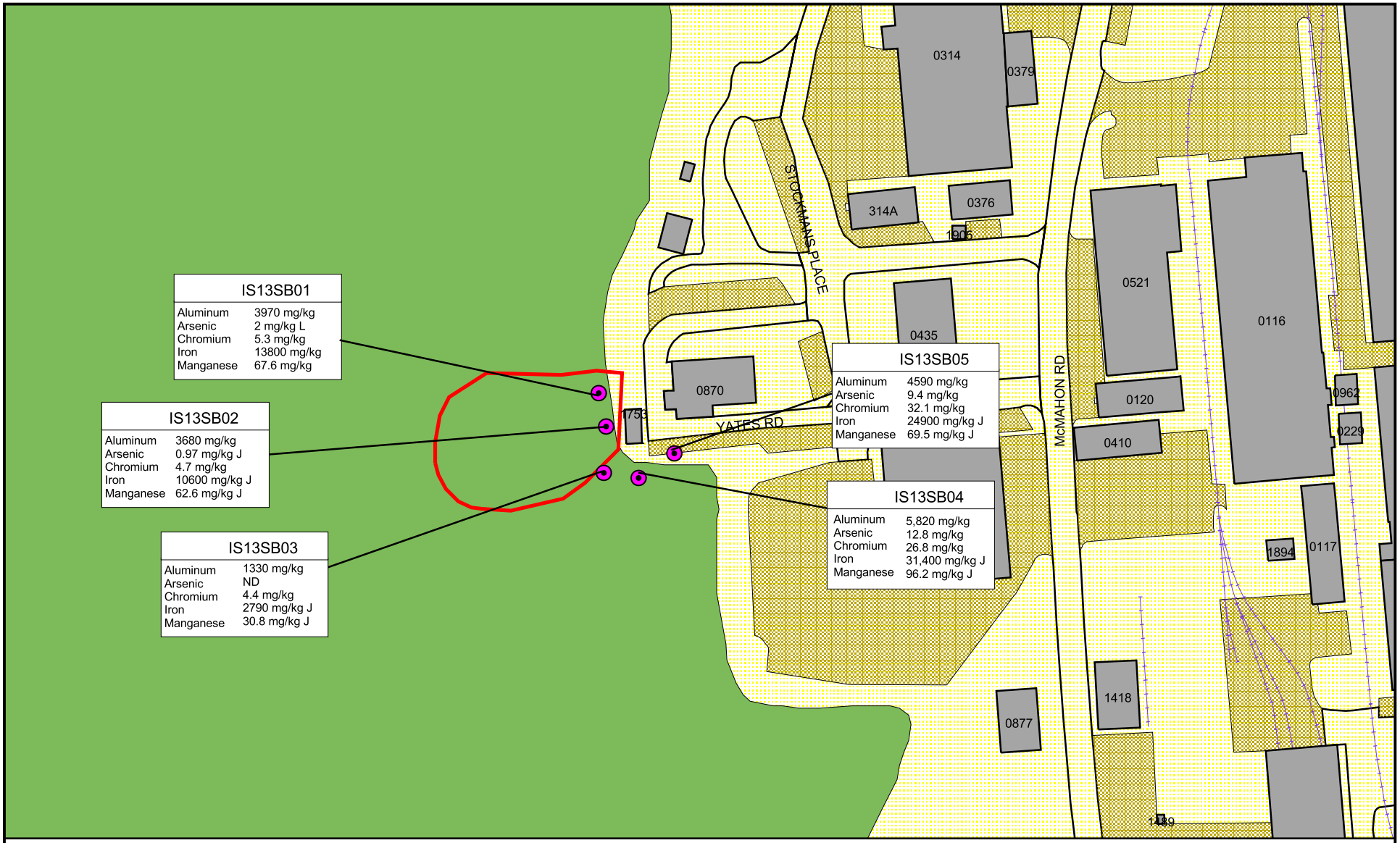


LEGEND

- Soil
- IR Site Boundary
- Buildings
- Parking Area
- Road
- Railroads
- Wooded Area

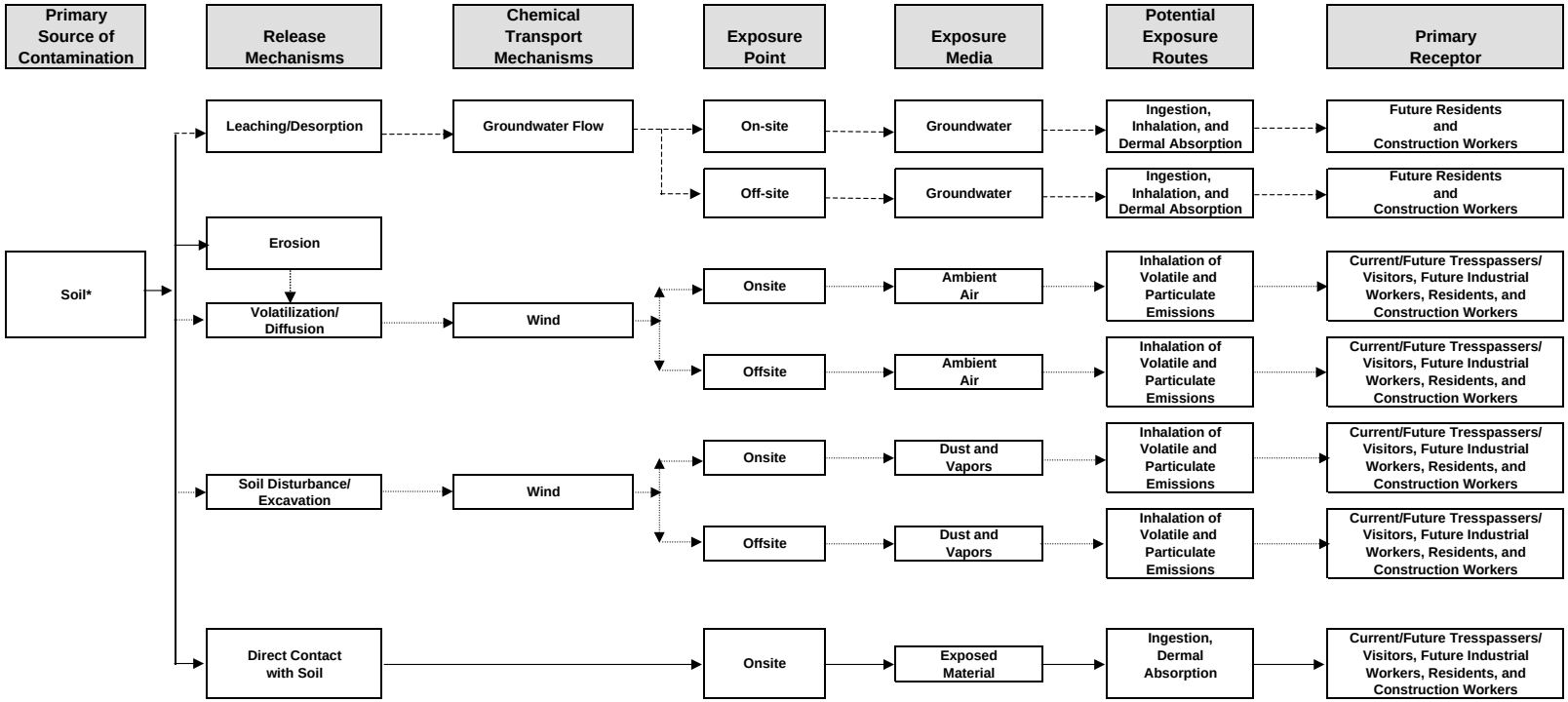
ND = Non Detect
J = Estimated Value Below the Detection Limit
L = Biased Low
mg/kg = Milligrams per kilogram

N

60 0 60 120 Feet

Figure 5-6
Site 13 - Selected Metals in Subsurface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL



* Current scenario is for surface soil and future scenarios are for surface and subsurface soil combined.

Complete Pathway
Incomplete Pathway
Pathway not evaluated because no CPOCs identified

Figure 5-7
Conceptual Exposure Model for Potential Human Exposures-Site 13
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

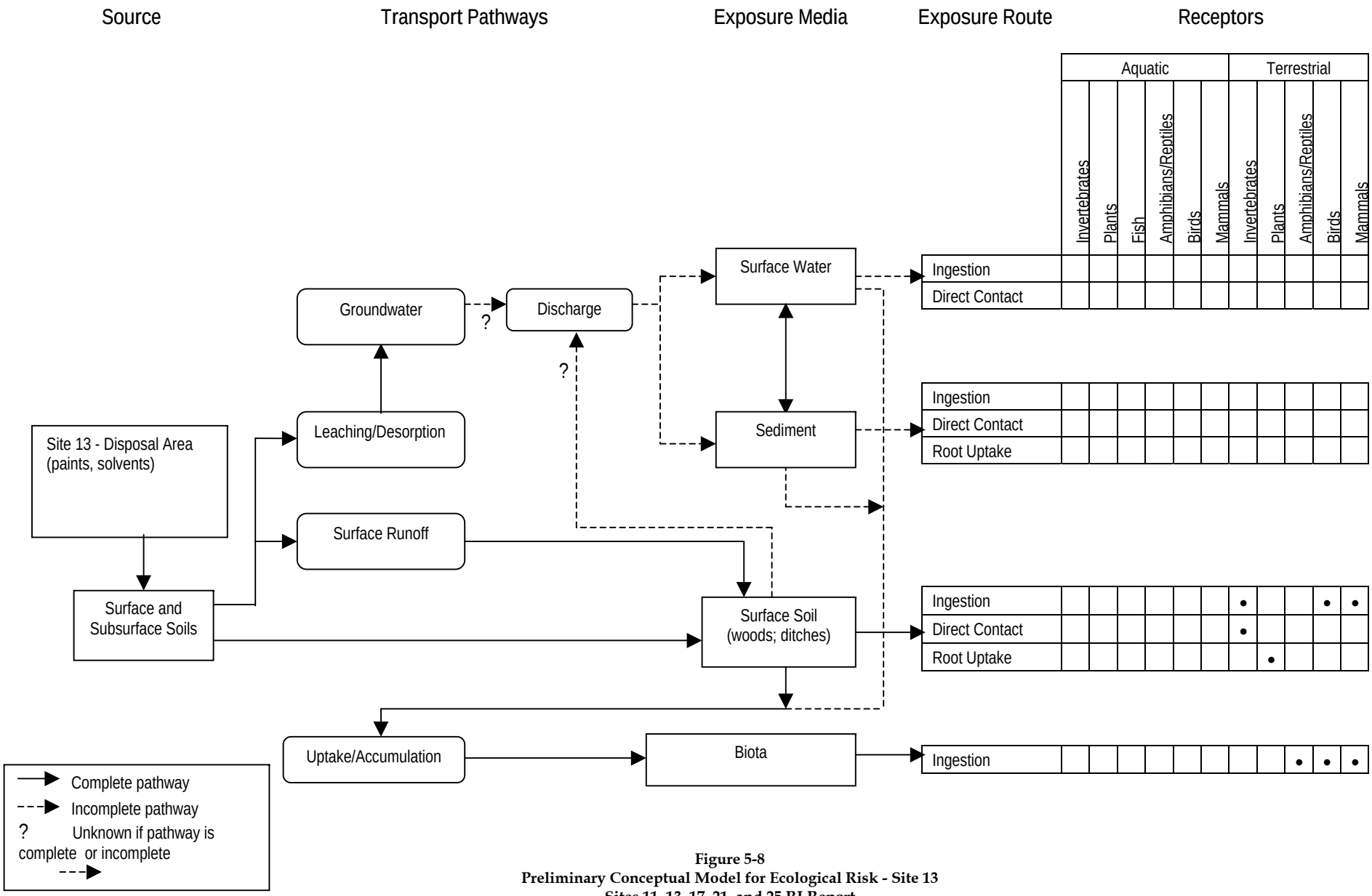


Figure 5-8
Preliminary Conceptual Model for Ecological Risk - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

SECTION 6

Site 17 Discarded Metal Parts Area

An RI was conducted at Site 17, the Discarded Metal Parts Area (Figure 6-1). The objectives of the RI were to: (1) determine whether or not the metal parts disposed of along the shoreline of the Mattawoman Creek contaminated sediment and surface water in the creek, and (2) determine whether or not the drums and/or their contents contaminated the surface and subsurface soil and groundwater in the surrounding area. The objectives of the RI were met by the activities performed, as discussed in this chapter.

6.1 Investigation Activities

The field activities were conducted between July 21 and October 12, 2000. The work consisted of:

- Surface soil sampling
- Subsurface soil sampling
- Monitoring well installation
- Groundwater sampling
- Sediment sampling in the Mattawoman Creek
- Surface water sampling in the Mattawoman Creek

Sampling locations are shown in Figure 6-2.

6.1.1 Surface Soil Sampling

Fifteen surface soil samples (IS17SS01 through IS17SS15) were collected between July 25 and October 12, 2000 at the locations described below and shown in Figure 6-2. The Indian Head laboratory had previously performed an initial sampling and screening for explosives in the drum contents. The results indicated the drum contents were wax. However, because it was not known whether all of the drums disposed of at Site 17 contained wax, surface soil samples were analyzed for a full suite of parameters (VOCs, SVOCs, TAL inorganics, and explosives). Several samples were also sampled for TOC and pH.

- **IS17SS01 through IS17SS10**—collected at locations around the discarded drums.
- **IS17SS11 through IS17SS15**—collected from intermittent stormwater swales located upslope of Site 17.

6.1.2 Subsurface Soil Sampling

Fifteen subsurface soil samples (IS17SB01 through IS17SB15) were collected between July 25 and October 12, 2000 at the locations described below and shown in Figure 6-2. As with the surface soil samples, the surface subsoil samples were analyzed for a full suite of parameters (VOCs, SVOCs, TAL inorganics, and explosives).

- **IS17SB01 through IS17SB10**—collected at locations around the discarded drums.
- **IS17SB11 through IS17SB15**—collected from intermittent stormwater swales located upslope of Site 17.

6.1.3 Monitoring Well Installation

Three shallow monitoring wells (IS17MW01 through IS17MW03) were installed on October 10 and 11, 2000 at the locations described below and shown in Figure 6-2.

- **IS17MW01**—installed along the shore or the Mattawoman Creek at the southwestern end of the site (total depth 12.5 ft bgs).
- **IS17MW02**—installed along the shore or the Mattawoman Creek at the northeastern end of the site (total depth 12 ft bgs).
- **IS17MW03**—installed upgradient of the landfill in the central portion of the site (total depth 19 ft bgs).

Lithologic logs are provided in Appendix A. Well-construction diagrams are provided in Appendix B.

6.1.4 Monitoring Well Sampling

Monitoring well samples IS17MW01 through IS17MW03 were collected from the newly installed wells between October 20 and 24, 2000. As with the soil, the groundwater samples were analyzed for the full suite of parameters (VOCs, SVOCs, total and filtered TAL inorganics, and explosives).

6.1.5 Sediment Sampling

Six sediment samples (IS17SD01 through IS17SD06) were collected on July 21, and 24, 2000, at the locations described below and shown in Figure 6-2. The sediment samples were analyzed for TAL inorganics, explosives, TOC, and pH.

- **IS17SD01 and IS17SD02**—collected along the shoreline of the Mattawoman Creek at locations upstream of the site.
- **IS17SD03 through IS17SD06**—collected along bank of the Mattawoman Creek at locations within the boundaries of the site. IS17SD03, the most upstream location (within the site) was collected at the northeastern corner of the site. Samples IS17SD04, IS17SD05, and IS17SD06 were collected 100 ft apart moving downstream.

6.1.6 Surface Water Sampling

Six surface water samples (IS17SW01 through IS17SW06) were collected on July 21 and 24, 2000, at the locations described below and shown in Figure 6-2. The surface water samples were analyzed for total and filtered TAL inorganics, explosives, and hardness.

- **IS17SW01 and IS17SW02**—collected along the shoreline of the Mattawoman Creek at locations upstream of the site.

- **IS17SW03 through IS17SW06**—collected along bank of the Mattawoman Creek at locations within the boundaries of the site. IS17SW03, the most upstream location (within the site) was collected at the northeastern corner of the site. Samples IS17SW04, IS17SW05, and IS17SW06 were collected 100 ft apart moving downstream.

6.2 Geology

Three boreholes were advanced during the RI to obtain geologic information. Each borehole was converted to a monitoring well. Fill material was encountered in the upper 10 ft of the subsurface. The fill is characterized by greenish clay with silt containing wood fragments.

Soil borings for wells IS17MW01 and IS17MW02 were only advanced to approximately 12 ft bgs; however; the soil boring for well IS17MW03 was advanced to 19 ft bgs. The boring log generated at this location suggests the fill is underlain by Quaternary deposits. At Site 17, the deposits are characterized by a fine to medium sand with some clay.

6.3 Hydrogeology

As discussed in Section 6.2, the site appears to be immediately underlain by fill material, clays, and sands.

The water table was encountered at the site at elevations ranging from 1.35 ft above msl at IS17MW01, located along the shoreline, to 6.72 ft above msl at IS17MW03, located upgradient of Site 17 (Figure 6-3). Groundwater flow is generally from northwest to southeast and discharges to the Mattawoman Creek.

The water table map was produced from water levels measured during a short period of time. It should be noted that the Mattawoman Creek is influenced by the tides and, in turn, it is likely the water table, at least near the creek, is as well. Typically, when an aquifer is influenced by tidal cycles, the water table or potentiometric surface will fluctuate in a harmonic motion. The amplitude (or height) of the fluctuation will decrease with increasing distance from the shoreline. The time between high tide and water level high also will increase with increasing distance from the shore. Tests were not performed to quantify the effects of the tidal cycle on the water table at Site 17. However, the assumption is that the tide would only affect the hydraulic gradient near the shoreline and that the general directions of groundwater flow at the site would not vary greatly from those observed in Figure 6-3.

No tests were performed to estimate the hydraulic conductivity of the subsurface materials. However, Domenico and Schwartz (1998) provide a range of hydraulic conductivities for fine- and medium-grained sand from about 0.05 ft/day to about 140 ft/day.

6.4 Nature and Extent of Contamination

This section discusses the nature and extent of contamination found in soil, groundwater, surface water, and sediment at Site 17. Detected analytical results for all samples analyzed are presented in tables throughout the section. Complete analytical results for all media are provided on the accompanying CD (Appendix L).

The discussion presented below focuses on the contaminants that are most prevalent at Site 17. Some contaminants from each contaminant group (i.e., VOCs, SVOCs, metals, etc.) are discussed. Regulatory and human health-based criteria were not used to select contaminants; however, preference was given to contaminants that generally are recognized to pose the greatest risks to human health and the environment.

The focus on this "short list" of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus this discussion. The baseline human health risk assessment and ecological risk assessment presented in Sections 6.6 and 6.7, respectively, of this chapter formally screen and evaluate all chemicals analyzed for in the various media Site 17 in accordance with established EPA Region III guidance.

In order to identify metals that may be of potential concern at Site 17, the data for inorganic analytes were compared to data presented in the BIR prepared by Brown and Root Environmental (B&RE, 1997). The BIR was conducted to establish a facilitywide background database to be used for current and future investigations. Samples were collected for the various media from areas outside the sites known to be impacted from facility operations. The facilitywide background statistics for each media are presented in Appendix E.

Sampling results for inorganic analytes in various media at Site 17 were compared to background concentrations as follows:

- Maximum detected concentrations for data collected during this investigation (provided in Appendix F) were compared to the UCLs of the facilitywide background data.
- For analytes found to have maximum concentrations above the facilitywide UCLs, site-specific background maximum detected concentrations were compared to the UCLs of the facilitywide background data.
- Where, based on the analysis described above, analytes were found above background and considered site-related, the background means were compared to the sampling means.

In some instances, where an inorganic analyte is discussed in one medium (e.g., surface soil), the analyte may be discussed in another medium (e.g., subsurface soil) even if the concentrations in the second medium do not exceed background. This is to allow a more complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

It should be noted that the groundwater background data set is based on unfiltered metals concentrations. Further, based on comparison of the groundwater data set to a subset reported as "nonturbid," four groundwater samples were excluded from the background data set due to elevated turbidity levels. The comparisons presented in this discussion are also based on unfiltered metals concentrations. None of the samples was excluded from the comparisons due to turbidity.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a compound in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used; (2) if a compound was detected in a sample and a corresponding duplicate, the higher of the two values was used; and (3) samples collected upslope or upgradient for the purpose of evaluating site-specific background conditions are

excluded from the descriptive statistics and following discussion except with respect to whether or not the observed concentrations of certain analytes may be site-related.

Background surface water samples were not collected as part of the background investigation and therefore are unavailable for comparison.

6.4.1 Surface Soil

Surface soil sampling activities conducted within Site 17 consisted of 15 samples (IS17SS01 through IS17SS15). Note that the samples that were collected within the defined limits of the site (i.e., the red line in the figures) were collected only in the western part of the site because this was expected to be the extent of drum disposal. Other samples were collected upslope from the site. The results of the surface soil sampling are presented in Table 6-1.

6.4.1.1 VOCs and SVOCs

Detectable concentrations of VOCs were observed in 11 surface soil samples (Table 6-1). Two samples (IS11SS05 and IS11SS07) contained TCE at concentrations of 8.3 µg/kg and 25 µg/kg, respectively (Figure 6-4). Other compounds detected in surface soil include toluene, ethylbenzene, and xylenes. The largest number of different VOCs was detected in samples IS17SS05 and IS17SS06, both located near the western end of the sampled area at the site. In 17SS06, the highest concentrations were of cyclohexane and xylenes. The maximum detected concentration of a VOC in surface soil was observed in IS17SS02, where toluene was detected at 250 µg/kg. Low levels of ethylbenzene and xylenes were detected in this sample, also.

Fourteen SVOCs were detected in 10 surface soil samples (Table 6-1). The concentrations of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are shown in Figure 6-5 because of their risk concerns, frequency of detection, and high concentrations. The largest number of SVOCs and the highest concentrations were detected in samples IS17SS01 and IS17SS08, located in the western and central parts of the sampled area at the site, respectively. Several SVOCs also were detected in samples IS17SS05 and IS17SS06, which also contained several VOCs; both samples are located near the western end of the site.

6.4.1.2 TAL Inorganics

Twenty-four inorganic analytes were detected in surface soil samples, all at concentrations above the facilitywide background 95 percent UCL (Table 6-1, and Table F-3 in Appendix F). This discussion focuses on arsenic, iron, lead, and manganese (Figure 6-6).

Arsenic was detected in all surface soil samples except IS17SS12. Concentrations ranged from 1.4 mg/kg to 13.6 mg/kg (at IS17SS06). Calculated mean concentration is 5.0 mg/kg, which is above the background mean of 2.2 mg/kg. Additionally, of 14 samples that contained arsenic, 13 contained concentrations greater than the background 95 percent UCL of 2.6 mg/kg. Under the assumption that samples IS17SS11 and IS17SS12, located northwest of the site, generally represent site-specific background locations (3.7 mg/kg and not-detected, respectively), several of the higher arsenic concentrations detected appear to be site-related.

No spatial trend is apparent in the arsenic data.

Iron was detected in all surface soil samples. Concentrations ranged from 8,950 mg/kg to 224,000 mg/kg. The mean concentration of 32,830 mg/kg is approximately three times the background average of 10,290 mg/kg. Nine of the 32 samples contained concentrations exceeding the background 95 percent UCL of 15,533 mg/kg. Samples IS17SS11 and IS17SS12 had iron concentrations of 17,000 mg/kg and 8,950 mg/kg, respectively. These are similar to most of the data collected on the site, but indicate that the high iron levels in such samples as IS17SS01 (47,400 mg/kg) and IS17SS06 (224,000 mg/kg) are likely derived from site operations.

One possible trend appears in the data: the samples collected from the stormwater swales (IS17SS11 through IS17SS15), located upslope of the site, generally contained lower concentrations than the samples collected around the drums.

Lead was detected in all surface soil samples. Concentrations ranged from 7.4 mg/kg to 602 mg/kg (at IS17SS01). The calculated mean of 73.1 mg/kg was above the background mean of 20 mg/kg. However, none of the samples (except IS17SS01, which contained the maximum concentration) exhibited concentrations above the background 95 percent UCL of 149 mg/kg. Samples IS17SS11 and IS17SS12 had lead concentrations of 11.8 mg/kg and 7.4 mg/kg, respectively. These are similar to many of the data collected on the site, but indicate that the high lead levels in such samples as IS17SS01 (602 mg/kg) and IS17SS06 (111 mg/kg) are likely derived from site operations.

No spatial trends are apparent in lead the data.

Manganese was detected in all surface soil samples. Concentrations ranged from 42.7 mg/kg to 752 mg/kg. The sample containing the maximum value was the only sample that contained a concentration above the background 95 percent UCL of 569 mg/kg. Samples IS17SS11 and IS17SS12 had manganese concentrations of 72.4 mg/kg and 79.3 mg/kg, respectively. These are lower than most of the data collected on the site, and indicate that some high manganese levels likely are derived from site operations.

No spatial trends are apparent in the manganese data.

In general, the highest concentrations of inorganics were detected in sample IS17SS01, located in the eastern part of the sampled area of the site, and in samples IS17SS05, IS17SS06, and IS17SS08, located in the western part of the sampled area of the site and where several VOCs and SVOCs also were detected.

6.4.1.3 Explosives

Low concentrations of explosives were detected in four surface soil samples (Table 6-1). None of the samples contained explosives at concentrations that warrant further discussion.

6.4.2 Subsurface Soil

Subsurface soil sampling activities conducted within Site 17 consisted of 15 samples (IS17SB01 through IS17SB15). As with surface soil, subsurface soil was only collected in the western part of the site. The results of the subsurface soil sampling are presented in Table 6-2.

6.4.2.1 VOCs and SVOCs

Low concentrations of VOCs were observed in many of the subsurface soil samples (Table 6-2). Four samples (IS17SB02, IS17SB03, IS17SB05, and IS17SB06) contained concentrations of TCE ranging from 3.3 µg/kg to 30 µg/kg (in sample IS17SB03). Additionally, TCE and cis-1,2-DCE were detected in IS17SB08 at concentrations of 680 µg/kg and 390 µg/kg, respectively (Figure 6-7).

It appears VOCs are concentrated around the drums. No other spatial trend is apparent.

High concentrations and a large variety of SVOCs were detected in samples IS17SB02 and IS17SB03, both located at the eastern end of the sampled area. Low concentrations of SVOCs were detected in three other subsurface soil samples (Table 6-2). The concentrations of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are shown in Figure 6-8.

6.4.2.2 TAL Inorganics

Twenty-three inorganic analytes were detected in subsurface soil samples (Table 6-2). Ten analytes were detected in one or more samples at concentrations above the facilitywide 95 percent UCL (Table F-3 in Appendix F). This discussion focuses on arsenic, iron, lead, and manganese (Figure 6-9).

Arsenic was detected in all subsurface soil samples. Concentrations ranged from 1.5 mg/kg to 7.6 mg/kg (in IS17SB03). The calculated mean concentration is 4.2 mg/kg, which is below the background mean of 4.8 mg/kg. All detected concentrations were equal to or below the background 95 percent UCL of 7.6 mg/kg. Under the assumption that samples IS17SB11 and IS17SB12, located northwest of the site, generally represent site-specific background locations 3.6 mg/kg and 2.5 mg/kg), some of the higher arsenic concentrations detected appear to be site-related. There are no obvious tends in these data.

Iron was detected in all subsurface soil samples. Concentrations ranged from 10,300 mg/kg to 37,700 mg/kg. The calculated mean concentration is 18,000 mg/kg, which is below the background mean of 24,192 mg/kg. Additionally, all detected concentrations were below the background 95 percent UCL of 44,744 mg/kg. Samples IS17SB11 and IS17SB12 had iron concentrations of 22,600 mg/kg and 12,300 mg/kg, respectively. These are similar to most of the data collected on the site. Although the iron level in sample IS17SS06 (37,700 mg/kg) exceeds these values, it still is lower than the facilitywide background and, therefore, may not be site-related.

Lead was detected in all subsurface soil samples. Concentrations ranged from 5.2 mg/kg to 99.4 mg/kg (in IS17SB03). The calculated mean concentration of 28.8 mg/kg is above the background mean of 8.6 mg/kg. Nine samples contained concentrations above the 95 percent UCL of 12.8 mg/kg. Samples IS17SS11 and IS17SS12 had lead concentrations of 10.5 mg/kg and 14.5 mg/kg, respectively. These are similar to most of the data collected on the site, and indicate that the high lead levels in such samples as IS17SS03 (99.4 mg/kg) and IS17SS02 (76 mg/kg) are likely derived from site operations.

A spatial trend is apparent in the data. The samples collected in the vicinity of the drums are elevated compared to those collected from the upslope stormwater swales.

Manganese was detected in all subsurface soil samples. Concentrations ranged from 39.5 mg/kg to 222 mg/kg (in IS17SB06). All values were less that the background 95 percent UCL of 1,270 mg/kg, although they tended to be higher than those in IS17SB11 (39.5 mg/kg) and IS17SB12 (77 mg/kg).

In general, the highest concentrations of inorganics were detected in sample IS17SB06, located at the western end of the sampled area, and in samples IS17SB02 and IS17SB03, located in the eastern part of the sampled area. The locations elevated concentrations in the western part generally coincide reasonably well with elevated concentrations in surface soil in this area.

6.4.2.3 Explosives

Very low concentrations of explosives were observed in samples IS17SB01, IS17SB03, IS17SB04, IS17SB05, and IS17SB06 (Table 6-2). None of the samples contained explosives at concentrations that warrant further discussion.

6.4.3 Groundwater

Groundwater sampling activities conducted within Site 17 consisted of three monitoring well samples (IS17MW01 through IS17MW03). The results of the groundwater sampling are presented in Table 6-3.

6.4.3.1 VOCs and SVOCs

VOCs were detected in groundwater samples IS17MW01 and IS17MW02 (Table 6-3). Notably, well IS17MW02 contained cis-1,2-DCE at a concentration of 4,200 µg/L and vinyl chloride at a concentration of 3,000 µg/L (Figure 6-10). Groundwater sample IS17MW01 contained cis-1,2-DCE at a concentration of 37 µg/L and vinyl chloride at a concentration of 40 µg/L (Figure 6-8). This sample also contained low concentrations of toluene and ethylbenzene. No VOCs were detected in the background well, nor were any detected in soil at the nearest sampling location (IS17SO04). Due to the limited number of groundwater samples, no clear trend is observed in the data.

Very low concentrations of 4-methylphenol and phenol were detected in groundwater samples IS17MW01 and IS17MW02 (Table 6-3). Neither of the samples contained SVOC concentrations that warrant further discussion. No SVOCs were detected in the background well.

6.4.3.2 TAL Inorganics

Twenty-one inorganic analytes were detected in unfiltered groundwater samples. Of these, 20 were detected at concentrations above the facilitywide background 95 percent UCL (Table F-3 in Appendix F). This discussion focuses on total arsenic, iron, lead, and manganese (Figure 6-11) detected in monitoring wells because of the their occurrence in soil, frequency of their detections, the extent to which they exceeded the background concentrations, and the general health risks associated with them. Total concentrations are focused on because only total metals were analyzed for in background wells; however, filtered samples also are mentioned.

Total arsenic was detected in one groundwater sample (IS17MW03) at a concentration of 4 µg/L. Note that this is the background well. This concentration exceeded the facility background concentration. No arsenic was detected in filtered samples, suggesting that arsenic is adsorbed to sediment in the groundwater.

Total iron was detected in all three of the samples collected from Site 17 monitoring wells. Concentrations ranged from 24,600 µg/L to 71,000 µg/L (in IS17MW02). The calculated mean concentration of 43,167 µg/L is greater than four times the background mean of 9,847 µg/L. Additionally, all three samples contained concentrations in excess of the 95 percent UCL of 19,900 µg/L. In general, iron concentrations were not greatly reduced between unfiltered and filtered samples, suggesting little role of sediment in the groundwater in adsorbing iron. An exception is for IS17MW03, which went from 31,400 mg/L to not detected. Due to the limited number of samples, no trend is apparent in the data.

Total lead was detected in groundwater samples IS17MW01 and IS11MW03 at concentrations of 4.9 µg/L and 13.9 µg/L, respectively. Lead was not detected in the background data set. As with arsenic, lead was not detected in filtered samples. Due to the limited number of samples, no trend is apparent in the data.

Total manganese was detected in the three samples collected from Site 17 monitoring wells. Concentrations ranged from 540 µg/L to 2,620 µg/L (in IS17MW02). Most samples contained concentrations in excess of the 95 percent UCL of 824 µg/L. As with iron, manganese concentrations were not significantly affected by filtering. Due to the limited number of samples, no trend is apparent in the data.

The largest number of maximum concentrations of total inorganics was detected in well IS17MW03, the background well for the site. However, most of the maximum concentrations for filtered samples were detected in well IS17MW02. It is unlikely that arsenic and lead at the site are related to site operations because arsenic was detected only in the background well and lead had its highest total concentration in this well. However, the high iron and manganese in well IS17MW02 likely are site-related.

6.4.3.3 Explosives

Only very low concentrations of explosives were detected in IS17MW01, IS17MW02, and IS17MW03 (Table 6-3). None of the samples contained explosives at concentrations that warrant further discussion.

6.4.4 Surface Water

Surface water sampling activities conducted within Site 17 consisted of six samples (IS17SW01 through IS17SW06). The results of surface water sampling are presented in Table 6-4.

6.4.4.1 VOCs and SVOCs

Neither VOCs nor SVOCs were analyzed for in surface water samples.

6.4.4.2 TAL Inorganics

Fifteen inorganic analytes were detected in unfiltered surface water samples (Table 6-4). No arsenic and little lead were detected in unfiltered samples. For most unfiltered samples, the concentrations were similar in all surface water samples. Exceptions were higher concentrations of aluminum in samples IS17SW02 through IS17SW04, one higher concentration of cyanide in IS17SW02, and higher iron concentrations in IS17SW02 and IS17SW03. The highest total lead concentration was detected in the most-downstream sample, IS17SW06, which is located near Site 11. This variability was removed in the filtered samples, leaving sample IS17SW01, the most-upstream sample, with the highest concentrations of metals.

6.4.4.3 Explosives

Only the explosive 4-nitrotoluene was detected in a surface water sample (at IS17SW02).

6.4.5 Sediment

Sediment sampling activities conducted within Site 17 consisted of six samples (IS17SD01 through IS17SD06). The results of sediment sampling are presented in Table 6-5.

6.4.5.1 VOCs and SVOCs

Neither VOCs nor SVOCs were analyzed for in sediment samples.

6.4.5.2 TAL Inorganics

Twenty-one inorganic analytes were detected in sediment samples (Table 6-5). Thirteen of these were detected in one or more samples at a concentration above the facilitywide background 95 percent UCL (Table F-1 in Appendix F). This discussion focuses on arsenic, iron, lead, and manganese because of their occurrence in soil at the site. The distribution of these analytes is presented in Figure 6-6.

Arsenic was detected in all of the sediment samples. Concentrations ranged from 2.1 mg/kg to 32.7 mg/kg. The calculated mean concentration is 11.1 mg/kg, above the background mean of 3.3 mg/kg. Two samples (IS17SD05 and IS17SD06) exceeded the background 95 percent UCL of 10.6 mg/kg.

A spatial trend is observed in the data: concentrations increase from sample to sample in the downstream direction. It should be noted that concentrations of arsenic in upstream sediment samples IS17SD01, IS17SD02, and IS17SD03 may be indicative of background conditions.

Iron was detected in all of the sediment samples. Concentrations ranged from 7,270 mg/kg to 118,000 mg/kg (in sample IS17SD06). Mean concentration is 34,662 mg/kg, which is above the background mean of 13,202 mg/kg. None of the samples (except IS17SD06, which contained the maximum concentration), however, exceeded the background 95 percent UCL of 42,900 mg/kg.

Lead was detected in all of the sediment samples. Concentrations ranged from 4.4 mg/kg to 1,140 mg/kg (in sample IS17SD06). The mean concentration of 337 mg/kg greatly exceeded

that of the background mean of 23.1 mg/kg. Similarly, the background 95 percent UCL of 79.3 mg/kg was exceeded in sediment samples IS17SD04, IS17SD05, and IS17SD06.

The trend observed in arsenic is observed in lead as well: Concentrations increase from sample to sample in the downstream direction. Again, it should be noted that concentrations of lead in upstream sediment samples IS17SD01, IS17SD02, and IS17SD03 may be indicative of background conditions.

Manganese was detected in all of the sediment samples. Concentrations ranged from 73.6 mg/kg to 763 mg/kg (in sample IS17SD06). Sample IS17SD06, containing the highest concentration, exceeded the background 95 percent UCL of 444 mg/kg. Again, concentrations appear to increase in the downstream direction.

In general, downstream samples IS17SD05 and IS17SD06 contained the highest concentrations and most frequent detections of all metals among all sediment samples. Note that these samples were collected closest to Site 11, which has been shown to be a source of metals to sediment at that site (Section 4).

6.4.5.3 Explosives

Very low concentrations of explosives were detected in sediment samples IS17SD02, IS17SD03, and IS17SD05 (Table 6-5). None of the samples contained explosives at concentrations that warrant further discussion.

6.5 Fate and Transport

The fate and transport of chemicals in soil and groundwater within Site 17 and how the chemicals may interrelate with the surface water and sediment in the Mattawoman Creek are discussed in this section. The fate and transport are described to support the HHRA and ERA, and to aid in defining remedial alternatives. At the end of the subsection is a summary of the conceptual model of fate and transport at Site 17.

6.5.1 Contaminant Fate

Analytes will adsorb onto and desorb from solid material at the site. This includes soil that is in contact with infiltrating water and sediment deposited in the Mattawoman Creek. Such sorption will be a function of the partitioning coefficient of the analyte and will be greater for most SVOCs and many metals than for VOCs and some SVOCs and metals. Most of the commonly occurring contaminants at Site 17 are SVOCs and metals; therefore, adsorption is expected to be an important fate process at the site. Analytes, particularly metals, also may be dissolved from the solids while they are in contact with water. As a result, contaminants could transfer from creek sediment to surface water.

Few VOCs were detected at the site. Therefore, volatilization is not expected to play a significant role in contaminant fate at the site. One exception is the detection of toluene in soil at IS17SS02, where volatilization likely is occurring but over only a small area of the site.

Some of the organic compounds may degrade through microbial activity, particularly with the amount of vegetation and other sources of organic material which encourage the likelihood of active microbial communities in the surface soil. However, the majority of the

SVOCs observed at Site 17, such as benzo(a)pyrene, are recalcitrant to microbial activity and would be transformed only at a slow rate. Therefore, due to the nature of the organic compounds detected at Site 17, microbial degradation is unlikely to play an important role in their fate.

Some of the metals at the site could vary in their migration behavior with change in valence state. This is particularly true for arsenic, which will become more mobile in its lower valence state.

Bioaccumulation is the process by which contaminants are ingested by ecological receptors and concentrated within the tissues of those receptors. Because of the vegetated nature of the site, it is likely that ecological receptors (e.g., mammals) visit the area on a regular basis. Such receptors forage at the site and may ingest contaminated surface soil. Those compounds with a tendency to associate with the soil, such as SVOCs (e.g., benzo[a]pyrene) and inorganics (e.g., arsenic and lead) may accumulate in these ecological receptors over time.

6.5.2 Contaminant Migration

This section discusses the possible source area and potential mechanisms for contaminant release and migration from the source area within the Site 17. The discussion is organized by media within Site 17 that may experience contaminant transport.

Fundamental to describing fate and transport at the site are the physical properties of the subsurface, which was described in Section 3.5, and the site hydrogeology, which was described in Section 6.3.

6.5.2.1 Source Areas

Source areas at the site are assumed to comprise both original and current sources associated with site operations and current sources such as contaminated soil that may serve as a source for contaminating other media.

The assumption is that the metal disposed of along the shoreline was an original source which has since been removed. Also, the drums disposed of at the site likely leaked contents that provided a source of contamination.

The RI identified areas where soil contamination has occurred that now may serve as a source of contamination to other media. The vicinity of samples IS17SS05, IS17SS06, and IS17SS08, located in the western part of the sampled area, exhibited high concentrations and frequent detections of many VOCs, SVOCs, and metals. However, so do the locations of samples IS17SS02 and IS17SS03, at the eastern end of the sampled area. Therefore, it appears that many locations at the site could serve as sources. These contaminants are elevated in concentration with respect to both facility background and site-specific background, indicating that many are site-related.

6.5.2.2 Releases from Soil to the Atmosphere

Site 17 is completely vegetated and there is no vehicular traffic; therefore, mechanical release of contaminants from soil to the atmosphere is likely not a significant process. Volatilization of VOCs from soil to the atmosphere likely is not a significant process at

Site 17, either. VOCs were detected at only low concentrations in soil at Site 17. Additionally, there is little evidence to suggest continued surface releases within Site 17.

6.5.2.3 Transport from Surface Soil to Subsurface Soil or from One Area to Another

The primary mechanisms for the release of contaminants from surface soil to subsurface soil or from one area to another are infiltration, runoff, and soil erosion caused by runoff.

The potential exists for infiltrating water to transport contaminants from surface soil to subsurface soil. This effect is expected to be limited because the vegetated nature of the site would encourage evapotranspiration rather than infiltration. The data show that contaminant levels in subsurface soil typically are less than those in surface soil (e.g., for lead, as shown in Figures 6-5 and 6-9), suggesting that there is only limited migration along this pathway due to the tendency for the site contaminants to adsorb. However, some arsenic values are equal to or greater in subsurface soil than in surface soil, indicating that there likely is transport by this process to some degree.

At Site 17, the vegetated terrain would resist erosion. Therefore, it is unlikely that much contamination moves around the site by this process.

6.5.2.4 Releases from Soil to Sediment and Surface Water

As noted above, Site 17 is completely vegetated and there is no vehicular traffic. This suggests contaminant migration due to runoff likely is not a significant process at Site 17. It should be noted, however, that significant concentrations of lead and elevated concentrations of arsenic were detected in sediment. Given the pattern observed in the data, it is likely that runoff may have been a significant process in the past. However, the fact that metals concentrations tend to increase downstream indicates that Site 11 is a more likely a current source of many of the contaminants observed in sediment than is Site 17.

It would be expected that only limited migration of contaminants would occur into surface water from sediment, due to the nature of most of the contaminants.

6.5.2.5 Releases from Soil to Groundwater

Releases of VOCs and SVOCs from soil likely have occurred in the past; however, it appears that the potential for future migration from soil to groundwater is low. The reasons for this are twofold. First, VOCs, which are somewhat mobile in the environment, were detected only in low concentrations in soil at Site 17, and, therefore, already have migrated into the groundwater (as seen by the VOCs detected in well IS17MW02). Second, SVOCs, while detected across the site and in some instances at high concentrations, have very low mobility in soil because of their low solubilities in water, and generally were not detected in groundwater at significant concentrations.

Releases of inorganics to groundwater likely are occurring. Total arsenic, total iron, and total lead were detected in soil and groundwater at levels that were elevated relative to background. However, most of the metals were greatly reduced in concentration or even eliminated in filtered samples, indicating that they typically are adsorbed to the subsurface materials and not particularly mobile. However, based on the analytical data, groundwater appears to be a primary transport mechanism for such inorganics as iron and manganese,

which occurred on the site at levels well above site-specific background, even in filtered samples.

Releases of explosives from soil likely have occurred in the past because explosives were detected in groundwater. However, the concentrations of explosives are very low, reflecting either their low mobility in the environment or scarcity in the soil.

6.5.2.6 Migration of Contaminants in Groundwater

This section addresses the migration of contaminants within the groundwater and any potential migration to the Mattawoman Creek.

As described in Section 6.3, groundwater generally flows from the northwest to southeast. Monitoring well IS17MW03, located northeast of Site 17, is considered to be the primary background monitoring location. Samples collected from IS17MW03 during the RI contained no detectable VOCs or SVOCs. Additionally, inorganics concentrations were comparable to facilitywide background. Trace concentrations of explosives were detected.

Although the primary constituents detected in groundwater are cis-1,2-DCE and vinyl chloride, the likely origin of these contaminants is degradation of TCE. Further, the presumed soil sources of TCE at Site 17 are the numerous abandoned drums at the site. As discussed above, it does not appear that a soil source remains; however, impacts to groundwater remain highest in the vicinity of IS17MW02. Concentrations of chlorinated VOCs in groundwater downgradient of this area are unknown. Due to the mobility of cis-1,2-DCE and vinyl chloride in groundwater, it is likely that VOCs are migrating in the direction of the Mattawoman Creek.

Cis-1,2-DCE and vinyl chloride also were detected at IS17MW01, but at much lower concentrations.

Cis-1,2-DCE and vinyl chloride do not tend to strongly adsorb onto aquifer materials and will not be significantly retarded by adsorption in the groundwater flow system. Cis-1,2-DCE is estimated to migrate at one-half of the rate of groundwater flow, while vinyl chloride may migrate at two-thirds the rate of groundwater flow. Biodegradation is likely to occur at varying rates depending on local geochemical conditions.

It should be noted that groundwater at Site 17 is likely influenced by the tidal cycle. Typically, tidal influence causes some ‘smearing’ of contamination near the shoreline.

No distinct pattern in the concentrations of inorganics was identified. Arsenic and lead were removed from groundwater in both samples via filtering, indicating somewhat limited mobility in the subsurface. Dissolved iron and manganese concentrations were comparable to total iron and manganese concentrations, respectively, indicating iron in groundwater is mostly occurring in the dissolved phase.

6.5.2.7 Releases from Groundwater to Surface Water

The Mattawoman Creek is the final receptor of all groundwater from Site 17. Given the concentrations of VOCs in IS17MW02 and its proximity to the Mattawoman Creek, releases from groundwater to surface water likely are occurring. VOCs were not sampled for in the creek because of the expected effects of volatilization in the surface water.

Release of inorganics from groundwater to surface water is part of the natural hydrologic cycle and is on-going. It is not clear that elevated levels of inorganic constituents (relative to concentrations reported in the BIR) observed in groundwater are impacting surface water. Although a background data set has not been generated for surface water, a review of the site data indicates that, in general, concentrations are consistent from sample to sample (except for aluminum and iron in unfiltered samples, as noted above). Further, concentrations of constituents discussed in Section 6.4.5 are greatly reduced in surface water relative to groundwater, presumably due to dilution in the surface water. Also, the data suggest that most inorganics are relatively immobile in the groundwater. Therefore, release of contaminants from groundwater to surface water does not appear to be a significant transport process at Site 17.

6.5.3 Conceptual Site Model

The above fate and transport discussions may be summarized into a conceptual site model that describes the fate and transport mechanisms at Site 17. The conceptual model is provided in Table 6-6. There appears to be only limited migration of contaminants at the site. The primary mechanisms are leaching from soil to groundwater and migration in groundwater.

6.6 Baseline Human Health Risk Assessment

This section presents the results of the HHRA for Site 17, the Discarded Metal Parts Area along the Mattawoman Creek.

6.6.1 Data Summary

The only data collected at Site 17 were collected during the RI. The RI data that were used in the risk assessment are presented in this section. Table 6-7 lists the samples that were used to estimate potential exposure and risks in each medium for Site 17. Figure 6-2 identifies the sampling locations for surface and subsurface soil, groundwater, and sediment and surface water.

Seventeen surface soil samples (including two duplicate samples) were collected from the top 6 in. of soil in July, August, and October of 2000 and analyzed for VOCs, SVOCs, explosives, and inorganics (Figure 6-2). Sixteen subsurface soil samples (including one duplicate sample) were collected in July, August, and October of 2000 and analyzed for the same parameters as the surface soil. One surface soil sample and one subsurface soil sample were collected from background locations and were not used to evaluate the risks associated with exposure to site soil.

Groundwater data collected in October 2000 as part of the RI were evaluated in the risk assessment. Groundwater samples were collected from three shallow monitoring wells (Figure 6-2). Groundwater samples were analyzed for VOCs, SVOCs, explosives, and inorganics (filtered and unfiltered). A groundwater sample was also collected from one background well; these data were not used to evaluate the risks associated with exposure to site-related groundwater.

Sediment and surface water samples were collected in July 2000. Seven surface water samples (including one duplicate sample) and six sediment samples were collected at Site 17 (Figure 6-2). The samples were analyzed for explosives and inorganics. As discussed in Section 6.6.3.3, exposure to sediment was not evaluated in the human health risk assessment.

The full set of data used for the HHRA is presented in Appendix G.3a. Appendix G.3b includes the detected constituents only, and Appendix G.3c is the sample statistics. The sample statistics include frequency of detection, minimum and maximum detected values, normal and lognormal arithmetic mean, normal and lognormal standard deviation, results of W-test, and 95 percent UCL based on the normal and lognormal distribution.

6.6.2 Identification of Chemicals of Potential Concern

Table 6-8 lists the COPCs retained for Site 17. There were no COPCs retained for the surface water. Therefore, surface water was eliminated as a medium of potential concern. The majority of the COPCs for the remaining media were inorganic constituents. Additionally, a few PAHs were retained as COPCs for the soil and a few VOCs and explosives were retained as COPCs for the groundwater.

6.6.3 Exposure Assessment

The site-specific exposure assessment includes the information necessary to develop the exposure scenarios applicable for Site 17. This includes identifying the exposure setting, the current and potential future site use, the potentially exposed populations, and the potential exposure pathways.

6.6.3.1 Exposure Setting

Site 17 is a wooded area located east-northeast of Site 11 along the Mattawoman Creek that was used for the past disposal of drums. Building 1569 is located on a 20-ft ridge above this site. Site 17 is defined as a 1000-ft stretch of shoreline along the Mattawoman Creek where metal parts were discarded and the forested area 100 ft from the shoreline where dozens of rusted drums were identified. The site is not currently used, and there are no development plans for the site and surrounding area.

The nearest potable water well is Well 17, located 1,000 ft north of the site.

6.6.3.2 Potentially Exposed Populations

Site 17 is not currently used, so there is no current exposure to site workers. The site is not fenced; therefore, there is the potential for trespassers/visitors to access the site under the current exposure scenario. Site 17 is adjacent to the Mattawoman Creek, and it is possible for receptors to access this stream for recreational purposes. Therefore, adolescent and adult trespassers/visitors and recreational adult and child are potential receptors at Site 17.

The projected future use of the site is consistent with current use. However, although unlikely, it is conservatively assumed that the site could be developed and used for industrial or residential activities in the future. Therefore, the future use scenarios include construction worker, industrial worker, and adult and child resident receptors, in addition to the trespassers/visitors and recreational users.

Groundwater is not currently used as a potable water supply at the base, and is not anticipated to be used in the future. However, groundwater downgradient of the site could be used as a potable water supply in the future. Therefore, the groundwater data from the site was used as a conservative assessment of groundwater quality downgradient of the site for the future exposure scenario. It is assumed that adult and child residents would be exposed to the groundwater through potable use. Additionally, the construction worker is assumed to have contact with the groundwater during excavation activities at the site.

6.6.3.3 Potential Exposure Pathways

As mentioned in Section 3.3.2.2, a complete exposure pathway has five elements: a source, a mechanism for release and migration, an environmental transport medium, a point of potential human contact, and a route of intake. These elements are discussed below for Site 17.

Contaminant Sources Metal parts were discarded along the Mattawoman Creek shoreline from the 1960s until the early 1980s. The disposed materials included rocket motor casings, shipping containers, empty drums, and various metal parts. A site reconnaissance done for the IAS in 1983 confirmed the presence of rusted metal parts in the vicinity of the reported disposal area. They noted that the submerged materials were covered over with bottom sediments. The Phase II RFA in August 1988 stated that NOS representatives intended to remove the metal parts in 1989 under the direction of the Army Corps of Engineers and the Fish and Wildlife Department. It is assumed that this removal occurred because recent site reconnaissance could not locate any large metal items on the shoreline.

Additionally, in the forested area 100 ft from the shoreline dozens of rusted drums were identified. A site reconnaissance during January 2000 found the drums disintegrated with rust and partially buried in the soil. The majority of the drums had holes exposing a yellow wax-like material. In 1997, the substance in the drums was described as being fluid and the drums were noted to be more intact. The origin of these drums cannot be verified by base personnel; however, the Indian Head laboratory has analyzed the contents and determined that the substance is wax. The contents were found to be safe to handle (e.g., not explosive) though they may contain residual levels of explosives.

Release and Transport Mechanisms The primary transport mechanism for contamination at Site 17 appears to be leaching from the soil to the groundwater and transport in the groundwater, and perhaps limited runoff from the surface to the Mattawoman Creek. Many of the VOCs and explosives detected in the groundwater were also detected in the soil.

A few VOCs were detected in the soil at concentrations above the SSL for soil to groundwater transport. Of these constituents, only one was detected in the groundwater. A number of the inorganic constituents detected in the soil were detected at a maximum concentration above the SSL, and were also detected in the groundwater. This evaluation indicates that the soil may be a continuing source of contamination to shallow groundwater.

Fate and transport modeling was conducted in the risk assessment for volatilization from groundwater during showering and from an open excavation.

Potential Exposure Points and Exposure Routes Exposure points are locations where humans could contact contamination. Onsite exposure points include surface soil, subsurface soil,

surface water, sediment, and groundwater beneath the site. However, no COPCs were retained for surface water, and therefore, it is not evaluated as a medium of potential concern for exposure. Offsite exposure points include surface water, sediment, and groundwater downgradient of the site. Only onsite exposure points were evaluated in the risk assessment. It is expected that dilution and attenuation of any contamination would occur in downgradient locations, and any associated risks would be less than those at the site.

Potential exposure routes were evaluated for current and potential future site use. Existing and potential exposure pathways are illustrated in the conceptual exposure model (Figure 6-12). Exposure scenarios and potentially complete pathways of exposure evaluated in this risk assessment are presented in Table 6-9 and Appendix G.3d, Table 1.

Current Exposure Routes The only media of potential concern currently accessible at Site 17 are surface soil and sediment. Based on current site use, potential receptors include adult and adolescent trespassers/visitors exposed to soil. Exposure to the Mattawoman Creek sediment by recreational adults and children is not considered a complete pathway. All of the sediment is completely covered by water, and there is no shoreline with exposed sediment. Therefore, all of the sediment would be washed from the skin. The shallow groundwater at the base is not used as a potable supply and therefore, there is no current exposure to shallow groundwater.

In summary, the current land use exposure routes for quantitative evaluation include:

- Trespasser/Visitor (adult and adolescent): incidental ingestion of and dermal contact with surface soil.

Future Exposure Routes As discussed above, potential future site use may be industrial or residential. Future industrial workers, trespassers, residents, and/or construction workers may be exposed to the site soil (both current surface soil and subsurface soil that may be placed on the surface due to construction or excavation activities). Construction workers may also be exposed to shallow groundwater during excavation activities. It was also conservatively assumed that shallow groundwater may be used as a potable water supply, although this is highly unlikely. Unfiltered groundwater results were used to evaluate both the construction worker and residential exposure scenarios, as discussed in Section 3.3.3.

In summary, the future land use exposure routes include the current trespasser/visitor scenario and the following:

- Industrial Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).
- Trespassers/Visitors (adult and adolescent): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).
- Resident (adult and child): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil), ingestion of and dermal contact with shallow groundwater, and inhalation (adults only) of volatiles from shallow groundwater.

- Construction Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil), and dermal contact with and inhalation of volatiles from shallow groundwater.

The exposure concentrations used to calculate potential risks to each of the receptors are presented in Appendix G.3d, Tables 3.1 through 3.7. The exposure parameters and equations used to calculate the risks are presented in Appendix G.3d Tables 4.1 through 4.22.

6.6.4 Risk Characterization

Risks were evaluated for the complete exposure pathways identified in Section 6.6.3. The results of the risk calculations are discussed below.

6.6.4.1 Soil

Risks were evaluated for exposure to surface soil for current scenarios and exposure to combined surface and subsurface soil for future scenarios.

Surface Soil RME risk estimates for exposure to surface soil were calculated for an adolescent and adult trespasser/visitor under current site use (Appendix G.3d, Tables 7.1.RME and 7.2.RME, and Tables 8.1.RME and 8.2.RME). The risks are summarized in Table 6-10. Exposure to surface soil via incidental ingestion and dermal contact was evaluated. Inhalation of volatile and fugitive emissions from surface soil was not evaluated because no COPCs were retained for this pathway.

The noncarcinogenic hazards associated with exposure to surface soil by current adolescent and adult trespassers/visitors (0.10 and 0.083, respectively) are below USEPA's target HI of 1.0. The carcinogenic risks associated with exposure to surface soil for these receptors ($5x10^{-7}$ and $1x10^{-6}$) are below or within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Lead was retained as a COPC for surface soil because the maximum detected concentration (602 mg/kg) of lead is slightly greater than the residential lead screening value of 400 mg/kg. Exposure to surface soil by a resident is not currently expected, however adolescent and adult trespassers/visitors may be exposed to lead in the surface soil. There is no way to quantify the risks associated with exposure to lead in the surface soil by an adolescent or adult trespasser/visitor because there are no toxicity values for lead. The average concentration of lead detected in the surface soil (73 mg/kg) is below the residential soil lead screening level. Therefore, because the maximum concentration is only slightly above the residential soil screening level, the average concentration is below the screening level, and exposure to lead in the surface soil by an adolescent or adult trespasser is expected to be less than that of a resident, exposure to lead in surface soil is not expected to result in any adverse health effects.

Combined Surface and Subsurface Soil RME risk estimates for exposure to combined surface and subsurface soil were calculated for an adult and child resident, a construction worker, an industrial worker, and an adolescent and adult trespasser/visitor, under potential future site use (Appendix G.3d, Tables 7.8.RME through 7.19.RME, and Tables 8.7.RME through 8.16.RME). The calculated RME risks are summarized in Table 6-10. It was assumed these receptors would be exposed to surface and subsurface soil through incidental ingestion and dermal contact, and inhalation of volatile and fugitive emissions from soil.

The noncarcinogenic hazard due to exposure to soil by an adult resident (0.54) is below USEPA's target HI of 1.0. The noncarcinogenic hazard for a child resident (2.7) exceeds USEPA's target HI. Iron is the only constituent that contributes a hazard greater than 1.0, and this hazard is associated mainly with the incidental ingestion route.

As discussed in Section 3.3.2.3, the carcinogenic risk for the resident is calculated as a lifetime age-adjusted risk. The carcinogenic risk associated with exposure to soil by the resident exposed over his or her lifetime ($2x10^{-5}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to soil by a construction worker (1.0) does not exceed USEPA's target HI. The carcinogenic risk associated with exposure to the soil by a construction worker ($8x10^{-7}$) is below USEPA's target risk range.

The noncarcinogenic hazard associated with exposure to soil by future industrial workers (0.45) is less than USEPA's target HI. The carcinogenic risk associated with exposure to soil by an industrial worker ($6x10^{-6}$) is within USEPA's target risk range.

The noncarcinogenic hazards associated with exposure to soil by adolescent and adult trespassers (0.073 and 0.061, respectively) are below USEPA's target HI. The carcinogenic risks associated with exposure to the soil by adolescent and adult trespassers ($5x10^{-7}$ and $9x10^{-7}$, respectively) are below USEPA's target risk range.

The CT noncarcinogenic hazard was calculated for the child resident because the RME noncarcinogenic hazard exceeds 1.0 (Appendix G.3d, Table 7.23.CT, and summarized in Table 6-11). The CT noncarcinogenic hazard due to exposure to combined surface and subsurface soil by a child resident is less than USEPA's target HI of 1.0.

Lead was retained as a COPC for combined surface and subsurface soil because the maximum detected concentration of lead exceeds the residential lead screening value of 400 mg/kg. Exposure to the combined surface and subsurface soil by a child resident was evaluated using the IEUBK lead model. Using the mean lead soil concentration of 25.5 mg/kg and the default values for the other parameters in the model, the IEUBK evaluation resulted in a geometric mean blood concentration of 1.87 µg/L blood for children 0 to 72 months old, which is below USEPA's recommended level of 10 µg/L. Approximately 99.99 percent of the population would have a blood lead level below USEPA's recommended level. Potential exposure of lead in the soil by children is not expected to result in blood-lead concentrations above USEPA's recommended levels.

Exposure to soil by an adult industrial worker was evaluated using the adult lead model (USEPA, 1996b, Table 6-12). This model calculates an acceptable concentration of lead in soil for an adult worker of 1,113 mg/kg. The average concentration of lead in the Site 17 combined surface and subsurface soil, 25.5 mg/kg, and the maximum detected concentration of lead in the soil, 602 mg/kg, are below this level. Therefore, it is not expected that exposure to lead in the surface soil by an adult industrial worker would result in an unacceptable risk.

Exposure to lead in the surface soil by an adolescent or adult trespasser is expected to be less than that of a resident or industrial worker, and is therefore, not expected to result in any adverse health effects.

6.6.4.2 Groundwater

Shallow groundwater beneath the site is not currently used as a potable water supply and will not likely be used as a potable water supply in the future. However, shallow groundwater beneath the site was evaluated as a worst-case risk estimate for potable groundwater use.

Risk estimates for exposure to shallow groundwater were calculated for child and adult residents under potential future residential use of the site (Appendix G.3d, Tables 7.3.RME, 7.4.RME, and 7.6.RME, and Tables 8.3.RME and 8.5.RME, and summarized in Table 6-10). It was assumed that a resident would drink the water, and bathe with the water, resulting in inhalation of volatiles (adult only) and dermal absorption.

The RME noncarcinogenic hazards associated with use of the groundwater as a potable residential water supply are above USEPA's benchmark noncarcinogenic HI of 1.0 for both the potential future child and adult resident. The noncarcinogenic hazards to a child and adult resident are 131 and 64, respectively. The hazard is primarily associated with ingestion of vinyl chloride, cis-1,2-dichloroethene, iron, and manganese in the groundwater. Aluminum, chromium, and vanadium also contribute HIs above 1.0.

As with residential soil exposure, the carcinogenic risk for groundwater for the resident is presented as a lifetime age-adjusted risk. The one-hit equation was used for calculating the age-adjusted carcinogenic risk because the linear equation for estimating risk levels described in Section 3.3.4.2 is only valid at low risk levels (i.e., below estimated risks of 0.01). The one-hit equation is:

$$\text{Risk} = 1 - \exp(-\text{Intake} \times \text{CSF})$$

The RME carcinogenic risk associated with use of the groundwater as a potable residential water supply exceeds USEPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$. The residential lifetime carcinogenic risk is $7x10^{-2}$. This risk is primarily associated with vinyl chloride.

Exposure to shallow groundwater by a construction worker during excavation was evaluated as a potential future exposure scenario (Appendix G.3d, Tables 7.5.RME, 7.7.RME, 8.4.RME, and 8.6.RME, and summarized in Table 6-10). The RME noncarcinogenic risk (1.7) exceeds USEPA's target HI. This hazard is primarily associated with the vinyl chloride detected in the groundwater. The RME carcinogenic risk is $4x10^{-5}$, which is within USEPA's target risk range.

The RME noncarcinogenic hazard for exposure to groundwater by a future adult and child resident exceeds the USEPA benchmark value of 1.0, and the RME carcinogenic risks for exposure to groundwater by a lifetime resident exceeds a risk of $1x10^{-4}$. Therefore, CT exposure was evaluated for these scenarios. The RME noncarcinogenic hazard for exposure to groundwater by a construction worker also exceeds USEPA's benchmark value, however, the route hazards (dermal contact and inhalation) alone do not exceed the benchmark value, and a CT risk estimate was not performed for the adult construction worker. The CT risk estimates are summarized in Table 6-11 (and Appendix G.3d Tables 7.20.CT through 7.22.CT, and 8.17.CT and 8.18.CT). The calculated CT noncarcinogenic hazard for an adult resident (12) and a child resident (34) are greater than USEPA's target HI. The CT lifetime carcinogenic risk ($8x10^{-3}$) exceeds USEPA's target risk range.

6.6.4.3 Surface Water

There were no COPCs retained for surface water. Therefore, exposure to surface water was not quantified in the risk assessment

6.6.4.4 Summary of Total Risks Across Pathways and Media

Table 6-10 and Appendix G3.d, Tables 9.1.RME through 9.9.RME summarize the RME potential noncarcinogenic hazards and carcinogenic risks to each receptor. Table 6-11 and Appendix G3.d, Tables 9.10.CT through 9.13.CT summarize the CT potential hazards and risks to each receptor that has HIs in excess of 1.0 or carcinogenic risks greater than $1x10^{-4}$. Potential risks were summarized for a current adolescent trespasser/visitor, current adult trespasser/visitor, future adult resident, future child resident, future lifetime resident, future construction worker, future industrial worker, future adolescent trespasser/visitor, and future adult trespasser/visitor. Appendix G3.d, Tables 10.1.RME through 10.4.RME and 10.5.CT through 10.8.CT show only the chemicals that contributed a hazard greater than 0.1 or a carcinogenic risk greater than 10^{-6} for scenarios with total HIs greater than 1.0 or total carcinogenic risks greater than 10^{-4}.

The risk assessment results may be summarized as follows:

- **Current Trespasser/Visitor, Adolescent** (Appendix G3.d, Table 9.1.RME): The HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Current Trespasser/Visitor, Adult** (Appendix G3.d, Table 9.2.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Future Resident, Adult** (T Appendix G3.d, able 9.3.RME): The HI greater than 1.0 from exposure to groundwater. Vinyl chloride and cis-1,2-dichloroethene contribute the greatest amount to this hazard, with iron, manganese, and vanadium also contributing HIs above 1.0. The CT hazard is also above USEPA's benchmark value, due to exposure to groundwater (Appendix G3.d, Table 9.10.CT).
- **Future Resident, Child** (Appendix G3.d, Table 9.4.RME): The HI exceeds 1.0, due to exposure to groundwater and combined surface and subsurface soil. Vinyl chloride, cis-1,2-dichloroethene, aluminum, chromium, iron, manganese, and vanadium in groundwater contribute HIs above 1.0, and iron in soil contributes an HI above 1.0. The CT future child resident also has a HI above the USEPA benchmark value (Appendix G3.d, Table 9.11.CT), associated mainly with groundwater.
- **Future Lifetime Resident** (Appendix G3.d, Table 9.5.RME): The carcinogenic risk posed by the Site 17 COPCs to the age-adjusted future lifetime resident is above the target USEPA risk range. This risk is primarily associated with exposure to groundwater, with a small contribution from soil (below the target risk range). The risk associated with groundwater is from ingestion, dermal contact, and inhalation of the vinyl chloride detected in the groundwater. The CT future lifetime resident carcinogenic risk associated with exposure to groundwater is above the USEPA target risk range (Appendix G3.d, Table 9.12.CT).

- **Future Construction Worker** (Appendix G3.d, Table 9.6.RME): The HI is above USEPA benchmark value and carcinogenic risk is within USEPA target risk range. Hazard is primarily associated with vinyl chloride detected in groundwater. Soil does not contribute significantly to this hazard.
- **Future Industrial Worker** (Appendix G3.d, Table 9.7.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Trespasser/Visitor, Adolescent** (Appendix G3.d, Table 9.8.RME): HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Trespasser/Visitor, Adult** (Appendix G3.d, Table 9.9.RME): HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.

6.7 Ecological Risk Assessment

Note: The ERA for Site 17 is discussed with that of Site 11 and can be found in Section 4.7.

6.8 Summary and Conclusions

6.8.1 General

A remedial investigation was conducted at Site 17. The objectives of the RI were to: (1) determine whether or not the metal parts disposed of along the shoreline of the Mattawoman Creek contaminated sediment and surface water in the creek, and (2) determine whether or not the drums and/or their contents contaminated the surface and subsurface soil and groundwater in the surrounding area.

Field activities were conducted between July 21 and October 12, 2000. The work consisted of surface soil sampling, subsurface soil sampling, monitoring well installation, groundwater sampling, and sediment and surface water sampling in the Mattawoman Creek.

The upper 10 ft of the subsurface is primarily fill material characterized by greenish clay with silt containing wood fragments. This is underlain by a fine to medium sand with some clay of the Quaternary. The thickness of the Quaternary deposits is unknown. Groundwater flow is generally from northwest to southeast and discharges to the Mattawoman creek.

The RI objectives were met. Neither human health nor ecological risks were determined for the surface water, indicating that the metal debris disposed of at the site has not contaminated surface water. Whether the debris may have contaminated sediment is less clear. Although metals such as iron and lead exhibit higher concentrations than background, it is more likely that they occur in the sediment due to the proximity of Site 11. This is

concluded because the concentrations of these metals in sediment increase downstream toward Site 11.

It appears that disposal of some kind, whether from drums or by other means, has contaminated groundwater at the site. Well IS17MW02 detected very high levels of several VOCs. In addition, iron and manganese occur at the site at concentrations greater than background.

6.8.2 Nature and Extent

The nature and extent of contamination at Site 17 was evaluated based on a 'short list' of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

Primarily of note at Site 17 were VOCs; specifically, TCE, cis-1,2-DCE, and vinyl chloride. Because cis-1,2-DCE and vinyl chloride are likely degradation products of TCE, the three VOCs will be summarized as a group.

TCE was observed in two surface soil samples and four subsurface soil samples, including one sample containing 680 µg/kg. Neither cis-1,2-DCE nor vinyl chloride were detected in surface soil samples; however, cis-1,2-DCE was detected in subsurface soil samples. TCE was not detected in groundwater; however one groundwater samples contained cis-1,2-DCE and vinyl chloride at concentrations of 4,200 µg/L and 3,000 µg/L, respectively. One site groundwater sample contained cis-1,2-DCE at a concentration of 37 µg/L and vinyl chloride at a concentration of 40 µg/L, as well.

Based on a review of the data and knowledge of the site, it appears that in the past, the primary mechanism for the spread of VOCs was infiltration. At present, it appears the primary mechanism is groundwater flow. The evidence for this is as follows:

- The site is almost entirely vegetated
- There were few detections of VOCs in soil
- Concentrations of VOCs were higher in subsurface soil than surface soil
- High concentrations of VOCs were detected in groundwater

In the past, the primary mechanism for the spread of inorganics may have been runoff. However, it is likely that inorganics are no longer migrating from the site at elevated concentrations. The evidence for this is as follows:

- Elevated concentrations of inorganics were detected in sediment but only downstream near Site 11
- The site is almost entirely vegetated

6.8.3 Human Health Risk Assessment

The risk assessment indicates that human health hazards and risks above USEPA target levels are associated with potential future exposure to combined surface and subsurface soil and groundwater. Hazards and/or risks above USEPA target levels may occur for future site use.

Future residential use of the site is unlikely. However, future residential use of the site may result in hazards and risks to children and adults above USEPA's target levels. Exposure to

vinyl chloride, cis-1,2-dichloroethene, aluminum, chromium, iron, manganese, and vanadium in the groundwater are the main contributors to the hazards and risks. The maximum detected concentrations in groundwater were used as the groundwater exposure point concentrations because less than five samples were available, which may result in an over-estimation of the risk. The concentrations of the inorganic constituents detected in the groundwater are greater than the concentrations detected in the facility-wide background groundwater samples.

Exposure to soil by future child residents may result in a hazard slightly greater than USEPA's target. This hazard is associated with iron. The concentration of the iron detected in the soil is greater than the concentrations detected in the site-specific background soil samples. However, iron is considered an essential human nutrient, and the concentration of iron detected in the soil would result in a daily intake of iron of 5.4 mg/day, which is below the recommended daily intake by the National Academy of Sciences of 10 mg/day. Therefore, exposure to the combined surface and subsurface soil would not result in an unacceptable hazard, based on the assumption that the iron is an essential nutrient and not present at a concentration above that of what is required for healthy children.

Future construction at the site may result in a hazard slightly above USEPA target levels associated with exposure to groundwater (mainly the vinyl chloride detected in the groundwater) by a construction worker.

6.8.4 Ecological Risk Assessment

There are several inorganics in sediment and soil that were selected as COPCs. These inorganics may pose a risk to soil invertebrates, plants, insectivorous birds and mammals, carnivorous terrestrial birds, and piscivorous birds. In addition, PAHs and explosives in sediment along the Mattawoman Creek may pose a risk to benthic invertebrates and aquatic plants. Based on preliminary reviews of concentration distribution, the soil and sediment in the vicinity of Site 17 will likely be the focus of additional risk assessment work.

6.9 Conclusions

The human health and the ecological risk assessments determined that there are risks associated with soil, sediment, and groundwater at Site 17. There may be an unacceptable risk to a future residential user from the VOCs and metals in groundwater. There is also risk to a future construction worker from vinyl chloride in groundwater. Finally, inorganics in soil and sediment pose unacceptable ecological risks.

The draft final RI report submitted in August 2002 recommended that an FS be performed for the site. It was also recommended that additional data were required to define the bounds of contamination in groundwater for the purposes of the FS.

Since submittal of the draft final RI report, a pre-FS investigation has been conducted and the results were presented in a technical memorandum entitled Pre-Feasibility Study Field Activities and Results, Site 17, Indian Head Division-NSWC, Indian Head, Maryland (September 30, 2002). The results from the pre-FS investigation will be used in the feasibility study for groundwater at the site.

Ecological risks identified in sediment at the site will be further evaluated in a Baseline Ecological Risk Assessment (BERA). A BERA will be conducted to assess potential ecological risk from contaminants along the shoreline and in the unnamed creek. Therefore, recommendations for sediment will await the results of the BERA, which will provide more site-specific information regarding potential ecological risk. The Mattawoman Creek Study assessed potential risk in general areas of the creek (i.e., Area 1, Area 2, etc), rather than potential risk at individual sites. Thus, the results will be used as a supplement to the BERA to determine recommendations for site sediment. If the BERA indicates ecological risks, then the sediment will be addressed in a feasibility study.

Ecological risks identified in soil will be addressed in an Engineering Evaluation/Cost Analysis. The Navy with the EPA and MDE agreed to soil removal to mitigate potential ecological risks from lead, mercury, and zinc in soil. Soil removal would prevent contact by humans and wildlife with contaminated soil, eliminate sources of contamination in soil from which infiltration could mobilize contaminants from soil into groundwater, and prevent further contamination of sediment in the Mattawoman Creek.

6.10 References

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Table 6-1
Detected Compounds in Site 17 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21 and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO01		IS17SO02		IS17SO03				IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SS010001		IS17SS020001		IS17SS030001		IS17SS030001P		IS17SS040001		IS17SS050001		IS17SS060001		IS17SS070001	
Sample Date	08/04/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,4-Dichlorobenzene																
Acetone													5.4	J		
Cyclohexane									1.8	J	1.7	J	11	J		
Dibromochloromethane																
Ethylbenzene			1.9	J									2.9	J		
Styrene											3.9	J				
Toluene			250													
Trichloroethene											8.3	J			25	J
Xylene, total	2.3	J	5.4	J					8.4	J	1.5	J	20	J		
Semi-volatile Organic Compounds (UG/KG)																
Acetophenone													72	J		
Benzaldehyde	1,100								47	J	81	J	71	J		
Benzo(a)anthracene	520										51	J				
Benzo(a)pyrene	130	J														
Benzo(b)fluoranthene	970										260	J	100	J		
Benzo(k)fluoranthene	380	J									99	J				
Chrysene	590										180	J	87	J		
Di-n-butylphthalate																
Dibenz(a,h)anthracene	69	J														
Fluoranthene	280	J									72	J	150	J		
Indeno(1,2,3-cd)pyrene	130	J									60	J				
Phenanthrene													60	J		
Pyrene	430						120	J			57	J	72	J		
bis(2-Ethylhexyl)phthalate					51	J	44	J								
Explosives (UG/KG)																
1,3,5-Trinitrobenzene																
1,3-Dinitrobenzene									46	J						
4-Nitrotoluene															240	J
Ammonium perchlorate																
Nitroguanidine									40	J						

J - Estimated Value
K - Biased high
L - Biased low

Table 6-1
Detected Compounds in Site 17 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21 and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO01		IS17SO02		IS17SO03		IS17SO03		IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SS010001		IS17SS020001		IS17SS030001		IS17SS030001P		IS17SS040001		IS17SS050001		IS17SS060001		IS17SS070001	
Sample Date	08/04/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
Total Metals (MG/KG)																
Aluminum	6,360	J	7,980	J	6,840	J	5,390	J	7,320		7,690		4,260		7,350	
Antimony	1.5	L														
Arsenic	11.3	L	4.7	L	3.2	L	3.1	L	2.9		4.6		13.6		3.9	
Barium	51.1		40.3	J	42.6	J	59.5		42.1	J	77.8		46.2	J	62	J
Beryllium													0.17	J	0.33	J
Cadmium	1.5		0.26	J	0.18	J	0.36	J			1.2	J	2.6	J	0.82	J
Calcium	1,120	J	525	J	1,170	J	2,210		445	J	2,510		2,120	E	2,640	E
Chromium	32.9		13.3		11.5		9.4		12.4		16.1		25.2		13.9	
Cobalt	11.4	J	6.5	J	4.2	J	4.8	J	6.1	J	8.4	J	29		7.9	J
Copper	90.7		14.5		8.4		9.6		9.4		19.6		82.5		15.3	
Cyanide			0.64		0.64		0.069	J								
Iron	47,400		13,600		14,900		13,500		15,500	J	22,900	J	224,000		16,000	
Lead	602		34.4		10.5		13.6		13	K	37.2	K	111		33.4	
Magnesium	656	J	726	J	851	J	819	J	826	J	1,540		519	J	1,100	J
Manganese	536		135		145		188		75.4	J	492	J	752		264	
Mercury	0.15	L									0.12	J	0.41		0.34	
Nickel	32.8		9.2	J	7.5	J	9.5	J	8.5	J	20.1		32.7		13.2	
Potassium	606	J	614	J	489	J	407	J	623	J	727	J	545	J	652	J
Selenium					1.1						1.6	L				
Silver	0.79		0.79		0.79		0.81									
Sodium	112		112				114						388	J	583	J
Thallium			1.4		1.4		1.4									
Vanadium	21.4		20.8		19.9		17.1		20.8		23.8		14.8	J	22	
Zinc	162	J	39	J	29.4	J	60.4	J	35	J	101	J	82.1	E	345	E
Wet Chemistry (MG/KG)																
% Moisture	21.5		21.5		21.9		23.1		20.8		29.6		44.8		36.3	
% Solids	72.3		64.6		69.7		65.9		79.2		64.9		44.6		75.5	
Total organic carbon (TOC)	29,200		36,700		45,500		59,300		21,600		60,100		152,000		23,400	
pH	5.8		5.3		5.6		5.6		5.2		6		5.8		6.1	

J - Estimated Value
K - Biased high
L - Biased low

Table 6-1
Detected Compounds in Site 17 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21 and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15			
Sample ID	IS17SS080001		IS17SS090001		IS17SS100001		IS17SS110001		IS17SS120001		IS17SS130001		IS17SS140001		IS17SS150001		IS17SS150001P	
Sample Date	07/26/00		07/25/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																		
Volatile Organic Compounds (UG/KG)																		
1,4-Dichlorobenzene											1.4	J			1.5	J	1.7	J
Acetone																		
Cyclohexane	5.3	J	7.9	J	26													
Dibromochloromethane			14	J														
Ethylbenzene																		
Styrene																		
Toluene																		
Trichloroethene																		
Xylene, total	2.9	J	1.5	J	20													
Semi-volatile Organic Compounds (UG/KG)																		
Acetophenone	49	J																
Benzaldehyde																		
Benzo(a)anthracene	280	J																
Benzo(a)pyrene	78	J																
Benzo(b)fluoranthene	880																	
Benzo(k)fluoranthene	310	J																
Chrysene	710																	
Di-n-butylphthalate							41	J										
Dibenz(a,h)anthracene	54	J																
Fluoranthene	1,400				57	J												
Indeno(1,2,3-cd)pyrene	110	J																
Phenanthrene	440	J																
Pyrene	740		72	J			47	J			160	J						
bis(2-Ethylhexyl)phthalate									45	J								
Explosives (UG/KG)																		
1,3,5-Trinitrobenzene																	210	J
1,3-Dinitrobenzene															30	J		
4-Nitrotoluene																		
Ammonium perchlorate					120	J												
Nitroguanidine																		

J - Estimated Value
K - Biased high
L - Biased low

Table 6-1
Detected Compounds in Site 17 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21 and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15			
Sample ID	IS17SS080001		IS17SS090001		IS17SS100001		IS17SS110001		IS17SS120001		IS17SS130001		IS17SS140001		IS17SS150001		IS17SS150001P	
Sample Date	07/26/00		07/25/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																		
Total Metals (MG/KG)																		
Aluminum	7,640		5,440		9,110		7,700		3,780		9,850		7,300		10,200		10,500	
Antimony			1.3	J														
Arsenic	6.5		3.9		4.1		3.7				1.4	J	2.5		2.8		3.8	
Barium	82.4		33.9	J	116		52.5		28.8	J	45.5	J	47.8		43	J	41.3	J
Beryllium	0.38	J	0.23	J	0.5	J												
Cadmium	6.9		0.81	J	1.7													
Calcium	4,150	E	1,920	E	4,490	E	837	J	1,110	J	602	J	1,100	J	482	J	376	J
Chromium	13.6		18		16.6		13.7		7.5		15.8		12.8		15		16.4	
Cobalt	9.2	J	5.5	J	11.5	J	5.5	J	2.6	J	5.8	J	6.4	J	6.1	J	5.6	J
Copper	42.6		17.2		40.9		13.3		5.6	J	11.3		11.6		10.4		11.4	
Cyanide															0.077	J		
Iron	20,600		23,000		20,100		17,000		8,950		11,200		13,900		20,600		23,400	
Lead	94.1		20.7		78.1		11.8		7.4		11.6		14.4		13.3		12.6	
Magnesium	1,260	J	965	J	1,690		1,110	J	469	J	1,300		1,170		733	J	733	J
Manganese	529		150		539		72.4		79.3		42.7		83.6		149		123	
Mercury	0.3				0.16	J												
Nickel	21.4		13		24.6		10.6		5.7	J	11		10.4		7.8	J	8	J
Potassium	799	J	347	J	1,200	J	688	J	315	J	840	J	654	J	866	J	884	J
Selenium																		
Silver																		
Sodium	516	J	600	J	551	J												
Thallium																		
Vanadium	23.7		19.5		29.4		22.2		12.2	J	22.7		23.3		26.8		28.3	
Zinc	1,140	E	653	E	227	E	34.7		68.3		41.4		151		31.1		29.5	
Wet Chemistry (MG/KG)																		
% Moisture	29.3		30.5		40.4		10.2		19.3		19.5		14.5		15.9		21.1	
% Solids	68.1		74		61.9													
Total organic carbon (TOC)	76,600		17,000		65,800													
pH	6.5		7.2		6.4													

J - Estimated Value
K - Biased high
L - Biased low

Table 6-2
Detected Compounds in Site 17 Subsurface Soil Samples
NDWIH
Site 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO01		IS17SO02	IS17SO03	IS17SO04	IS17SO05	IS17SO06	IS17SO07
Sample ID	IS17SB010203	IS17SB010203P	IS17SB020203	IS17SB030203	IS17SB040203	IS17SB050203	IS17SB060203	IS17SB070203
Sample Date	08/03/00	08/03/00	08/03/00	08/03/00	07/27/00	07/27/00	07/26/00	07/26/00
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane				1.8 J				
1,2-Dichloroethene (total)								
2-Butanone								6.7 J
Acetone						33		21
Cyclohexane			1.4 J			4.5 J	7.2 J	1.9 J
Ethylbenzene			2.3 J	2.6 J		2.4 J	3.3 J	
Methylene chloride		24						
Styrene					2.1 J			
Toluene						1.5 J		
Trichloroethene			3.5 J	30		4.1 J	3.3 J	
Xylene, total	5.4 J	5.1 J	16	2.1 J		9.3 J	23	
cis-1,2-Dichloroethene				7.5 J		14		
trans-1,2-Dichloroethene								
Semi-volatile Organic Compounds (UG/KG)								
Acenaphthene				76 J				
Anthracene			75 J	63 J				
Benzo(a)anthracene		49 J	730	310 J				
Benzo(a)pyrene		55 J	270 J	83 J				
Benzo(b)fluoranthene		120 J	1,500	390 J				
Benzo(k)fluoranthene			630	190 J				
Carbazole			47 J	49 J				
Chrysene		58 J	880	350 J				
Di-n-butylphthalate			63 J					
Dibenz(a,h)anthracene			190 J					
Fluoranthene		48 J	1,100	680				
Indeno(1,2,3-cd)pyrene		74 J	360 J	92 J				
Phenanthrene			370 J	390 J				
Pyrene		65 J	590	350 J				
bis(2-Ethylhexyl)phthalate				79 J				
Explosives (UG/KG)								
1,3-Dinitrobenzene					35 J			

J - Estimated Value
K - Biased high
L - Biased low

Table 6-2
Detected Compounds in Site 17 Subsurface Soil Samples
NDWIH
Site 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO01		IS17SO02	IS17SO03	IS17SO04	IS17SO05	IS17SO06	IS17SO07
Sample ID	IS17SB010203	IS17SB010203P	IS17SB020203	IS17SB030203	IS17SB040203	IS17SB050203	IS17SB060203	IS17SB070203
Sample Date	08/03/00	08/03/00	08/03/00	08/03/00	07/27/00	07/27/00	07/26/00	07/26/00
Chemical Name								
2-Nitrotoluene	170 J			170 J				
4-Nitrotoluene						230 J		
Ammonium perchlorate							57 J	
Total Metals (MG/KG)								
Aluminum	7,250 J	3,770 J	7,660 J	7,510 J	8,600	6,240	8,060	9,320
Arsenic	4.6 L	1.5 L	6.9 L	7.6 L	3.6	2.5 J	6.8	3.1
Barium	50.5 J	51.1	75.7	64.8	64.4	61.5	59.9	79.6
Beryllium	0.68 J	0.75 J					0.41 J	0.66 J
Cadmium	0.24 J	0.37 J	1.5	0.53 J	0.55 J	0.29 J	0.95 J	0.16 J
Calcium	2,060	2,350	1,640	1,250 J	828 J	567 J	1,090 J	817 J
Chromium	14.1	9.7	14.1	13.5	13.7	11.1	15.8	15
Cobalt	7.4 J	2.9 J	7 J	7.4 J	6.5 J	7.6 J	7.9 J	17.3
Copper	15.3	12.4	25.1	27.6	13.1	14.5	29.2	7.2
Cyanide	0.66	0.059 J	0.15 J	0.44 J				
Iron	24,100	17,100	17,300	17,400	16,100 J	10,500 J	37,700	10,400
Lead	17.1	5.2	76	99.4	26.6 K	24.2 K	46.2	17.7
Magnesium	1,050 J	875 J	849 J	806 J	1,170 J	576 J	790 J	806 J
Manganese	128	133	197	151	85.8 J	186 J	222	132
Mercury			0.18 L	1.1 L			0.68	0.089 J
Nickel	7.5 J	3.2 J	11	10.7 J	11.5	6 J	10.1 J	10.2 J
Potassium	496 J	205 J	484 J	548 J		346 J	676 J	501 J
Selenium		1.1	1.4					
Silver	0.81	0.76	0.85	0.84				
Sodium	115	108	120	119			452 J	464 J
Thallium		1.3	1.5	1.4				
Vanadium	32.3	18.9	28.3	25.5	23.2	20.7	22.2	24.9
Zinc	45.9 J	11.1 J	111 J	91.5 J	46.8 J	27.5 J	73.6 E	52.8 E
Wet Chemistry (MG/KG)								
% Moisture	23.8	18.5	27.1	26.4	21.3	22.2	21.5	28.4

J - Estimated Value
K - Biased high
L - Biased low

Table 6-2
Detected Compounds in Site 17 Subsurface Soil Samples
NDWIH
Site 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15	
Sample ID	IS17SB080203		IS17SB090203		IS17SB100203		IS17SB110203		IS17SB120203		IS17SB130203		IS17SB140203		IS17SB150203	
Sample Date	07/26/00		07/26/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane																
1,2-Dichloroethene (total)	430															
2-Butanone			4.6	J												
Acetone			20													
Cyclohexane					6	J										
Ethylbenzene																
Methylene chloride																
Styrene																
Toluene			2.9	J												
Trichloroethene	680															
Xylene, total	14	J	7.5	J												
cis-1,2-Dichloroethene	390		7.6	J												
trans-1,2-Dichloroethene	18	J														
Semi-volatile Organic Compounds (UG/KG)																
Acenaphthene																
Anthracene																
Benzo(a)anthracene																
Benzo(a)pyrene																
Benzo(b)fluoranthene																
Benzo(k)fluoranthene																
Carbazole																
Chrysene																
Di-n-butylphthalate																
Dibenz(a,h)anthracene																
Fluoranthene																
Indeno(1,2,3-cd)pyrene																
Phenanthrene																
Pyrene			110	J											59	J
bis(2-Ethylhexyl)phthalate			280	J												
Explosives (UG/KG)																
1,3-Dinitrobenzene																

J - Estimated Value
K - Biased high
L - Biased low

Table 6-2
Detected Compounds in Site 17 Subsurface Soil Samples
NDWIH
Site 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15	
Sample ID	IS17SB080203		IS17SB090203		IS17SB100203		IS17SB110203		IS17SB120203		IS17SB130203		IS17SB140203		IS17SB150203	
Sample Date	07/26/00		07/26/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																
2-Nitrotoluene																
4-Nitrotoluene																
Ammonium perchlorate																
Total Metals (MG/KG)																
Aluminum	6,720		5,540		4,880		9,560		9,510		8,840		9,760		7,850	
Arsenic	6.6		2.5	J	2	J	3.6		2.5		2.1	J	2.4		5.8	
Barium	60.4		78.6		34.4	J	51.6		61.3		59.2		29	J	105	
Beryllium	0.38	J														
Cadmium	0.5	J	0.38	J	0.28	J										
Calcium	903	J	745	J	883	J	435	J	419	J					245	J
Chromium	12.4		10.9		8.9		15.9		15.8		14.9		15		15.4	
Cobalt	7.1	J	7.1	J	10.8	J	6.3	J	7.8	J	6.6	J	5.5	J	9.6	J
Copper	519		13.6		7.1		12.5		12.2		13.9		11.4		16.2	
Cyanide																
Iron	18,600		17,900	J	10,300	J	22,600		12,300		12,300		14,800		27,700	
Lead	40.3		14.1	K	10.2	K	10.5		14.5		10.9		12.4		12.4	
Magnesium	717	J	939	J	785	J	995	J	1,580		1,440		1,260		1,490	
Manganese	140		98.1	J	171	J	39.5		77		58		73.4		160	
Mercury	0.96															
Nickel	10.2		10.2	J	6.7	J	10.1		13.6		11.7		9.9		13.8	
Potassium	562	J	515	J	512	J	679	J	830	J	786	J	803	J	774	J
Selenium																
Silver																
Sodium																
Thallium																
Vanadium	20.7		16		17		26.7		27.3		19.9		25.2		29	
Zinc	114	J	56.5	J	33	J	32.9		48.1		39.4		36.2		46.6	
Wet Chemistry (MG/KG)																
% Moisture	17.3		27.7		14.1		16.8		17.9		18.9		14.3		13.4	

J - Estimated Value
K - Biased high
L - Biased low

Table 6-3
Detected Compounds in Site 17 Monitoring Well Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17MW01				IS17MW02		IS17MW03	
Sample ID	IS17MW011000P		IS17MW011000		IS17MW021000		IS17MW031000	
Sample Date	10/24/00		10/24/00		10/24/00		10/20/00	
Chemical Name								
Volatile Organic Compounds (UG/L)								
Ethylbenzene	47	J	50	J				
Toluene	200		200					
Vinyl chloride	40	J	40	J	3,000			
cis-1,2-Dichloroethene	37	J	37	J	4,200			
Semi-volatile Organic Compounds (UG/L)								
4-Methylphenol	62	J	42	J	4	J		
Phenol	19	J	13	J				
Explosives (UG/L)								
1,3,5-Trinitrobenzene			4	J				
1,3-Dinitrobenzene	1.4	J						
2,4,6-Trinitrotoluene	5.8	J	4.4	J			1	
2,4-Dinitrotoluene	1.8	J			0.28		1.2	
2,6-Dinitrotoluene					0.14	J	0.12	J
2-Amino-4,6-dinitrotoluene					0.2			
3-Nitrotoluene							0.18	J
4-Amino-2,6-dinitrotoluene							0.39	
4-Nitrotoluene			2.8	J				
Nitrobenzene					0.098	J		
RDX			3.3	J				
Tetryl	5	J	5.9	J	0.12	J		
Total Metals (UG/L)								
Aluminum	3,630		2,520		420		31,500	
Antimony			3.6	J				
Arsenic							4	J
Barium	93.5	J	83.7	J	138	J	202	
Beryllium					0.18	J		
Cadmium			0.3	J				
Calcium	23,800		22,900		37,800		5,440	
Chromium	42.3		22.7		5.8	J	86.9	
Cobalt	4	J	3.1	J	2.6	J	32.7	J

J - Estimated Value
K - Biased high
L - Biased low

Table 6-3
Detected Compounds in Site 17 Monitoring Well Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17MW01				IS17MW02		IS17MW03	
Sample ID	IS17MW011000P		IS17MW011000		IS17MW021000		IS17MW031000	
Sample Date	10/24/00		10/24/00		10/24/00		10/20/00	
Chemical Name								
Copper	5.7	J	4.1	J	6.3	J	39.7	
Cyanide			0.1	J				
Iron	27,100		24,600		71,000		31,400	
Lead	4.9		3.1				13.9	
Magnesium	11,600		11,000		15,700		5,330	
Manganese	1,210		1,120		2,620		540	
Nickel	31	J	20.4	J	7	J	73.4	
Potassium	5,440		5,110		7,720		3,350	J
Selenium	4.3	J						
Sodium	46,400		44,600		41,100		26,800	
Vanadium	9.4	J	6.6	J	1.4	J	49	J
Zinc							128	
Dissolved Metals (UG/L)								
Aluminum					108	J	90.4	J
Antimony					3.3	J		
Barium	82.1	J	77.3	J	152	J	33.2	J
Calcium	26,900		25,300		42,000		3,440	J
Chromium	5.5	J	12.3		1.8	J		
Cobalt	2.1	J	6.8	J	2.4	J	14.5	J
Copper			3	J	1.7	J	1.4	J
Iron	25,000		23,800		77,200			
Magnesium	12,900		12,000		17,500		2,060	J
Manganese	1,310		1,230		2,890		339	
Nickel	3.4	J	7	J	4.8	J	16.3	J
Potassium	5,750		5,470		8,490			
Sodium	53,200		50,100		46,300		31,400	
Vanadium	1.3	J	0.79	J	0.96	J		

J - Estimated Value
K - Biased high
L - Biased low

Table 6-4
Detected Compounds in Site 17 Surface Water Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17SW01		IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample ID	IS17SW01	IS17SW01P	IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample Date	07/21/00	07/21/00	07/20/00	07/21/00	07/24/00	07/24/00	07/24/00
Chemical Name							
Explosives (UG/L)							
4-Nitrotoluene			0.11 J				
Total Metals (UG/L)							
Aluminum			664	553 J	258		
Barium	19 J	23.4 J	24.7 J	25.8 J	24 J	25.2 J	24.4 J
Calcium	10,600	10,200	10,000	10,100	9,750	10,800	11,800
Copper			3.9 J	2.4 J	4.5 J	5 J	5.4 J
Cyanide		2.2 L	10 L	1.1 L			
Iron		453	725	981	576	362	227
Lead				1.3 K		1.9 J	7.3
Magnesium	5,690	5,500	5,300	5,310	5,140	5,600	5,900
Manganese		93.9	87.4	106	105	105	95.9
Nickel		2.5 K		2.7 J	3.5 J	2.8 J	2.8 J
Potassium	2,770 J	2,790 J	2,670 J	2,700 J	2,650 J	2,920 J	3,030 J
Selenium						5.8	
Sodium	13,400	12,200	12,200	12,100	15,000	15,800	15,900
Vanadium			2.1 J	2.1 J	1.7 J	1.5 J	
Zinc					24.2	26	32.7
Dissolved Metals (UG/L)							
Barium	21.8 J	18.4 J	17 J	17.8 J	20.4 J	20.7 J	21 J
Beryllium	0.31 J						
Calcium	9,120	10,400	10,100	10,200	10,000	10,700	12,200
Copper	4.8 J				2.8 J	2.2 J	
Iron	456			28.2 J	59.2 J		37.5 J
Magnesium	4,840 J	5,660	5,320	5,470	5,230	5,630	6,180
Manganese	86.7	1.7 J					
Nickel	17.9 J				3.1 J	3.7 J	3.3 J
Potassium	2,400 J	2,800 J	2,550 J	2,710 J	2,640 J	2,840 J	3,090 J
Selenium					4.9 J		
Sodium	11,300	12,800	12,300	12,900	14,900	13,700	14,200
Zinc					29.9		

J - Estimated Value
K - Biased high
L - Biased low

Table 6-4
Detected Compounds in Site 17 Surface Water Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17SW01		IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample ID	IS17SW01	IS17SW01P	IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample Date	07/21/00	07/21/00	07/20/00	07/21/00	07/24/00	07/24/00	07/24/00
Chemical Name							
Wet Chemistry (MG/L)							
Hardness	42	48	44	46	40	36	42

J - Estimated Value
K - Biased high
L - Biased low

Table 6-5
Detected Compounds in Site 17 Sediment Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS17SD01		IS17SD02		IS17SD03		IS17SD04		IS17SD05		IS17SD06	
Sample ID	IS17SD010001		IS17SD020001		IS17SD030001		IS17SD040001		IS17SD050001		IS17SD060001	
Sample Date	07/21/00		07/21/00		07/21/00		07/24/00		07/24/00		07/24/00	
Chemical Name												
Explosives (UG/KG)												
1,3,5-Trinitrobenzene			94	J								
1,3-Dinitrobenzene			69	J								
2,4,6-Trinitrotoluene			100	J					66	J		
2,6-Dinitrotoluene					100	J						
2-Amino-4,6-dinitrotoluene									220	J		
3-Nitrotoluene			220	J								
Total Metals (MG/KG)												
Aluminum	837		5,440		5,360		1,560		13,100		11,900	
Antimony							1.3	J	3.5	J	3.2	J
Arsenic	2.1	J	3.4		3.5		7.1		17.8		32.7	
Barium	7.6	J	56.1		61.1		11	J	95		85.8	
Beryllium	0.2	J					0.061	J	0.39	J	0.39	J
Cadmium	0.13	J					0.71	J	4.2		18.7	
Calcium			349	J	441	J	362	J	1,750	E	3,350	E
Chromium	7		10.6		10		27.5		38.8		43.4	
Cobalt	2.5	J	3.9	J	7.4	J	2.9	J	12	J	12.2	J
Copper	3	J	6.5		11.7		80.4		335		483	
Iron	7,270		11,100		10,600		26,900		34,100		118,000	
Lead	4.4	J	10.9	J	21.6	J	138	J	707	J	1,140	J
Magnesium	108	J	563	J	516	J	181	J	1,550		1,510	J
Manganese	85.3		73.6		311		172		305		763	
Mercury			0.062	J	0.097	J			0.34		0.26	
Nickel			5.6	J	6	J	9.5	J	39.4		35.7	
Potassium	91.7	J	340	J	356	J	94.8	J	796	J	581	J
Silver									8.3		4.5	
Sodium							372	J	521	J	604	J
Vanadium	7.7	J	17		17.5		11.3	J	28.1		33.6	
Zinc	8.8	J	23.5	J	25.6	J	156	E	712	E	939	E
Wet Chemistry (MG/KG)												
% Moisture	24.1		19		24.8		22.6		21.4		39.6	
% Solids	79.7		75.3		65.3		81		79.5		60.2	
Total organic carbon (TOC)					13,000				39,200		52,100	
pH	7.1		5.4		5.8		6.8		7.1		7.5	

J - Estimated Value
K - Biased high
L - Biased low

TABLE 6-6
Conceptual Site Model for Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Surface Soil:

- Transport of organic and inorganic contaminants via erosion and deposition as sediment in Mattawoman Creek. Once deposited as sediment, limited desorption and dissolution into surface water, with subsequent transport in the surface water.
- Limited leaching of organic and inorganic contaminants from the surface soil to the subsurface soil via the infiltration of precipitation.
- Some bioaccumulation of inorganic and organic compounds in ecological receptors.
- Biodegradation of organic compounds.

Subsurface Soil:

- Limited leaching of inorganic contaminants to the groundwater via the infiltration of precipitation.

Groundwater:

- Movement of dissolved contaminants with the groundwater flow southeastward from the site to Mattawoman Creek. Contaminant concentration will decrease with distance from the source area due to the dilution caused by advection and dispersion and due to the removal of inorganics from the aqueous phase via precipitation and transformation.

Table 6-7
Summary of Data Quantitatively Used in Risk Assessment-Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Medium	Date of Sampling	Sample	Parameters
Soil			
Subsurface Soil (Below 2 feet)	7/25/2000	IS17SB100203	EXPLO, METAL, SVOA, VOA
	7/26/2000	IS17SB090203	EXPLO, METAL, SVOA, VOA
	7/26/2000	IS17SB080203	EXPLO, METAL, SVOA, VOA
	7/26/2000	IS17SB070203	EXPLO, METAL, SVOA, VOA
	7/26/2000	IS17SB060203	EXPLO, METAL, SVOA, VOA
	7/27/2000	IS17SB050203	EXPLO, METAL, SVOA, VOA
	7/27/2000	IS17SB040203	EXPLO, METAL, SVOA, VOA
	8/3/2000	IS17SB010203	EXPLO, METAL, SVOA, VOA
	8/3/2000	IS17SB010203P	EXPLO, METAL, SVOA, VOA
	8/3/2000	IS17SB020203	EXPLO, METAL, SVOA, VOA
	8/3/2000	IS17SB030203	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SB110203	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SB120203	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SB130203	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SB140203	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SB150203	EXPLO, METAL, SVOA, VOA
Surface Soil (0 to 6 inches)	7/25/2000	IS17SS090001	EXPLO, METAL, SVOA, VOA
	7/25/2000	IS17SS100001	EXPLO, METAL, SVOA, VOA
	7/26/2000	IS17SS080001	EXPLO, METAL, SVOA, VOA
	7/26/2000	IS17SS070001	EXPLO, METAL, SVOA, VOA
	7/26/2000	IS17SS060001	EXPLO, METAL, SVOA, VOA
	7/27/2000	IS17SS050001	EXPLO, METAL, SVOA, VOA
	7/27/2000	IS17SS040001	EXPLO, METAL, SVOA, VOA
	8/3/2000	IS17SS020001	EXPLO, METAL, SVOA, VOA
	8/3/2000	IS17SS030001	EXPLO, METAL, SVOA, VOA
	8/3/2000	IS17SS030001P	EXPLO, METAL, SVOA, VOA
	8/4/2000	IS17SS010001	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SS110001	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SS120001	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SS130001	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SS140001	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SS150001	EXPLO, METAL, SVOA, VOA
	10/12/2000	IS17SS150001P	EXPLO, METAL, SVOA, VOA
Background Soil			
Subsurface Soil (Below 2 feet)	7/27/2000	IS11SB260203	EXPLO, METAL, SVOA, VOA
Surface Soil (0 to 6 inches)	07/27/2000	IS11SS420001	EXPLO, METAL, SVOA, VOA
Groundwater			
	10/20/2000	IS17MW031000	EXPLO, FMETAL, METAL, SVOA, VOA
	10/24/2000	IS17MW011000	EXPLO, FMETAL, METAL, SVOA, VOA
	10/24/2000	IS17MW011000P	EXPLO, FMETAL, METAL, SVOA, VOA
	10/24/2000	IS17MW021000	EXPLO, FMETAL, METAL, SVOA, VOA
Background Groundwater			
	9/8/2000	IS11MW050900	EXPLO, FMETAL, METAL, SVOA, VOA

Table 6-7
Summary of Data Quantitatively Used in Risk Assessment-Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Surface Water			
	07/21/00	IS17SW01	METAL, FMETAL, EXPLO
	07/21/00	IS17SW01P	METAL, FMETAL, EXPLO
	07/20/00	IS17SW02	METAL, FMETAL, EXPLO
	07/21/00	IS17SW03	METAL, FMETAL, EXPLO
	07/24/00	IS17SW04	METAL, FMETAL, EXPLO
	07/24/00	IS17SW05	METAL, FMETAL, EXPLO
	07/24/00	IS17SW06	METAL, FMETAL, EXPLO
Sediment			
	07/21/00	IS17SD010001	METAL, EXPLO
	07/21/00	IS17SD020001	METAL, EXPLO
	07/21/00	IS17SD030001	METAL, EXPLO
	07/24/00	IS17SD040001	METAL, EXPLO
	07/24/00	IS17SD050001	METAL, EXPLO
	07/24/00	IS17SD060001	METAL, EXPLO

Table 6-8

Summary of Chemicals of Potential Concern for the HHRA-Site 17 (based on comparison to RBCs)

Sites 11, 13, 17, 21, and 25 RI Report

NDWIH

Indian Head, Maryland

Groundwater	Soil		Surface Water
Shallow Aquifer	**Surface Soil**	**Surface and Subsurface**	
Toluene	Benzo(a)pyrene	Benzo(a)pyrene	None
Vinyl chloride	Benzo(b)fluoranthene	Benzo(b)fluoranthene	
cis-1,2-Dichloroethene	Aluminum	Dibenz(a,h)anthracene	
4-Methylphenol	Arsenic	Aluminum	
1,3-Dinitrobenzene	Chromium	Arsenic	
2,4,6-Trinitrotoluene	Iron	Chromium	
RDX	Lead	Copper	
Aluminum	Manganese	Iron	
Antimony	Thallium	Lead	
Arsenic	Vanadium	Manganese	
Chromium		Thallium	
Iron		Vanadium	
Manganese			
Nickel		**Soil to Air Pathway**	
Vanadium		Trichloroethene	

* COPCs for groundwater for all scenarios (based on unfiltered metals results).

Table 6-9
Exposure Pathways-Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Exposure Route	Current				Future							
		Trespasser/ Visitor		Recreational User		Construction Worker	Industrial Worker	Trespasser/ Visitor		Recreational User		Resident	
		Adult	Adolescents	Adult	Child			Adult	Adolescents	Adult	Child	Adult	Child
Groundwater - Shallow Aquifer													
	Ingestion											X	X
	Dermal					X						X	X
	Inhalation					X						X	
Surface Soil													
	Ingestion	X	X										
	Dermal	X	X										
	Inhalation	NC	NC										
Combined Surface and Subsurface Soil													
	Ingestion					X	X	X	X			X	X
	Dermal					X	X	X	X			X	X
	Inhalation					NC	NC	NC	NC			NC	NC
Surface Water													
	Ingestion			X*	X*					X*	X*		
	Dermal			X*	X*					X*	X*		
	Inhalation												

X Quantitative evaluation (if COPCs selected for pathway).

* Current and Future scenario are the same.

NC No COPCs identified, therefore, not evaluated quantitatively.

Table 6-10
Summary of RME Cancer Risks and Hazard Indices-Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current Trespasser/Visitor Adolescent	Surface Soil	Ingestion	4.5E-07				0.072	
		Dermal Contact	9.1E-08				0.030	
		Inhalation	NA				NA	
		Total	5.4E-07				0.10	
	All Media	Total	5.4E-07				0.10	
Current Trespasser/Visitor Adult	Surface Soil	Ingestion	8.7E-07				0.052	
		Dermal Contact	2.5E-07				0.031	
		Inhalation	NA				NA	
		Total	1.1E-06				0.083	
	All Media	Total	1.1E-06				0.083	
Future Resident Adult	Groundwater	Ingestion	NA				54	VC, cis-1,2-DCE, Iron, Manganese, Vanadium
		Dermal Contact	NA				2.4	VC
		Inhalation	NA				7.5	VC
		Total	NA				64	VC, cis-1,2-DCE, Iron, Manganese, Vanadium
	Soil*	Ingestion	NA				0.25	
		Dermal Contact	NA				0.30	
		Inhalation	NA				0.0	
		Total	NA				0.54	
	All Media	Total	NA				64	
Future Resident Child	Groundwater	Ingestion	NA				126	VC, cis-1,2-DCE, Aluminum, Chromium, Iron, Manganese, Vanadium
		Dermal Contact	NA				5.6	VC, cis-1,2-DCE
		Inhalation	NA				NA	
		Total	NA				131	VC, cis-1,2-DCE, Aluminum, Chromium, Iron, Manganese, Vanadium
	Soil*	Ingestion	NA				2.3	Iron
		Dermal Contact	NA				0.40	
		Inhalation	NA				0.0	
		Total	NA				2.7	Iron
	All Media	Total	NA				134	
Future Resident Child/Adult	Groundwater	Ingestion	6.1E-02	VC	Arsenic	2,4,6-Trinitrotoluene, RDX	NA	
		Dermal Contact	2.5E-03	VC			NA	
		Inhalation	2.2E-03	VC			NA	
		Total	6.6E-02	VC	Arsenic	2,4,6-Trinitrotoluene, RDX	NA	
	Soil*	Ingestion	1.8E-05		Arsenic	Benzo(a)pyrene, Dibenz(a,h)anthracene	NA	
		Dermal Contact	5.5E-06			Benzo(a)pyrene, Dibenz(a,h)anthracene, Arsenic	NA	
		Inhalation	4.6E-09				NA	
		Total	2.4E-05		Arsenic	Benzo(a)pyrene, Dibenz(a,h)anthracene	NA	
	All Media	Total	6.6E-02				NA	

Table 6-10
Summary of RME Cancer Risks and Hazard Indices-Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Construction Worker Adult	Groundwater	Ingestion	NA				NA	
		Dermal Contact	3.2E-05		VC		0.98	
		Inhalation	8.6E-06			VC	0.71	
		Total	4.1E-05		VC		1.7	VC
	Soil*	Ingestion	7.8E-07				0.82	
		Dermal Contact	4.5E-08				0.18	
		Inhalation	1.2E-10				0.0	
		Total	8.3E-07				1.0	
	All Media	Total	4.2E-05				2.7	
Future Industrial Worker Adult	Soil*	Ingestion	4.1E-06			Arsenic	0.18	
		Dermal Contact	1.5E-06			Arsenic	0.28	
		Inhalation	1.6E-09				0.0	
		Total	5.6E-06			Arsenic	0.45	
	All Media	Total	5.6E-06				0.45	
Future Trespasser/Visitor Adolescent	Soil*	Ingestion	4.2E-07				0.050	
		Dermal Contact	4.6E-08				0.023	
		Inhalation	1.7E-11				0.0	
		Total	4.6E-07				0.073	
	All Media	Total	4.6E-07				0.073	
Future Trespasser/Visitor Adult	Soil*	Ingestion	8.1E-07				0.036	
		Dermal Contact	1.3E-07				0.024	
		Inhalation	2.0E-11				0.0	
		Total	9.4E-07				0.061	
	All Media	Total	9.4E-07				0.061	

NA - Not applicable, pathway incomplete.
cis-1,2-CDE = cis-1,2-Dichloroethene
TCE = Trichloroethene
VC = Vinyl chloride

Table 6-11
Summary of CT Cancer Risks and Hazard Indices-Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Resident Adult	Groundwater	Ingestion	NA				9.9	VC, cis-1,2-DCE, Iron
		Dermal Contact	NA				0.52	
		Inhalation	NA				1.7	VC
		Total	NA				12	VC, cis-1,2-DCE, Iron
	All Media	Total	NA				12	
Future Resident Child	Groundwater	Ingestion	NA				33	VC, cis-1,2-DCE, Iron, Manganese
		Dermal Contact	NA				1.2	
		Inhalation	NA				NA	
		Total	NA				34	VC, cis-1,2-DCE, Iron, Manganese
	Soil*	Ingestion	NA				0.56	
		Dermal Contact	NA				0.19	
		Inhalation	NA				NA	
		Total	NA				0.74	
	All Media	Total	NA				35	
Future Resident Child/Adult	Groundwater	Ingestion	7.6E-03	VC	Arsenic		NA	
		Dermal Contact	3.0E-04	VC			NA	
		Inhalation	1.9E-04	VC			NA	
		Total	8.1E-03	VC	Arsenic		NA	
	All Media	Total	8.1E-03				NA	
Future Construction Worker Adult	Soil*	Ingestion	NA				0.52	
		Dermal Contact	NA				0.050	
		Inhalation	NA				NA	
		Total	NA				0.57	
	All Media	Total	NA				0.57	

NA - Not applicable, pathway incomplete.
cis-1,2-CDE = cis-1,2-Dichloroethene
TCE = Trichloroethene
VC = Vinyl chloride

Table 6-12
Lead Risk-based Concentration for the Adult - Industrial Worker- Site 17
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

$$PbB_{adult,\ central} = PbB_{fetal,\ 0.95,goal} / ((GSD^{\wedge}1.645) * R)$$

$$PbS = ((PbB_{adult,\ central} - PbB_{adult,0}) * AT) / (BKSF * IR * AF * EF)$$

Exposure Parameter	Description	Industrial Adult Values	Source[1]
PbS	Soil Lead Concentration expressed in ug/g;	1,113	Calc.
$PbB_{adult,central}$	Central estimate of Blood Lead Concentrations in adults exposed to the site expressed in ug/dl;	3.55	Calc.
$PbB_{fetal,0.95,goal}$	Goal for 95th % blood lead concentration (ug/dl);	10	A
GSD	Geometric standard deviation (dimensionless);	2.0	A
R	Constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (dimensionless);	0.9	A
$PbB_{adult,0}$	Typical Blood Lead Concentration in the absence of exposure to the site expressed in ug/dL;	2.0	A
AT	Averaging Time (days/year)	365	A
BKSF	Biokinetic Slope Factor expressed in ug/dL blood lead increase per ug/day lead uptake;	0.4	A
IR	Intake rate of soil (g/day);	0.05	A
AF	Gastrointestinal absorption fraction for ingested lead in soil and lead in dust from soil (dimensionless)	0.12	A
EF	Exposure frequency (days/year)	219	A

A - EPA, December 1996. *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil.*

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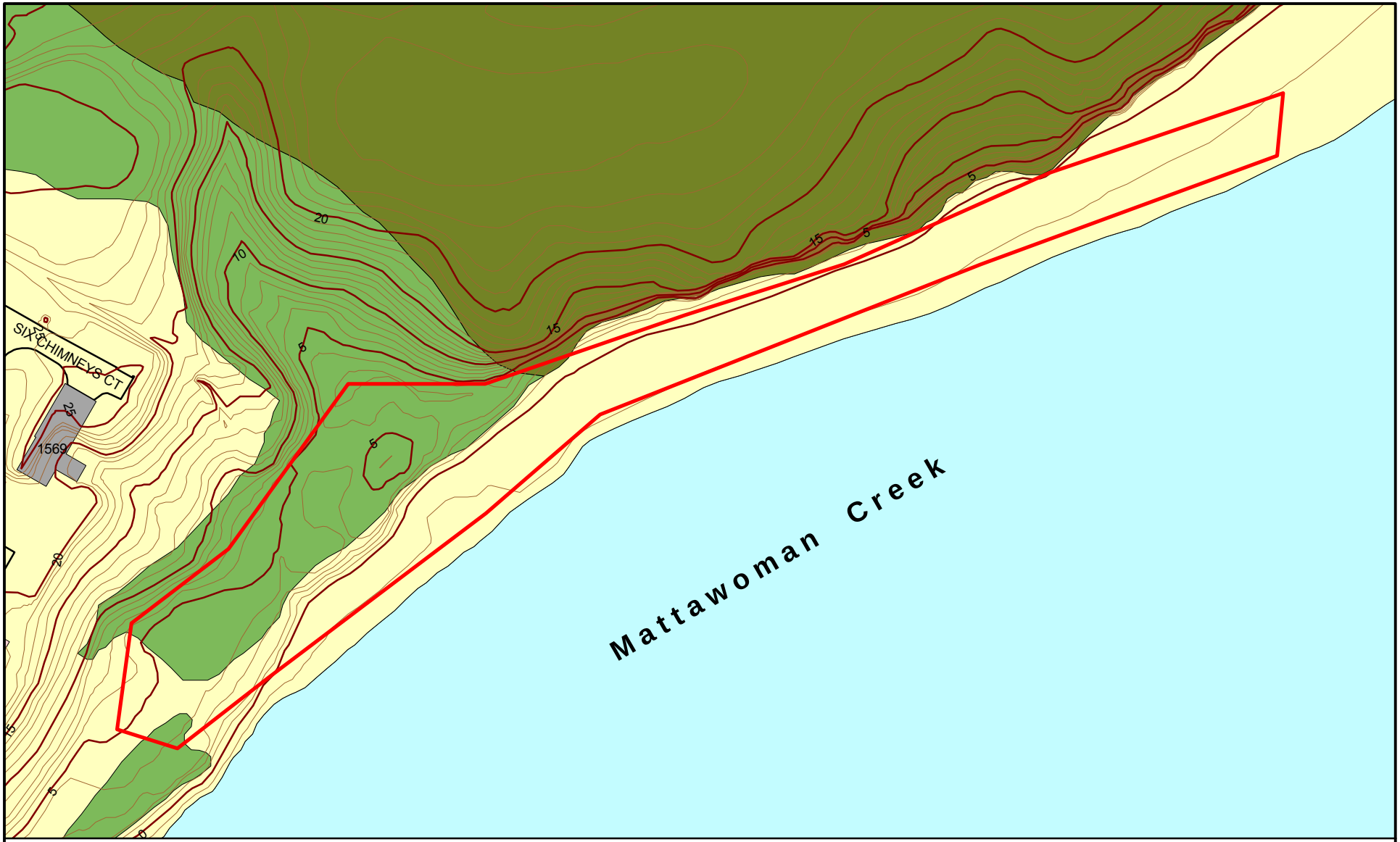

LEGEND

- IR Sites
- Buildings
- Railroads
- Road
- Wooded Area
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)
- Dense Wooded Area

N

60 0 60 120 Feet

Figure 6-1
Site 17 Topography
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr

LEGEND

- Surface Water
- Soil Samples
- Sediment
- Monitoring Wells
- Ground Water
- IR Sites
- Buildings
- Demolished Buildings
- Dense Wooded Area

N

70 0 70 140 Feet

Figure 6-2
Site 17 Sampling Locations
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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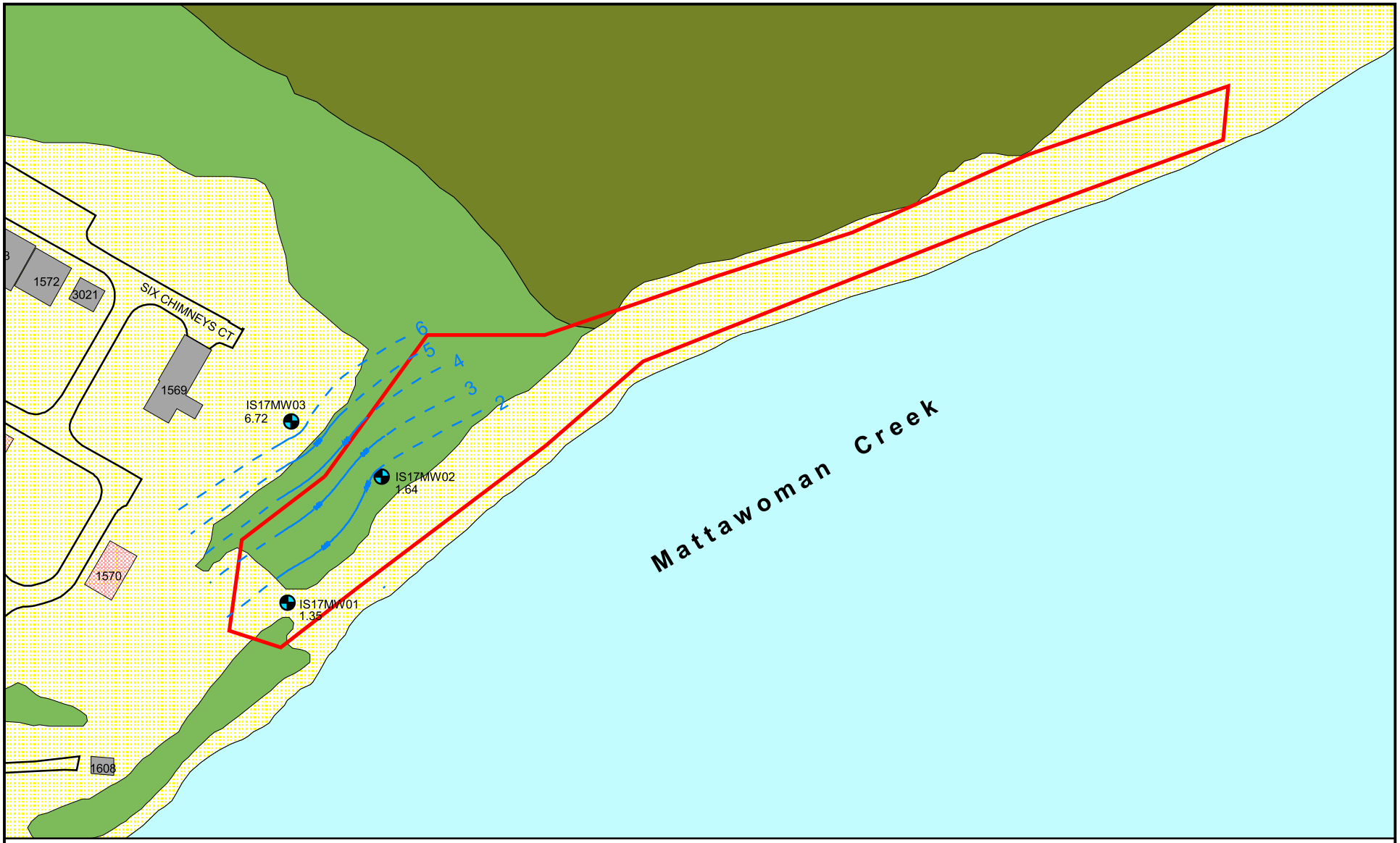

LEGEND

- Monitoring Wells
- Interpolated Groundwater Contours
- Inferred Groundwater Contours
- IR Site Boundary
- Buildings

1.35 = Feet above msl

- Wooded Area
- Dense Wooded Area
- Demolished Buildings

N

70 0 70 140 Feet

Figure 6-3
Site 17 - Groundwater Contours
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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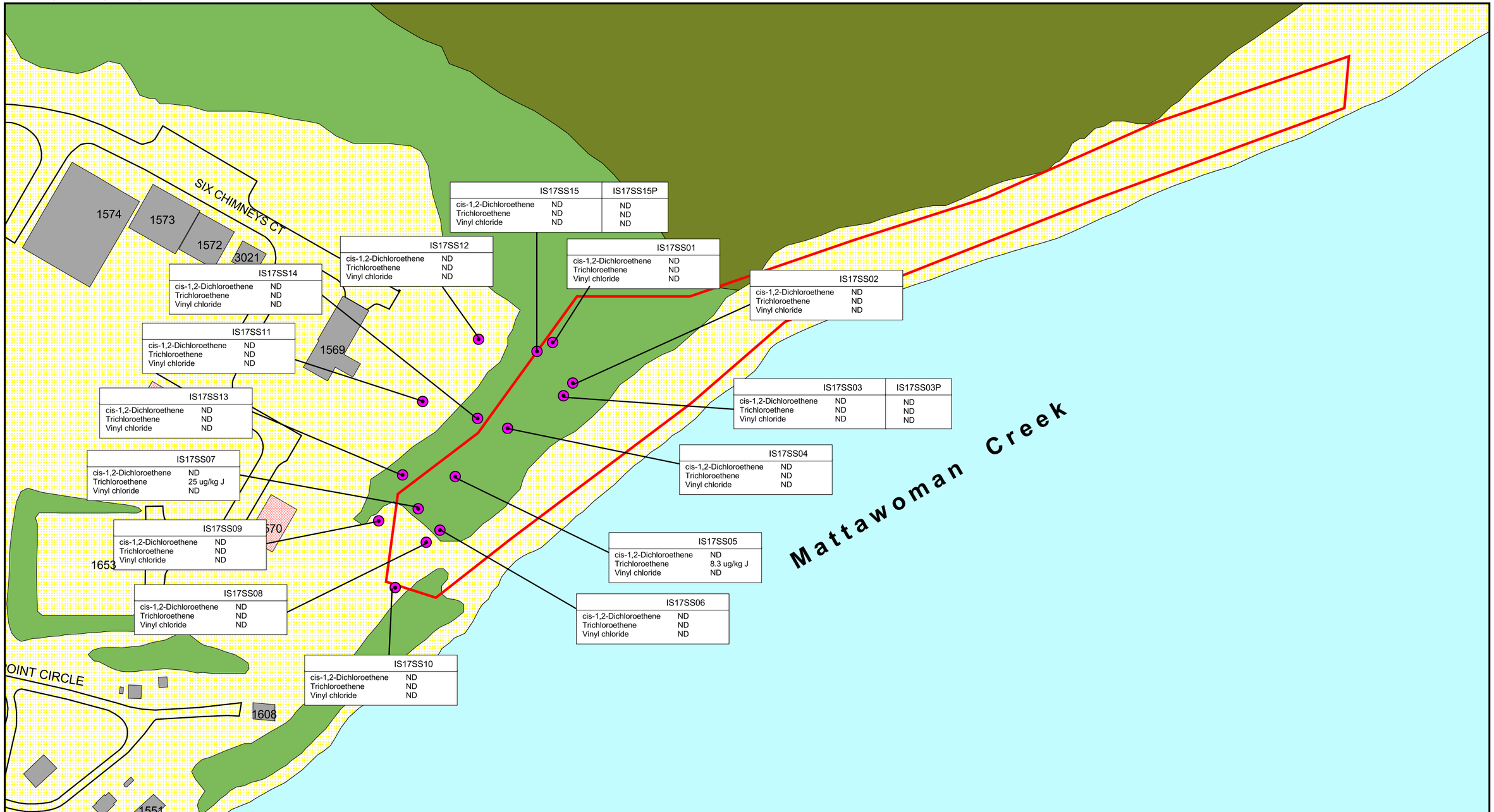

LEGEND

- Surface Soil
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

ND = Non Detect

J = Estimated Value Below the Detection Limit

ug/kg = Micrograms per kilogram

N

50 0 50 100 150 Feet

Figure 6-4
Site 17 - VOCs
In Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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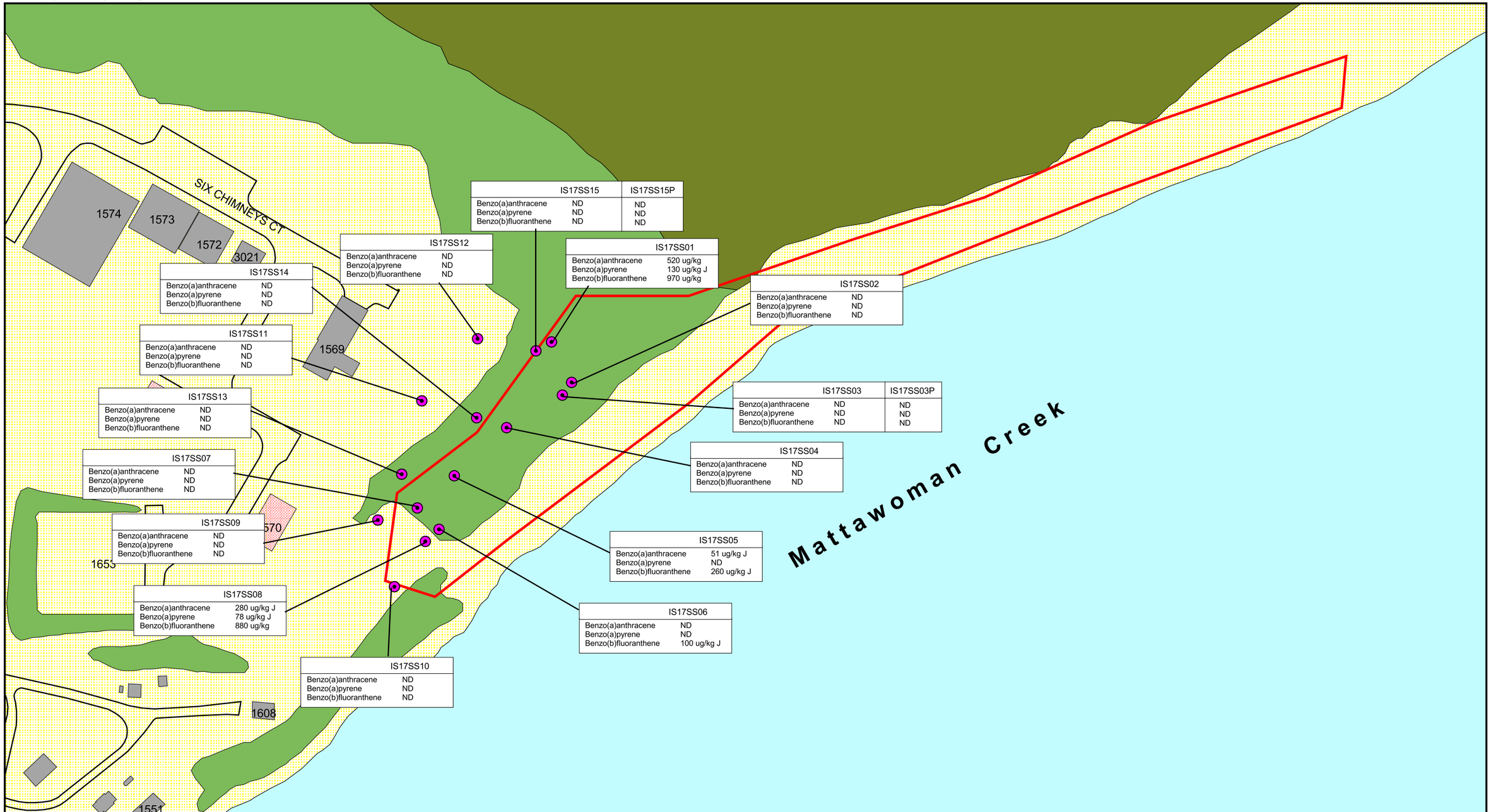


LEGEND

- Surface Soil
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

ND = Non Detect

J = Estimated Value Below the Detection Limit

ug/kg = Micrograms per kilogram

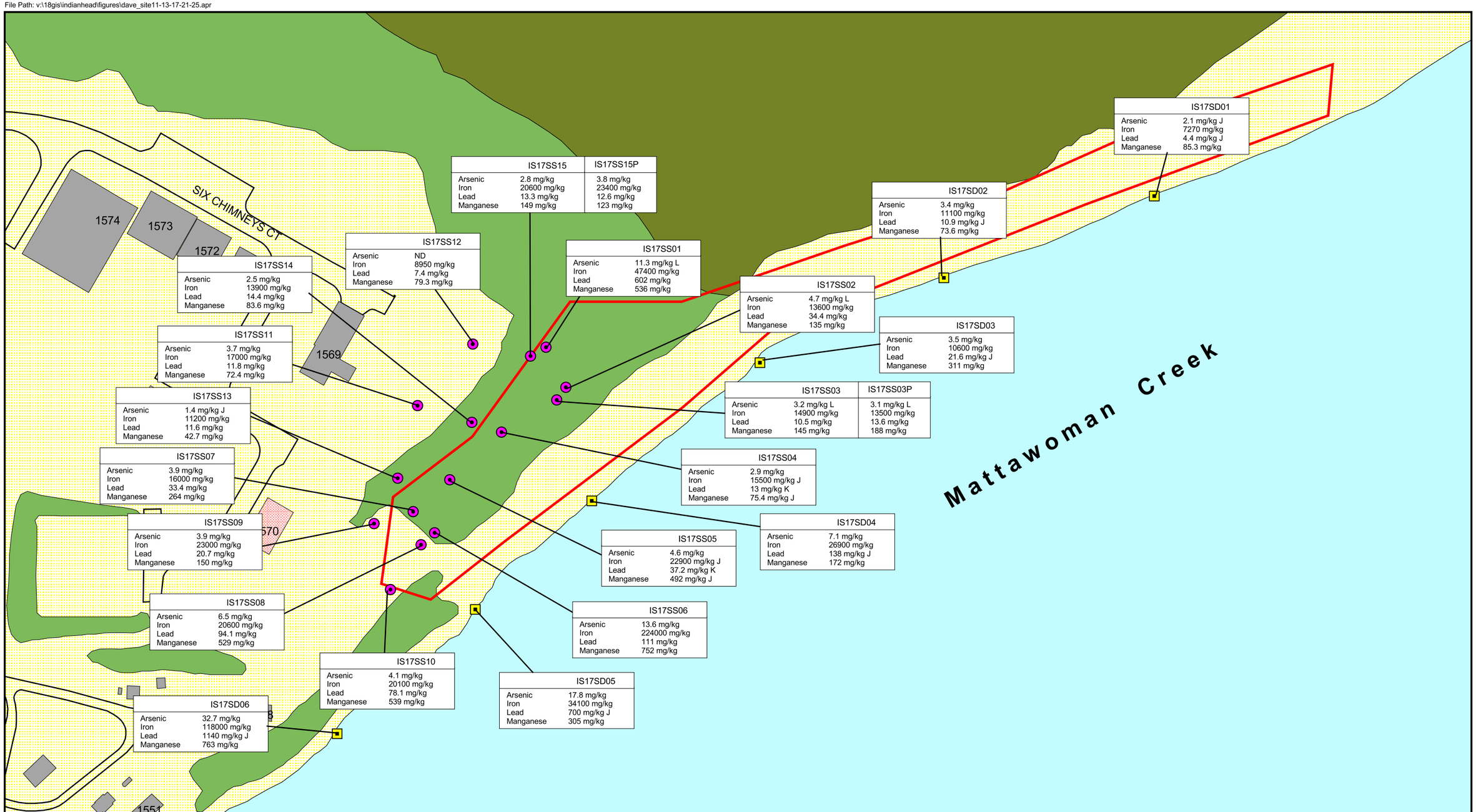
N

50 0 50 100 150 Feet

Figure 6-5
Site 17 - SVOCs
In Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr



LEGEND

- Surface Soil
- Sediment
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

J = Estimated Value Below the Detection Limit
K = Biased High
L = Biased Low
mg/kg = Milligrams per kilogram

N

50 0 50 100 150 Feet

Figure 6-6
Site 17 - Metals
In Surface Soil and Sediment
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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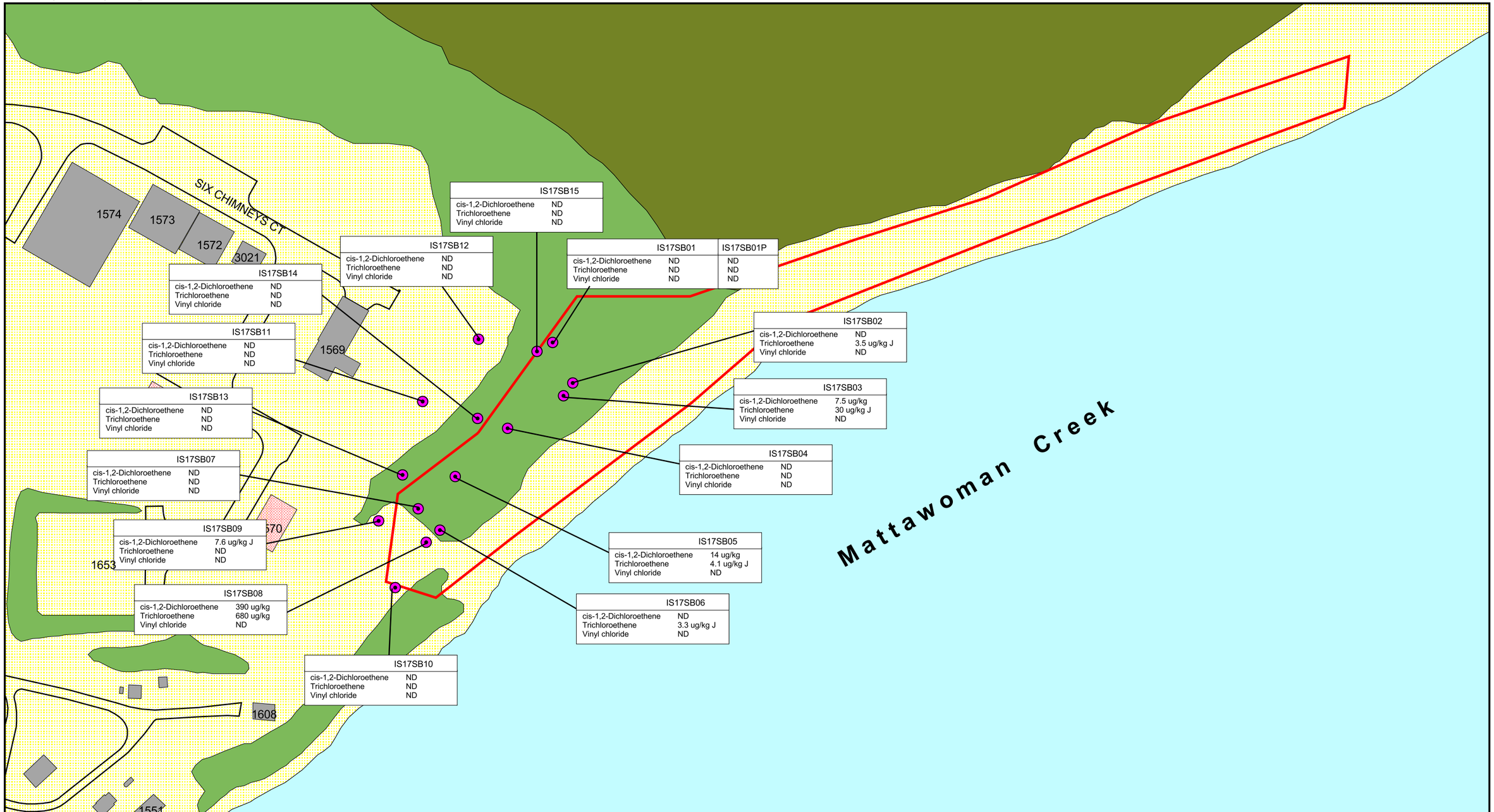

LEGEND

- Subsurface Soil
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/kg = Micrograms per kilogram

N

50 0 50 100 150 Feet

Figure 6-7
Site 17 - VOCs
In Subsurface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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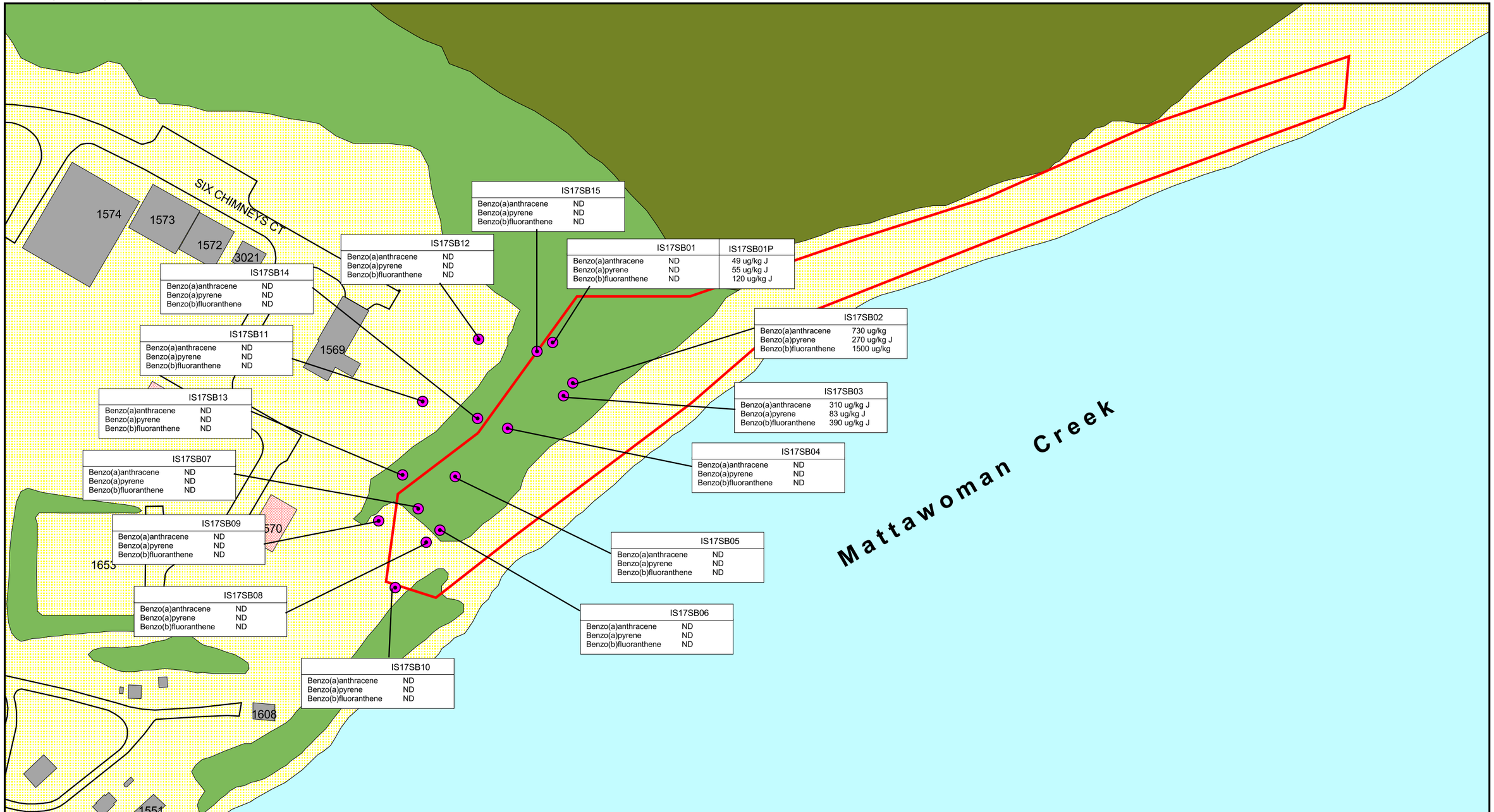

LEGEND

- Subsurface Soil
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/kg = Micrograms per kilogram

N

50 0 50 100 150 Feet

Figure 6-8
Site 17 - SVOCs
In Subsurface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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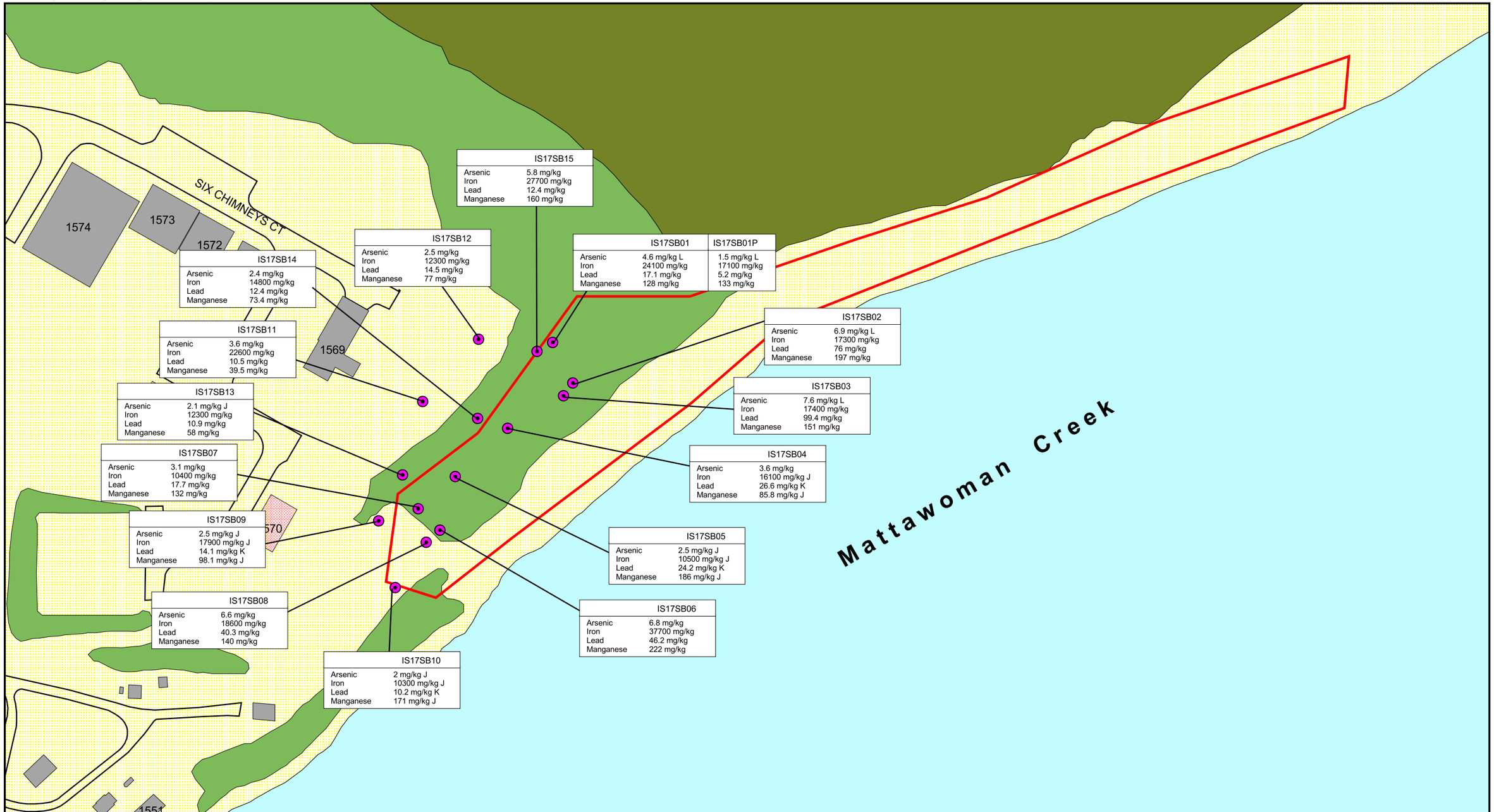

LEGEND

- Subsurface Soil
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

J = Estimated Value Below the Detection Limit
K = Biased High
L = Biased Low
mg/kg = Milligrams per kilogram

N

50 0 50 100 150 Feet

Figure 6-9
Site 17 - Arsenic, Iron, Lead, and Manganese in Subsurface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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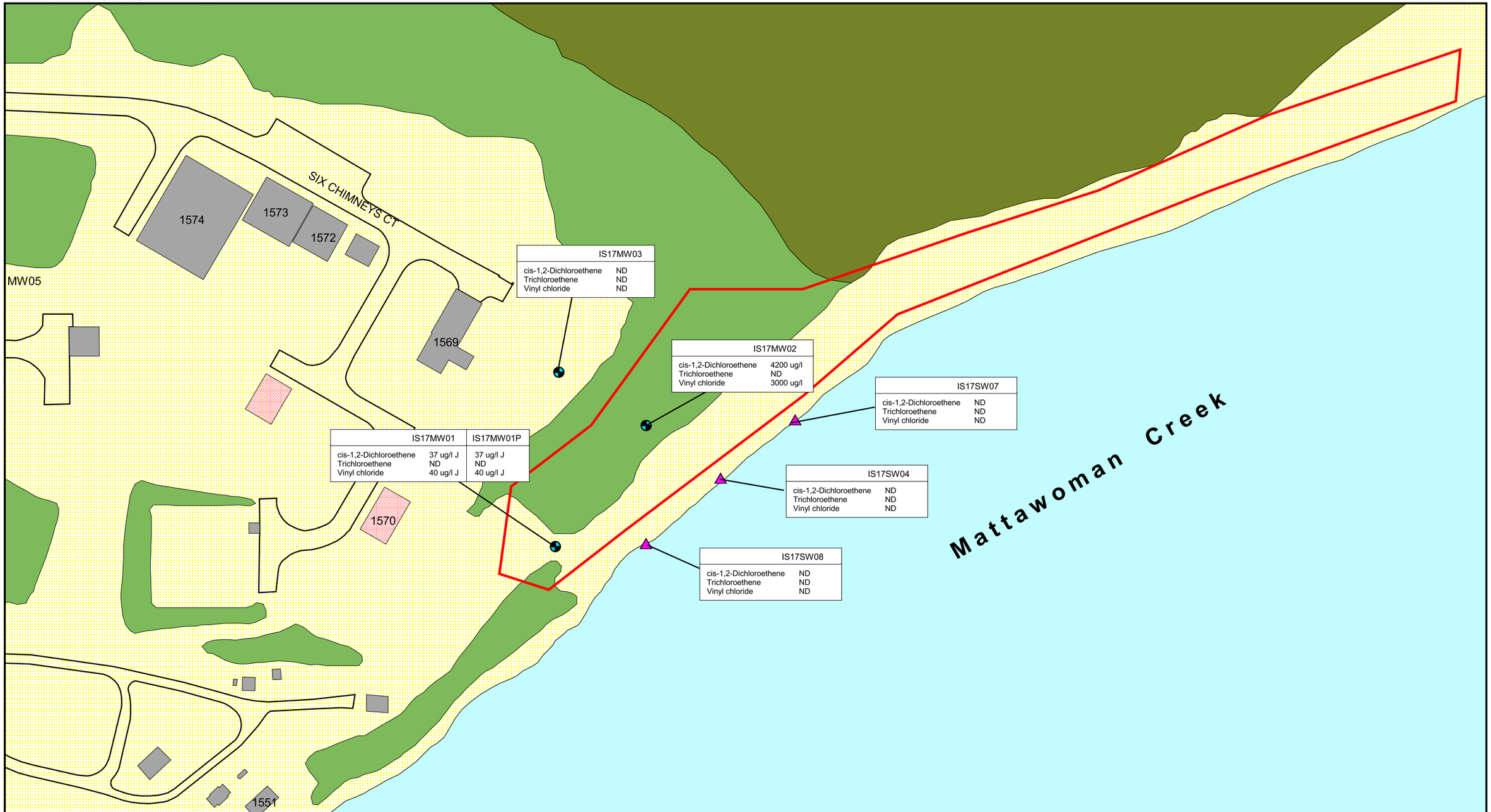

LEGEND

- Monitoring Wells
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/l = Micrograms per liter

N

50 0 50 100 150 Feet

Figure 6-10
Site 17 - Total VOCs in Groundwater
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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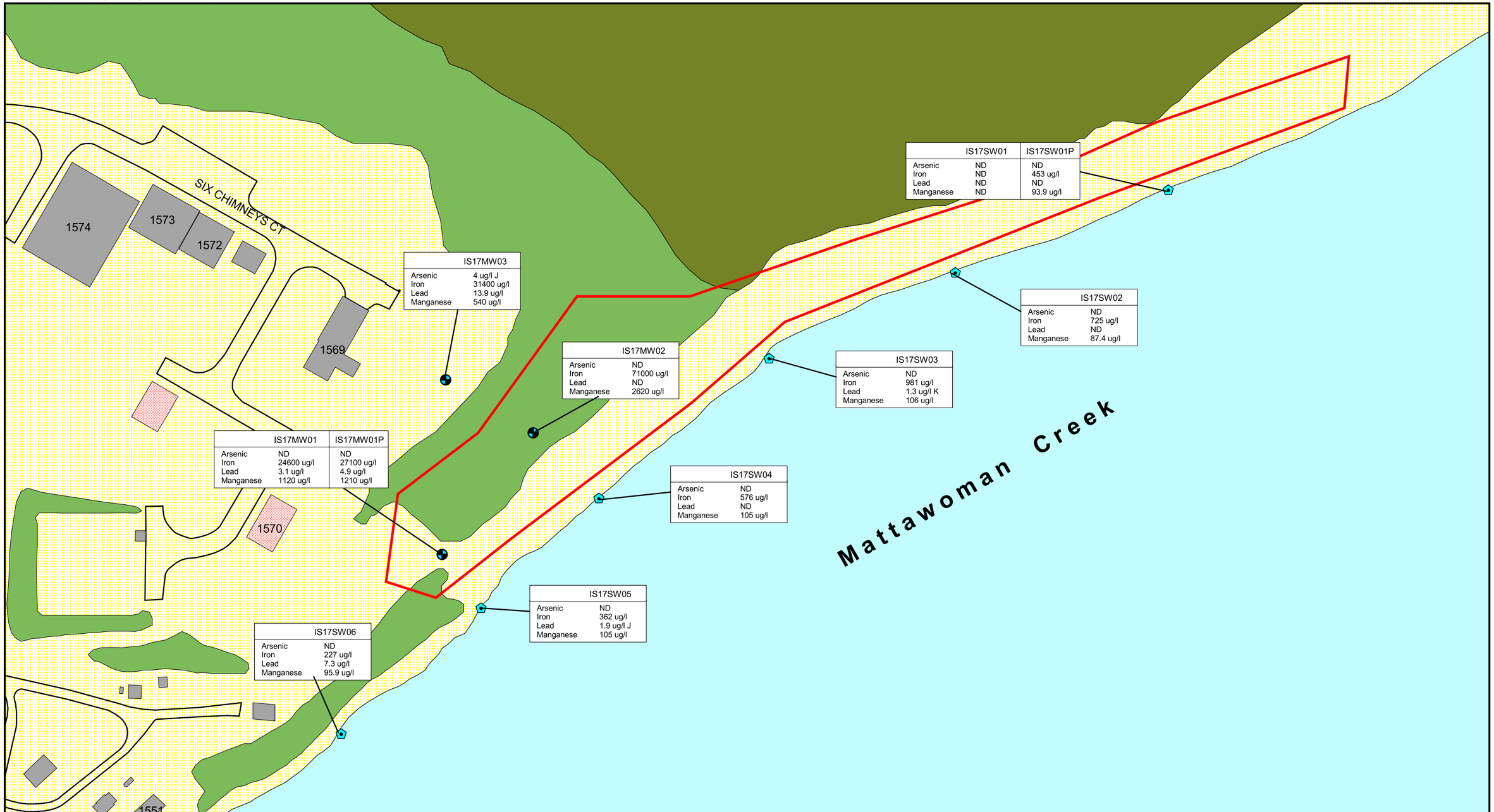


LEGEND

- Monitoring Wells
- Surface Water
- IR Sites
- Buildings
- Demolished Buildings
- Wooded Area
- Dense Wooded Area
- Road

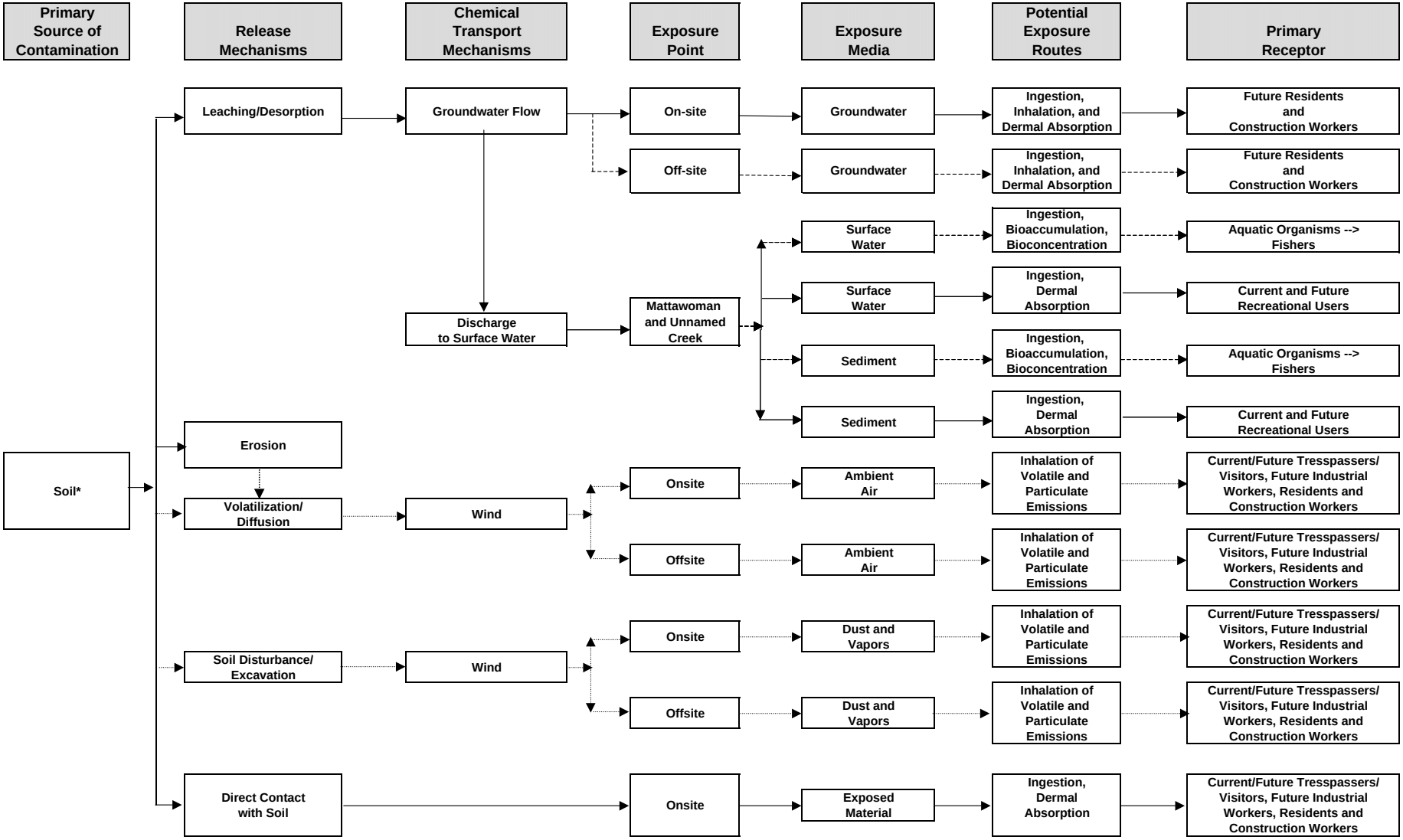
ND = Non Detect
J = Estimated Value Below the Detection Limit
K = Biased High
ug/l = Micrograms per liter

N

50 0 50 100 150 Feet

Figure 6-11
Site 17 - Total Metals In Groundwater and Surface Water
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL



* Current scenario is for surface soil and future scenarios are for surface and subsurface soil combined.

Complete Pathway
Incomplete Pathway
Pathway not evaluated because no CPOCs identified

Figure 6-12
Conceptual Exposure Model for Potential Human Exposures - Site 17
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

SECTION 7

Site 21 Bronson Road Landfill

An RI was conducted at Site 21, Bronson Road Landfill (Figure 7-1). The objectives of the RI at Site 21 were to: (1) determine the lateral extent and depth of waste disposed of at the site; and (2) determine whether or not the waste is a source of contamination to underlying soil or groundwater at the site. The objectives of the RI were met by the activities performed, as discussed in this chapter.

Following the RI, a pre-FS investigation was conducted in July 2002 to confirm the concentration of manganese and perchlorate in groundwater. The results are presented in a technical memorandum entitled *Pre-Feasibility Study Groundwater Sampling Activities Site 21 (Bronson Road Landfill), Indian Head Division-NSWC Indian Head, Maryland* (CH2M HILL, October 8, 2002), and is provided as Appendix J.

The pre-FS sampling confirmed the presence of perchlorate in the upgradient well at Site 21. However, the source was not readily identifiable. Additionally, the groundwater flow regime at Site 21 was not well defined. Thus, an additional investigation was conducted to determine if perchlorate in groundwater is associated with the landfill (Site 21). The results are presented in a technical memorandum entitled *Investigation of Groundwater Flow and Perchlorate at Site 21, Indian Head Division-NSWC, Indian Head, Maryland* (CH2M HILL, March 5, 2003) and is provided as Appendix K.

7.1 Investigation Activities

The field activities were conducted between July 27 and August 4, 2000. The work consisted of:

- Surface soil sampling
- Geophysical surveying
- Soil boring confirmation
- Test pit confirmation
- Monitoring well installation
- Groundwater sampling

Sampling locations are shown in Figure 7-2.

7.1.1 Surface Soil Sampling

Twenty surface soil samples (IS21SS01 through IS21SS20) were collected on July 26, 2000, at the locations described below and shown in Figure 7-2. Because historical information indicates a wide variety of materials may have been disposed of at Site 21 and no previous analytical data were available, samples collected were analyzed for a full suite of parameters (TCL organics, TAL inorganics, explosives, and TPH).

- **IS21SS01—**collected near the northern edge of the site proximate to the head of a stormwater management pond.
- **IS21SS02—**collected near a historical roll-off bin transfer area.
- **IS21SS03 through IS21SS17—**collected at regular intervals on a predetermined 100-ft grid pattern.
- **IS21SS18 through IS21SS20—**(background samples) collected in areas upslope of Site 21.

7.1.2 Geophysical Survey

A surface geophysical survey was performed on July 18-20, 2000. The work consisted of EM and ER surveys and was designed to locate metallic waste buried at the site and define the boundaries of the landfill. Details of the survey are provided in Section 3 and Appendix D.

7.1.3 Soil Borings

Five soil borings (IS21SB01 through IS21SB05) were installed for lithologic data between July 27 and August 1, 2000 at the locations described below and shown in Figure 7-2:

- **IS21SB01–** installed approximately 25 ft north of the landfill boundary.
- **IS21SB02 through IS21SB04 —**installed approximately 25 ft east of the landfill boundary, moving from north to south.
- **IS21SB05–** installed on approximately 25 ft south of the landfill boundary.

Lithologic logs are presented in Appendix A.

7.1.4 Test Pits

Seven test pits (IS21TP01 through IS21TP07), were excavated on August 2, 2000, at the locations described below and shown in Figure 7-2 to locate the extent of the landfill:

- **IS21TP01 through IS21TP05 —**excavated on the eastern side of Bronson Road (the western boundary of Site 21) at intervals of 100 to 150 ft.
- **IS21TP06 and IS21TP07 —**excavated in two locations on the western side of Bronson Road in the vicinity of Building 1384.

Lithologic logs from the test pits are presented in Appendix C.

7.1.5 Monitoring Well Installation

Four shallow groundwater monitoring (IS21MW01 through IS21MW04) were installed between August 2 and 4, 2000. The locations of the wells are described below and shown in Figure 7-2.

- **IS21MW01–** installed northwest of Site 21 (total depth 18 ft bgs).
- **IS21MW02–** installed southwest of Site 21 (total depth 17 ft bgs).
- **IS21MW03–** installed south of Site 21 (total depth 18 ft bgs).
- **IS21MW04–** installed upgradient (east) of Site 21 (total depth 47.5 ft bgs).

Lithologic logs are presented in Appendix A. Well construction diagrams are presented in Appendix B.

7.1.6 Monitoring Well Sampling

Monitoring well samples (IS21MW01 through IS21MW04) were collected from the newly installed wells on August 24 and 25, 2000. Because historical information indicates a wide variety of materials may have been disposed of at Site 21 and no previous analytical data were available, samples collected were analyzed for a full suite of parameters (TCL organics, TAL inorganics, explosives, and TPH).

7.2 Geology

Several borings, boreholes, and test pits were advanced during the RI to obtain geologic information as well as information pertaining to the depth and limits of waste disposed of at Site 21. Soil borings IS21SB01 (to a depth of 22 ft bgs), IS21SB02 (to a depth of 46 ft bgs), IS21SB03 (to a depth of 49 ft bgs), IS21SB04 (to a depth of 34 ft bgs), and IS21SB05 (to a depth of 24 ft bgs) were drilled in the vicinity of the site (as defined by the red line in the figures) to determine the presence of waste. Boreholes for wells IS21MW01 (to a depth of 18 ft bgs), IS21MW02 (to a depth of 20 ft bgs), IS21MW03 (to a depth of 18 ft bgs), and IS21MW04 (to a depth of 48 ft bgs) were drilled for geologic information and to install four monitoring wells. The borehole for IS21MW04 was advanced to 48 ft bgs because it was installed at a higher elevation. Boring logs are presented in Appendix A. Monitoring well construction diagrams are presented in Appendix B. A geophysical survey was also performed to estimate the depth and limits of waste and a copy of the report is provided in Appendix D.

The boreholes for the monitoring wells primarily encountered layers of sandy silt, silty sand, and sand with some gravel, materials that are characteristic of the Quaternary deposits. Clay or silt lenses were observed in all monitoring well boreholes at various depths but none of the layers had significant thickness. None of the well boreholes encountered fill.

Figure 7-3 provides information from the soil borings, test pits, and geophysical surveys on the fill at Site 21. The types of information provided in the figure are discussed below.

The patterns show different types of material identified with the electromagnetic survey. This survey was performed to identify the lateral limits of the fill, and provides no information on the thickness. Most of the patterned area identifies mixed buried metallic and nonmetallic debris. Three areas of buried metal debris were identified, two near South Bronson Road and one on the eastern side of the site. Another area featuring both surface and buried metal debris was identified in the southeastern part of the study area along Components Place.

The locations of the five soil borings are provided Figure 7-3. At each soil boring, an estimate of the elevation of the bottom of the fill and of the thickness of the fill are provided; note that the thickness is not for waste that might have been placed in the borrow pit but only of the total thickness of fill material. At most soil boring locations, fill material was encountered from the surface to a particular depth: IS21SB01 (no fill encountered), IS21SB02 (to a depth of 20 ft bgs), IS21SB03 (to a depth of 9 ft bgs), IS21SB04 (to a depth of 24 ft bgs),

and IS21SB05 (to a depth of 11 ft bgs). Given the estimated ground surface elevations at the soil borings (about 40 ft above msl), the bottom of the fill is at an elevation of approximately 17 ft to 19 ft above msl at borings IS21SB02 through IS21SB04 and up to 27 ft above msl at IS21SB05.

The fill at these soil borings was of similar character to the natural materials, which is reasonable because presumably the fill would have come from a deposit of Quaternary sediments located somewhere on the facility. The fill was distinguished from the natural material generally by the presence of coal, glass, paper, and wood fragments and, in some cases, by lower blow counts. Trash and metal debris was distinctly identified only in boring IS21SB05, at a depth of 8 ft bgs and 10 ft bgs. This material may correlate with the buried metal debris noted by the electromagnetic survey just north of the boring. The subsurface below the fill in these soil borings is similar in nature to that identified in the monitoring well boreholes.

Figure 7-3 also includes 10 estimates of the elevation of the bottom and the thickness of the fill derived from the two electrical resistivity profiles. The locations of the profiles are shown in the figure, along with the locations of 10 estimating points. The west-east profile indicates the waste thickens from west to east to about 45 ft (and a bottom elevation of about 10 ft above msl), then thins and rises. From south to north the fill varies in thickness up to 39 ft and the bottom drops to as low as mean sea level. The data obtained from soil borings IS21SB02 and IS21SB03 generally agree with those obtained from the profiles. However, the data from boring IS21SB04 suggest that, although the thickness is similar, the bottom is not as low in elevation (i.e., 17 ft rather than 0 ft above msl). The elevation of 17 ft above msl seems more reasonable, given the information from other locations. The data have not been contoured because of the variability of the values and the lack of data in the southeastern part of the study area.

There is no distinction in Figure 7-3 between fill and waste because of the difficulty in distinguishing the two. The geophysical report indicates that the landfill thickness ranges from 10 ft to 30 ft and the “landfill cap” thickness ranges from 5 ft to 10 ft. The profiles sometimes indicate a distinction between “landfill material” and overlying material. If this is indeed a cover, then the bottom of the waste is at depths on the order of 15 ft to 40 ft bgs.

The assumption is that the waste pinches out towards Bronson Road, where significant amounts of waste were encountered in test pits IS21TP01, IS21TP02, and IS21TP03, and smaller amounts in pits IS21TP04 and IS21TP05. Waste also was reportedly encountered in the excavation for a stormwater pond in the northern part of the site. The pits excavated on the western side of Bronson Road encountered no waste material.

The conclusion is that the lateral extent of the major part of the fill has been identified, but that thinner intervals of waste appear to exist, such as those encountered in the test pits on the eastern side of South Bronson Road. The bottom of the fill appears to be, at its lowest, at an elevation of about 17 ft above msl. The thickness of the fill may be up to 40 ft to 45 ft but 5 ft to 10 ft of this likely is soil cover. The likelihood that the fill and waste are in the groundwater is discussed in the next subsection.

7.3 Hydrogeology

The water table was encountered at the site at elevations ranging from 22.25 ft above msl at IS21MW03, located at the junction of South Bronson Road and Components Place, to 35.52 ft above msl at IS21MW04, located upgradient of Site 21 (Figure 7-4). It appears that groundwater flow is generally from the northeast to the southwest and south, discharging to the Mattawoman Creek. It should be noted that the Mattawoman Creek is influenced by the tides and in turn may influence the water table at Site 21 is as well. However, due to the distance of Site 21 from the Mattawoman Creek shoreline, the influence of the tides on groundwater flow likely is reduced as compared to other sites discussed in this report.

Based on the estimated bottom elevation of the fill from the geophysical survey and borings, the lower part of the waste appears to be below the water table. Along the eastern part of the west-east profile, where the bottom of the fill appears to be at an elevation of about 10 ft above msl, as much as the lower 20 ft to 22 ft of the fill may be below the water table.

No tests were performed to estimate the hydraulic conductivity of the subsurface materials. However, Domenico and Schwartz (1998) provide a range of hydraulic conductivities for fine- and medium-grained sand from about 0.05 ft/day to about 140 ft/day.

7.4 Nature and Extent of Contamination

This section discusses the nature and extent of contamination found in soil and groundwater at Site 21. Detected analytical results for all samples analyzed are presented in tables throughout the section. Complete analytical results for both media are provided on the accompanying CD (Appendix L).

The discussion presented below focuses on the contaminants that are most prevalent at Site 21. Some contaminants from each contaminant group (i.e., VOCs, SVOCs, metals, etc.) are discussed. Regulatory and human health-based criteria were not used to select contaminants; however, preference was given to contaminants that are generally recognized to pose the greatest risks to human health and the environment.

The focus on this “short list” of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus this discussion. The baseline human health risk assessment and ecological risk assessment presented in Sections 7.6 and 7.7, respectively, of this chapter, formally screen and evaluate all chemicals analyzed for in the various media Site 21 in accordance with established EPA Region III guidance.

In order to identify metals that may be of potential concern at Site 21, the data for inorganic analytes were compared to data presented in the BIR prepared by Brown and Root Environmental (B&RE, 1997). The BIR was conducted to establish a facilitywide background database to be used for current and future investigations. Samples were collected for the various media from areas outside the sites known to be impacted from facility operations. The facilitywide background statistics for each media are presented in Appendix E.

Sampling results for inorganic analytes in various media at Site 21 were compared to background concentrations as follows:

- Maximum detected concentrations for data collected during this investigation (provided in Appendix F) were compared to the UCLs of the facilitywide background data.
- For analytes found to have maximum concentrations above the facilitywide UCLs, site-specific background maximum detected concentrations were compared to the UCLs of the facilitywide background data.
- Where, based on the analysis described above, analytes were found above background and considered site-related, the background means were compared to the sampling means.

In some instances, where an inorganic analyte is discussed in one medium (e.g., surface soil), the analyte may be discussed in another medium (e.g., subsurface soil), even if the concentrations in the second medium do not exceed background. This is to allow a more complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

It should be noted that the groundwater background data set is based on unfiltered metals concentrations. Further, based on comparison of the groundwater data set to a subset reported as "nonturbid," four groundwater samples were excluded from the background data set due to elevated turbidity levels. The comparisons presented in this discussion are also based on unfiltered metals concentrations. None of the samples were excluded from the comparisons due to turbidity.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a compound in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used; (2) if a compound was detected in a sample and a corresponding duplicate, the higher of the two values was used; and (3) samples collected upslope or upgradient for the purpose of evaluating site-specific background conditions are excluded from the descriptive statistics and following discussion except with respect to whether or not the observed concentrations of certain analytes may be site-related.

7.4.1 Surface Soil

Surface soil sampling activities conducted within Site 21 consisted of 20 samples (IS21SS01 through IS21SS20). Note that the sampling extended well beyond the original site limits, shown with a red line in the figures, because of the uncertainty in the distribution of the waste materials. The results of the surface soil sampling are presented in Table 7-1.

7.4.1.1 VOCs and SVOCs

Detectable concentrations of VOCs were observed in four surface soil samples (Table 7-1). Most of the VOCs are related to petroleum products, including one detection of MTBE. However, none of the samples contained concentrations that warrant further discussion.

Sixteen SVOCs were detected in 17 surface soil samples (Table 7-1). Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene concentrations are shown in Figure 7-5 because of their frequency of detection, high concentrations, and general risk concerns. The highest concentrations and greatest frequency of detections were at samples IS21SS04, IS21SS05, IS21SS07, IS21SS08, and IS21SS12, located near the center of the sampled area, and samples

IS21SS10 and IS21SS14, located on the east side of the sampled area. Most of the other SVOCs were not detected at concentrations that warrant further discussion.

The site-specific background samples (IS21SS18, IS21SS19, and IS21SS20) contained no VOCs and almost no SVOCs, indicating that the organics detected are related to activities at the site and its vicinity.

7.4.1.2 TAL Inorganics

Twenty-two inorganic analytes were detected in surface soil samples (Table 7-1). Seventeen of these were detected in one or more samples at a concentration above the facilitywide background 95 percent UCL (Table F-4 in Appendix F). This discussion focuses on arsenic, iron, lead, and manganese (Figure 7-6) because of their frequency of detection.

Arsenic was detected in all surface soil samples. Concentrations in the site samples ranged from 3.4 mg/kg to 51.8 mg/kg (at IS21SS14). Calculated mean concentration is 14.6 mg/kg, above the background mean of 2.2 mg/kg. Additionally, every sample contained concentrations greater than the background 95 percent UCL of 2.6 mg/kg. The site-specific background samples contained arsenic at levels similar to most of the site samples (i.e., 3.3 mg/kg to 7.7 mg/kg), but several exceedances of this background suggests that the arsenic is site-related.

There is no spatial trend in the data. Concentrations of arsenic are relatively uniform across most of the site, with the highest concentrations detected in sample IS21SS14, located on the eastern side of the sampled area, and sample IS21SS04, located near the northern side of the sampled area.

Iron was detected in all surface soil samples. Concentrations in the site samples ranged from 9,120 mg/kg to 29,500 mg/kg. Approximately one-half of the samples contained concentrations greater than the background 95 percent UCL of 15,533 mg/kg. The site-specific background samples contained iron at levels (i.e., 8,280 mg/kg to 22,200 mg/kg) that covered most of the range of the site samples, suggesting that most of the iron in the surface soil is not site-related.

There is no spatial trend in the data. Concentrations of iron are relatively uniform across most of the site, with the highest concentrations detected in sample IS21SS04, located near the northern side of the sampled area, and in sample IS21SS14, located in the eastern part of the sampled area.

Lead also was detected in all surface soil samples. Concentrations in the site samples ranged from 10.5 mg/kg to 57.1 mg/kg (in IS21SS01), and all were below the background 95 percent UCL of 149 mg/kg. There is no spatial trend in the data. Several of the site samples had lead above the site-specific background results (i.e., 16.8 mg/kg to 25.7 mg/kg) but these exceedances are not necessarily site-related.

Manganese was detected in all surface soil samples. Concentrations in the site samples ranged from 32.6 mg/kg to 398 mg/kg, and all were below the background 95 percent UCL of 569 mg/kg. There is no spatial trend in the data, except that the highest concentrations were detected along the western side of the sampled area (samples IS21SS06 and IS21SS15).

In general, the highest concentrations of the most metals were detected in sample IS21SS01, located along the northern edge of the sampled area, and sample IS21SS14, located on the east side of the sampled area. However, several high levels of metals also occurred in IS21SS04, also in the northern part of the sampled area.

7.4.1.3 Explosives

Low concentrations of explosives were detected in two surface soil samples (IS21SS06 and IS21SS13 in Table 7-1). None of the samples contained explosives at concentrations that warrant further discussion.

7.4.2 Groundwater

Groundwater sampling activities conducted within Site 21 consisted of four monitoring well samples (IS21MW01 through IS21MW04) collected from locations within Site 21. The results of the groundwater sampling are presented in Table 7-2.

7.4.2.1 VOCs and SVOCs

VOCs were detected in groundwater samples IS21MW01 and IS21MW02 (Table 7-2). However, neither of the samples contained concentrations that warrant further discussion.

No SVOCs were detected in any of the groundwater samples.

7.4.2.2 TAL Inorganics

Twenty inorganic analytes were detected in unfiltered groundwater samples. Of these, fourteen were detected at concentrations above the facilitywide background 95 percent UCL (Table F-4 in Appendix F). Concentrations of total arsenic, total iron, total lead, and total manganese are shown in Figure 7-7. Arsenic was detected in only one well (IS21MW03), at a concentration of 3.6 µg/L.

The highest concentrations of both total and dissolved metals were detected in downgradient wells IS21MW02 and IS21MW03, with most of the maximum values detected in well IS21MW02. Those total metals with maximums detected in well IS21MW02 include chromium at 103 µg/L, iron at 24,200 µg/L, manganese at 23,100 µg/L, silver at 1.3 µg/L, and zinc at 164 µg/L. There was a significant reduction in the concentrations of many inorganics between the unfiltered and filtered samples, suggesting that these analytes tend to adsorb to solids in the groundwater, but this is not particularly true for iron and manganese.

The background well (IS21MW04) typically contained the lowest concentrations of inorganic analytes, followed by well IS21MW01. This is true for both unfiltered and filtered samples. Based on the data, it appears that, at least in well IS21MW02, the elevated concentrations are site-related.

7.4.2.3 Explosives

Very low concentrations of explosives were detected in all monitoring wells (Table 7-2). Of note, background well IS21MW04 contained perchlorate at a concentration of 2,000 µg/L. A perchlorate investigation was conducted in December 2002 (CH2M Hill Technical Memorandum, March 14, 2003). results showed that perchlorate impacts are not associated

with the landfill. Perchlorate concentrations showed low values at locations to the north and northwest, and decreased in concentration towards the west and southwest.

7.5 Fate and Transport

The fate and transport of chemicals in soil and groundwater within Site 21 and how the chemicals may impact with the surface water and sediment in the Mattawoman Creek are discussed in this section. The fate and transport are described to support the HHRA and ERA and to aid in defining remedial alternatives. At the end of the subsection is a summary of the conceptual model of fate and transport at the site.

7.5.1 Contaminant Fate

Analytes will adsorb onto and desorb from soil that is in contact with infiltrating water. Such sorption will be a function of the partitioning coefficient of the analyte and will be greater for most SVOCs and many metals than for VOCs and some SVOCs and metals. Analytes, particularly metals, also may be dissolved from the solids while they are in contact with water.

Few VOCs were detected at the site. Therefore, volatilization is not expected to play a significant role in contaminant fate at the site.

Some of the organic compounds may be subject to transformation through microbial activity. The majority of the SVOCs observed at Site 21, such as benzo(a)pyrene, are recalcitrant to microbial activity and would be transformed only at a slow rate. Due to the nature of the organic compounds detected at Site 21, microbial degradation is unlikely to play an important role in their fate.

Some of the metals at the site could vary in their migration behavior with a change in valence state. This is particularly true for arsenic, which will become more mobile in its lower valence state, and chromium, which will become more mobile in its higher valence state.

Bioaccumulation is the process by which contaminants are ingested by ecological receptors and concentrated within the tissues of those receptors. Because the site is grassy, it is possible that ecological receptors (e.g., mammals) visit the area. Such receptors as may forage at the site may ingest contaminated surface soil. Those compounds with a tendency to associate with the soil, such as SVOCs (e.g., pyrene and benzo[a]pyrene) and inorganics (e.g., arsenic) may accumulate in these ecological receptors over time.

7.5.2 Contaminant Migration

This section discusses the possible source area and potential mechanisms for contaminant release and migration from the source area within the Site 21. The discussion is organized by media within Site 21 that may experience contaminant transport.

Fundamental to describing fate and transport at the site are the physical properties of the subsurface, which were described in Section 3.5.3, and the site hydrogeology, which was described in Section 7.3.

7.5.2.1 Source Areas

Source areas at the site are assumed to comprise both original and current sources associated with site operations and current sources such as contaminated soil that may serve as a source for contaminating other media.

The assumption is that the buried waste is the primary source of contaminants at the site. No waste samples have been collected but it is likely that it contains at least some source of contamination because the groundwater in wells IS21MW02 and IS21MW03 contained concentrations of some metals above background levels.

In addition, the surface soil appears to contain SVOCs and metals at sufficient concentrations to serve as sources of further contamination. The source of this contamination is unknown because the assumption is that the soil cover sampled as surface soil was never in contact with the buried waste.

Specific source areas were not identified because elevated levels of contamination are so widespread at the site. These contaminants are elevated in concentration with respect to both facility background and site-specific background, indicating that they are site-related. In general, though, SVOCs were elevated in the center and along the eastern side of the sampled area and metals were elevated at the southeastern corner and in the northern part of the sampled area.

7.5.2.2 Releases from Soil to the Atmosphere

Parts of the site are unvegetated; therefore, wind erosion may cause soil particles to be entrained and transported to other portions of NDWIH or to the Mattawoman Creek. Although vehicular traffic is not common, it may contribute to this process. The subsurface landfill materials, of course, are not subject to these influences.

VOCs were detected only at low concentrations in soil at Site 21; therefore, volatilization is not a significant process at Site 21. However, SVOCs and metals, which can adsorb to fine particles of dirt and dust, could be mobilized in the air from the site.

7.5.2.3 Transport from Surface Soil to Subsurface Soil or from One Area to Another

The primary mechanisms for the release of contaminants from surface soil to subsurface soil or from one area to another are infiltration, runoff, and soil erosion caused by runoff. The east side of Site 21 has little vegetation and slopes to the west; therefore it is likely that considerable runoff occurs during precipitation events, and infiltration is limited. When erosion does occur, the eroded soil would tend to be deposited along the flat portions of the site, immediately east of South Bronson Road. Any adsorbed contaminants associated with the eroded soil will be transported in this manner. Because contaminants tend to associate with finer particulates, and because finer particulates are more easily suspended and transported, this transport process could be a means of contaminant movement around the site. In particular, SVOCs, because of their tendency to sorb, could be transported in this manner. Some inorganics such as lead also may be transported in this manner.

There is a potential for infiltrating water to transport contaminants from surface soil to subsurface soil. Although parts of the site are unvegetated, which encourages runoff rather than infiltration, there are flat areas at the site in which surface water pools. Arsenic and

other metals associated with surface soil may also dissolve into the surrounding soil water. It is likely that vertical leaching of arsenic and some other metals is occurring to some extent.

7.5.2.4 Releases from Soil to Surface Water and Sediment

Although much of Site 21 is bare ground and surface runoff likely carries a high sediment load, the impact to the Mattawoman Creek is likely insignificant due to the distance between the Site 21 and the Mattawoman Creek (more than 500 ft). Subsurface landfill materials would not be subject to such transport.

7.5.2.5 Releases from Soil or Waste to Groundwater

Limited releases of VOCs from soil likely have occurred in the past; however, soil and groundwater sampling suggests limited potential for future migration from soil to groundwater. SVOCs and explosives contamination present in soil at Site 21 appears to be at low concentrations. Additionally, due to the limited mobility of these contaminants, the potential for future migration from soil to groundwater appears limited.

It is unclear whether releases of inorganics from soil to groundwater are significant. Soil sampling suggests arsenic and lead may be of concern; however, results of groundwater sampling did not indicate elevated levels of these inorganics. Elevated levels of iron and manganese, though, were detected in well IS21MW03. Waste within the landfill was not sampled during this investigation; however, the waste is a potential source of contamination to groundwater and may be the source of the iron and manganese in groundwater detected above background levels.

7.5.2.6 Migration of Contaminants in Groundwater

Although transport through groundwater is not considered the primary mechanism for the migration of contaminants because of the low mobility of most site-related chemicals, this subsection addresses the migration of contaminants within the groundwater and any potential migration to the Mattawoman Creek.

Sampling suggests that groundwater has been impacted by waste at Site 21, as shown by elevated levels of such analytes as iron and manganese above both facilitywide and site-specific background. Contamination would be expected to move southwestward and southward beneath the site, exiting from below the site to the south in the vicinity of well IS21MW03, based on the water-table map in Figure 7-4. However, the highest concentrations of iron and manganese were detected in well IS21MW02, which does not appear to be downgradient (Figure 7-4). Either there is another source of these and other metals upgradient from this well (i.e., north along South Bronson Road) which was not detected by well IS21MW01, or the groundwater flow directions vary, either seasonally or with recharge events, in a manner that directs groundwater flow more to the southwest during parts of the year.

7.5.2.7 Releases from Groundwater to Surface Water

The Mattawoman Creek is the final receptor of all groundwater from Site 21. Given the concentrations of constituents identified in groundwater and the site's distance from the

Mattawoman Creek, releases from groundwater to surface water do not appear to be of concern.

7.5.3 Conceptual Site Model

The above fate and transport discussions may be summarized into a conceptual site model that describes the fate and transport mechanisms at Site 21. The conceptual model is provided in Table 7-3.

7.6 Baseline Human Health Risk Assessment

This section presents the results of the HHRA for Site 21, the Bronson Road Landfill.

7.6.1 Data Summary

The only data collected at Site 21 were collected during the RI. The RI data used in the risk assessment are presented in this section. Table 7-4 lists the samples that were used to estimate potential exposure and risks in each medium for Site 21. Figure 7-2 identifies the sampling locations for surface soil and groundwater.

Nineteen surface soil samples (including two duplicate samples) were collected from the top 6 in. of soil in August of 2000 and analyzed for VOCs, SVOCs, explosives, and inorganics (Figure 7-2). Three surface soil samples were collected from background locations and were not used to evaluate the risks associated with exposure to site soil.

Groundwater data collected in September 2000 as part of the RI were evaluated in the risk assessment. Groundwater samples were collected from three shallow monitoring wells (Figure 7-2). Groundwater samples were analyzed for VOCs, SVOCs, explosives, and inorganics (filtered and unfiltered). A groundwater sample was also collected from one background well; these data were not used to evaluate the risks associated with exposure to site-related groundwater.

The full set of data used for the HHRA is presented in Appendix G.4a. Appendix G.4b includes the detected constituents only, and Appendix Gb.c is the sample statistics. The sample statistics include frequency of detection, minimum and maximum detected values, normal and lognormal arithmetic mean, normal and lognormal standard deviation, results of W-test, and 95 percent UCL based on the normal and lognormal distribution.

7.6.2 Identification of Chemicals of Potential Concern

Table 7-5 lists the COPCs retained for Site 21. All of the COPCs for the surface soil are inorganic constituents. Inorganic constituents and one organic constituent were retained as COPCs for the groundwater.

MTBE and nitroguanidine were each detected in one of the 17 surface soil samples; however, there are no Region III soil RBCs for these constituents because there are no published oral reference doses or cancer slope factors. The detected concentrations were qualified with a J because they were below the detection limit. Due to the low detected concentrations and the uncertainty in the concentrations, MTBE and nitroguanidine were not retained as COPCs.

Perchlorate was detected in one of the three groundwater samples and one of the 17 surface soil samples collected at Site 21. Since, the Region III RBCs for this constituent have been withdrawn from the October 2003 Tables, provisional values (USEPA, 1999b) provided by the USEPA's Office of Research and Development (ORD) have been used for screening purposes. Based on a provisional interim RfD range of 0.0001 mg/kg-day to 0.0005 mg/kg-day for perchlorate (USEPA, 1999b), a standard default body weight of 70 kg, and a water ingestion rate of 2 liters per day (L/day), a provisional action level ranging from 4 to 18 ppb was derived for groundwater. These values are supported by a January 22, 2003 memo from the USEPA Administrator Marianne L. Horinko titled, *Status of EPA's Interim Assessment Guidance for Perchlorate*, to Assistant and Regional Administrators, where the USEPA's 1999 provisional action levels for perchlorate (4 to 18 µg/L) were reaffirmed along with a recommendation to use the lower end of this range (4 µg/L) for screening purposes at contaminated sites, until the values could be updated. Based on these recommendations, it can be concluded that the concentration of perchlorate detected in IS21MW01 (2µg/L), was below the 4 µg/L provisional action level. Therefore, perchlorate was not retained as a COPC for groundwater.

Similarly, using the above provisional RfDsa provisional action level of 39.1 mg/kg was calculated for soil. The detected concentration of perchlorate in the Site 21 surface soil is below this range. Therefore, perchlorate is not a COPC for the Site 21 surface soil.

7.6.3 Exposure Assessment

The site-specific exposure assessment includes the information necessary to develop the exposure scenarios applicable for Site 21. This includes identifying the exposure setting, the current and future site use, the potentially exposed populations, and the potential exposure pathways.

7.6.3.1 Exposure Setting

Site 21 is a former landfill which is currently covered with fill material. It is located on Bronson Road across from Building 1384, approximately 500 ft from the Mattawoman Creek. It extends from Building 478 on the north to Building 480 on the south. An unpaved road runs along the eastern side of the reported site limit. The site is an open and grassy area that is currently not used. The site was formerly surrounded by 20-ft cliffs on three sides; however, placement of fill from other sites on NDWIH has brought the ground surface nearly up to the elevation of the cliff tops.

7.6.3.2 Potentially Exposed Populations

Site 21 is a covered landfill that is not currently used. The projected future use of the site is consistent with current use. There are no plans to develop the site because it is a landfill. However, an industrial worker may be exposed to the site during maintenance activities (i.e., mowing). Additionally, as the site is not secure, a trespasser can access the site. Therefore, the trespasser/visitor (adult and adolescent) and industrial worker scenarios were evaluated for both current and future use scenarios.

Although unlikely because the site is a landfill, it was conservatively assumed that the site could be developed and used for industrial or residential activities in the future. Therefore,

the future use receptors include adult and child residents, in addition to the trespasser/ visitor and industrial worker.

Groundwater is not currently used as a potable water supply at the base, and is not anticipated to be used in the future. However, groundwater downgradient of the site could be used as a potable water supply in the future. Therefore, the groundwater data from the site was used as a conservative assessment of groundwater quality downgradient of the site for the future exposure scenario. It is assumed that adult and child residents would be exposed to the groundwater through potable use. Additionally, the construction worker is assumed to have contact with the shallow groundwater during excavation activities.

7.6.3.3 Potential Exposure Pathways

As mentioned in Section 3.3.2, a complete exposure pathway has five elements: a source, a mechanism for release and migration, an environmental transport medium, a point of potential human contact, and a route of intake. These elements are discussed below for Site 21.

Contaminant Sources Originally, Site 21 was the location of a 2-acre gravel mining pit. However, around 1975 the NOS PW Department began filling in the pit with trash generated in the explosives manufacturing area. The landfill was filled using trench excavation methods and is estimated to contain approximately 1,500 tons of trash and various quantities of paint sludges, asbestos, and barium sulfate. This practice ended in November 1981 when a 40-cubic-yard dumpster was placed at the site to act as a transfer container for IHDIV-NSWC. The site also accepted sludges from paint spray booths and bagged asbestos until June 1982.

Site reconnaissance conducted in 1982 indicated the facility had a partial cover over the deposited material (6 in. to 1 ft in depth). Uncovered bags of asbestos were observed, as well as several small dark brown colored pools of water which may have been leachate. However, by 1989 the inactive landfill had been completely covered with a soil cap. The thickness of the cap is being continually increased using soil from various locations at IHDIV-NSWC. The dumpster was removed in 1996 and the area was regraded, so that the current ground surface is approximately 10 ft to 15 ft higher than the level of the dumpster. Excavation of a sediment pond near the north end of the site in 1996 uncovered waste consisting mostly of plastic, glass, and metal.

Release and Transport Mechanisms The dominant transport mechanisms at Site 21 appear to be surface runoff and erosion, with minor amounts of vertical leaching to subsurface soil and groundwater. Different VOCs and explosives were detected in the groundwater than in the soil, indicating that there may not be significant leaching of contaminants from the soil to the groundwater. Only a few of the constituents detected in the surface soil (one PAH and five metals) were detected at a maximum concentration above the SSL for soil to groundwater transport. Of these constituents, only four were detected in the groundwater (only metals), and only three were retained as groundwater COPCs. Waste was not sampled but is a potential source of contamination to groundwater.

Fate and transport modeling was conducted for volatilization from groundwater during showering and from an open excavation.

Potential Exposure Points and Exposure Routes Exposure points are locations where humans could contact contamination. Onsite exposure points include surface soil and groundwater. Offsite exposure points include groundwater downgradient of the site. Offsite exposure points were not evaluated in the risk assessment. Dilution and attenuation of any contamination would occur in downgradient locations, and any associated risks would be less than those at the site.

Potential exposure routes were evaluated for both current and potential future site use. Existing and potential future exposure pathways are illustrated in the conceptual exposure model (Figure 7-8). Exposure scenarios and potentially complete pathways of exposure evaluated in this risk assessment are presented in Table 7-6 and Appendix G.4d, Table 1.

Current Exposure Routes The only medium of potential concern currently accessible at the site is surface soil. Based on current site use, potential receptors include adolescent and adult trespassers/visitors and industrial site workers. The shallow groundwater at the site is not used as a potable water supply, and therefore, there is no current exposure to shallow groundwater.

In summary, the current land use exposure routes for quantitative evaluation include:

- Trespasser/Visitor (adult and adolescent): incidental ingestion of and dermal contact with surface soil.
- Industrial Worker: incidental ingestion of and dermal contact with surface soil.

Future Exposure Routes As discussed above, potential future site use is expected to be the same as current site use. However, potential future industrial and residential use of the site was also evaluated. Future industrial workers, trespassers, and residents may be exposed to the surface soil. Additionally, it was conservatively assumed that shallow groundwater may be used as a potable water supply, although this is highly unlikely. Construction workers may also be exposed to shallow groundwater during excavation activities.

In summary, the future land use exposure routes include the current land use exposure routes and the following exposure routes:

- Resident (adult and child): incidental ingestion of and dermal contact with surface soil, ingestion of and dermal contact with shallow groundwater, and inhalation (adults only) of volatiles from groundwater.
- Construction Worker: dermal contact with and inhalation of volatiles from shallow groundwater.

The exposure concentrations used to calculate potential risks to each of the receptors are presented in Appendix G.4d, Tables 3.1 through 3.5. The exposure parameters and equations used to calculate the risks are presented in Appendix G.4d, Tables 4.1 through 4.12.

7.6.4 Risk Characterization

Risks were evaluated for the complete exposure pathways identified in Section 7.6.3. These risks are discussed below.

7.6.4.1 Soil

Risks were evaluated for exposure to surface soil for current and future scenarios.

7.6.4.2 Surface Soil

RME risk estimates for exposure to surface soil were calculated for an adolescent and adult trespasser/visitor and an adult industrial worker under current and future site use (Appendix G.4d, Tables 7.1.RME through 7.3.RME, and Tables 8.1.RME through 8.3.RME). The risks are summarized in Table 7-7. Exposure to surface soil via incidental ingestion and dermal contact were evaluated. Inhalation of volatile and fugitive emissions from surface soil was not evaluated because no COPCs were retained for this pathway.

The noncarcinogenic hazards associated with exposure to surface soil by current adolescent and adult trespassers/visitors (0.084 and 0.071, respectively) are below USEPA's target HI of 1.0. The carcinogenic risks associated with exposure to surface soil for these receptors ($1x10^{-6}$ and $3x10^{-6}$) are within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface soil by current industrial workers (0.5) is less than USEPA's target HI. The carcinogenic risk associated with exposure to surface soil by an industrial worker ($2x10^{-5}$) is within USEPA's target risk range.

RME risk estimates for exposure to surface soil were calculated for a future adult and child resident under future site use (Appendix G.4d, Tables 7.9.RME, 7.10.RME, and 8.10.RME, and summarized in Table 7-7).

The noncarcinogenic hazard due to exposure to soil by an adult resident (0.65) is below USEPA's target HI of 1.0. The noncarcinogenic hazard for a child resident (3.0) exceeds USEPA's target HI. There are no individual constituent that contribute a hazard greater than 1.0.

As discussed in Section 3.3.2.3, the carcinogenic risk for the resident is calculated as a lifetime age-adjusted risk. The carcinogenic risk associated with exposure to soil by the resident exposed over his or her lifetime ($6x10^{-5}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The CT noncarcinogenic hazard was calculated for the child resident because the RME noncarcinogenic hazard exceeds 1.0 (Appendix G.3d, Table 7.14.CT, and summarized in Table 7-8). The CT noncarcinogenic hazard due to exposure to surface soil by a child resident is less than USEPA's target HI of 1.0.

7.6.4.3 Groundwater

Shallow groundwater beneath the site is not currently used as a potable water supply and will not likely be used as a potable water supply in the future. However, shallow groundwater beneath the site was evaluated as a worst-case risk estimate for potable groundwater use.

Risk estimates for exposure to shallow groundwater were calculated for child and adult residents under potential future residential use of groundwater (Appendix G.4d, Tables 7.4.RME, 7.5.RME, and 7.7.RME, and Tables 8.4.RME and 8.6.RME, and summarized in Table 7-7). It was assumed that a resident would drink the water, and bathe or shower with the water, resulting in inhalation of volatiles (adult only) and dermal absorption.

The RME noncarcinogenic hazards associated with use of the groundwater as a potable residential water supply are above USEPA's benchmark noncarcinogenic HI of 1.0 for both the potential future child and adult resident. The noncarcinogenic hazards to a child and adult resident are 94 and 40, respectively. The hazard is primarily associated with ingestion of manganese in the groundwater. Iron and thallium also contribute individual HIs above 1.0.

The carcinogenic risk for groundwater for the resident is presented as a lifetime age-adjusted risk. The RME carcinogenic risk associated with use of the groundwater as a potable residential water supply is within USEPA's benchmark of $1x10^{-4}$ to $1x10^{-6}$. The residential lifetime carcinogenic risk is $1x10^{-6}$.

Exposure to shallow groundwater by a construction worker during excavation was evaluated as a potential future exposure scenario (Appendix G.4d, Tables 7.6.RME, 7.8.RME, 8.5.RME, and 8.7.RME, and summarized in Table 7-7). The RME noncarcinogenic risk (2.2) is above USEPA's benchmark value. The noncarcinogenic hazard is associated with dermal contact with manganese in the groundwater. The RME carcinogenic risk is $3x10^{-8}$, which is below USEPA's target risk range.

The RME noncarcinogenic hazards for exposure to groundwater by future adult and child residents, and construction workers exceed USEPA's benchmark value of 1.0. Therefore, CT exposure was evaluated for these scenarios. The CT risk estimates are summarized in Table 7-8 (and Appendix G.4d Tables 7.11.CT through 7.13.CT). The calculated CT noncarcinogenic hazards for an adult (1.9) and child (23) resident exceed USEPA's target HI. The risk drivers are the same as those for the RME HI. The calculated CT noncarcinogenic hazard for the construction worker is below USEPA's target HI.

7.6.4.4 Summary of Total Risks Across Pathways and Media

Table 7-7 and Appendix G.4d, Tables 9.1.RME through 9.7.RME summarize the RME potential noncarcinogenic hazards and carcinogenic risks to each receptor. Table 7-8 and Appendix G.4d, Tables 9.8.CT through 9.10.CT summarize the CT potential hazards and risks to each receptor that have HIs in excess of 1.0 or carcinogenic risks greater than $1x10^{-4}$. Potential risks were summarized for a current/future adolescent trespasser/visitor, current/future adult trespasser/visitor, current/future industrial worker, future adult resident, future child resident, future lifetime resident, and future construction worker. Appendix G.4d, Tables 10.1.RME through 10.4.RME, and 10.5.CT, and 10.6.CT show only the chemicals that contributed a hazard greater than 0.1 or a carcinogenic risk greater than 10^{-6} for scenarios with total HIs greater than 1.0 or total carcinogenic risks greater than 10^{-4}.

The risk assessment results may be summarized as follows:

- **Current/Future Trespasser/Visitor, Adolescent** (Appendix G.4d, Table 9.1.RME): HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Current/Future Trespasser/Visitor, Adult** (Appendix G.4d, Table 9.2.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.

- **Current/Future Industrial Worker** (Appendix G.4d, Table 9.3.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Future Resident, Adult** (Appendix G.4d, Table 9.4.RME): The HI exceeds 1.0. Hazard is associated with ingestion of iron, manganese, and thallium in shallow groundwater. The CT future adult resident has a HI that is also above the USEPA benchmark value (Appendix G.4d, Table 9.9.CT). No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Future Resident, Child** (Appendix G.4d, Table 9.5.RME): The HI exceeds 1.0. Hazard is associated with ingestion of iron, manganese, and thallium in shallow groundwater. The CT future child resident has a HI that is above the USEPA benchmark value (Appendix G.4d, Table 9.10.CT). Hazard associated with surface soil also exceeds 1.0, however, there are no individual constituents with HIs above 1.0.
- **Future Lifetime Resident** (Appendix G.4d, Table 9.6.RME): The carcinogenic risk is below the target USEPA risk range. No unacceptable health threats are posed to this receptor for exposure to shallow groundwater.

Future Construction Worker (Appendix G.4d, Table 9.7.RME): Both noncarcinogenic hazards and carcinogenic risks are below USEPA action levels. No unacceptable health threats are posed to this receptor for exposure to shallow groundwater and surface soil.

7.7 Ecological Risk Assessment (Steps 1–3A)

7.7.1 Screening Problem Formulation

Problem formulation involves preparing descriptions of environmental setting, sources, fate and transport of site chemicals, chemical ecotoxicity, and potential receptors. This information is used to build the conceptual model. The conceptual model includes a discussion of exposure pathways, as well as assessment and measurement endpoints.

7.7.1.1 Environmental Setting

Site 21 is located on Bronson Road across from Building 1384 and about 500 ft from the Mattawoman Creek. From north to south, it extends from Building 478 to Building 480. An unpaved road runs through the site. Originally, this site was the location of a 2-acre gravel mining pit. However, around 1975, the NOS PW Department began filling in the pit with trash generated in the explosives manufacturing area. This practice ended in November 1981. The site also accepted sludges from paint spray booths and bagged asbestos until June 1982. The landfill was filled using trench excavation methods and is estimated to contain approximately 1,500 tons of trash and various quantities of paint sludges, asbestos, and barium sulfate.

Site reconnaissance conducted in 1982 indicated the facility had a partial soil cover over the deposited material (6 in. to 1 ft in depth). Uncovered bags of asbestos were observed, as well as several small dark brown colored pools of water which may have been leachate. However, by 1989 the inactive landfill had been completely covered with a soil cap. The

thickness of the cap is being continually increased using soil from various locations at IHDIV-NSWC.

Habitat at Site 21 is primarily old field. Portions of the eastern section are being filled with additional soil and graded to restore the hillside. The site has been seeded with tall fescue (*Festuca arundinacea*) which dominates the herbaceous layer. Immature red cedar (*Juniperus virginiana*) and black locust (*R. pseudoacacia*) have become established in clusters in the western section. A small storm water management pond (roughly 100 m^2) has been constructed off the northern corner of the site. Cattails are growing in the pond (*Typha* spp.). A mixed oak forest borders the site to the east and northeast. The forest understory is dominated by American holly (*I. opaca*). During site reconnaissance in Spring 2001, CH2M HILL ecologists observed an active bald eagle nest in the forest to the east of the site.

7.7.1.2 Summary of Available Analytical Data

Twenty surface soil samples (IS21SS01 through IS21SS20) were collected on July 26, 2000 as part of the RI (Figure 7-2). Sample IS21SS01 was collected near the northern edge of the site proximate to the head of the storm water management pond where waste was observed during previous excavation. Sample IS21SS02 was collected near an historical roll-off bin transfer area**.** The rest of the samples were collected from a predetermined grid pattern. Three of the samples were background samples (IS21SS18, IS21SS19, IS21SS20) from areas upslope of the site.

Because historical information indicated a wide variety of materials may have been disposed of at Site 21 and no previous analytical data were available, surface soil samples were analyzed for full TCL organics, TAL inorganics, explosives, NG, PETN, and perchlorate. Surface soil samples were also analyzed for TOC and pH.

7.7.1.3 Ecotoxicity and Potential Receptors

Because a variety of wastes were disposed of at the site and the type and quantity of disposal is unknown, there is no one chemical or set of chemicals that are expected to be of primary ecological concern at the site. Based on what is known about the site, metals and explosives are likely to be present. Each of these chemical classes can affect terrestrial receptors under certain circumstances.

Receptors potentially exposed to chemicals in soil at Site 21 include organisms that have significant direct contact with soil or consume prey that live in the soil or leaf litter. At Site 21, these could include plants, soil invertebrates, and birds or mammals that consume plants and invertebrates. If chemicals that biomagnify are present, top consumers such as raptors or foxes could also be exposed to potentially significant levels of chemicals in their diet.

The storm water management pond is small (< 1000 ft^2), and it is managed as a water control structure. It is likely not to contain water during the warmest months of the year. Additionally, because the pond is a stormwater control structure, it is slowly filling in with sediment from the site. Due to its small size, proximity to Bronson Road, and minimal surrounding cover, the pond provides minimal ecological services; as such, the pond was not evaluated as part of the assessment.

7.7.1.4 Preliminary Conceptual Model

Information on the habitat features and the fate and transport of the chemicals detected at the site were used to build the preliminary conceptual model (Figure 7-9). The conceptual model addresses complete exposure pathways, receptors, and endpoints.

Exposure Pathways. The soils at Site 21 are known to have been impacted by past disposal activities. However, the subsequent placement of soil as cover has eliminated much of the exposure potential. If chemicals are present in the upper soil layers, key exposure routes for ecological receptors include ingestion of chemicals adsorbed to soil (invertebrates) and direct contact with chemicals in the soil (invertebrates and plants). Other organisms that forage in the area are also potentially exposed to chemicals by direct contact, incidental ingestion of soil, and ingestion of invertebrates and/or plants that have accumulated body burdens.

Except for the small storm water pond, no surface water bodies occur on Site 21. Evaluation of contamination migration in Section 7.5.1 suggests the potential for release of chemicals from soil to groundwater is low as is the potential for significant discharge to the Mattawoman Creek. As such, the downgradient aquatic resources are not evaluated in the assessment. In addition, risk from chemicals that were disposed of in or migrated to the Mattawoman Creek is being address in a separate study.

Assessment and Measurement Endpoints. The conclusion of problem formulation includes the selection of assessment and measurement endpoints, based on the preliminary conceptual model. Based on the habitat and types of chemicals potentially present, seven assessment endpoints were chosen to evaluate the potential risk to ecological receptor populations from chemicals disposed of at Site 21. Each assessment endpoint and corresponding representative species or community is described below.

1. ***Growth, survival, and reproduction of soil invertebrate communities —*** Soil invertebrates, such as earthworms, promote soil fertility by breaking down organic matter and releasing nutrients. They also improve aeration, drainage, and aggregation of soil, and serve as a forage base for many terrestrial species. The soils at the site will support fewer insectivorous birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of soil invertebrate communities.

2. ***Growth, survival, and reproduction of terrestrial plant communities —***Plants provide food, cover, and nesting material for many animals. The soils at the site will support fewer birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of plants.

3. ***Growth, survival, and reproduction of avian terrestrial insectivores*** – These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. A juvenile American robin (*Turdus migratorius*) was chosen to represent this assessment endpoint. Robins live in a variety of habitats, including woodlands, swamps, suburbs, and parks. Robins forage on the ground in open areas, along edge habitats, or along the edges of streams. They forage along the ground for ground-dwelling invertebrates and search for fruit and foliage-

dwelling insects in low tree branches (USEPA, 1993). While growing in the nest, earthworms constitute the majority of the diet of the juvenile robin.

4. ***Growth, survival, and reproduction of mammalian terrestrial insectivores*—**These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. Short-tailed shrew (*Blarina brevicauda*) was chosen to represent this assessment endpoint. Short-tailed shrews live in a wide variety of habitats and need cool, moist conditions (Randolf, 1973). They eat insects, worms, snails, and other invertebrates (Robinson and Brodie, 1982).

5. ***Growth, survival, and reproduction of mammalian terrestrial herbivores*—**These receptors are primary consumers, feeding on plants. Many of the species in this group are prey for upper trophic levels. The meadow vole (*Microtus pennsylvanicus*) was chosen to represent this assessment endpoint. The meadow vole inhabits areas where there is good grass cover. It consumes primarily shoots, grasses, and bark (USEPA, 1993).

6. ***Growth, survival, and reproduction of avian terrestrial carnivores*** – These receptors are top level predators and are susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial food chains. The American kestrel (*Falco sparverius*) was chosen to represent this endpoint**.** They are found in open to semi-open areas and near the edges of groves. American kestrels eat small mammals, birds, and invertebrates (USEPA, 1993).

7. ***Growth, survival, and reproduction of carnivorous terrestrial mammals* —** These receptors are top level consumers and are thus most susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial foodchains. The red fox (*Vulpes vulpes*) was chosen to represent this endpoint. Red fox utilize many different types of habitats including salt marshes, cropland, rolling farmland, brush, pastures, hardwood stands, and coniferous forests. Their diet consists primarily of small mammals including meadow voles, mice, and rabbits. They also consume plant material, mainly in the summer and fall when fruits, berries, and nuts become available.

Although potentially complete exposure pathways exist for reptiles and amphibians, they were not specifically selected as receptors because information on the toxicological effects of chemicals on adult amphibians and reptiles via ingestion is limited. The assessment indirectly evaluates these groups because there are receptors included in the assessment that have similar diets to reptiles and amphibians (such as the shrew).

The corresponding measurement endpoints associated with each assessment endpoint were defined as follows:

Assessment Endpoints		Measurement Endpoints
Growth, survival, and reproduction of soil invertebrate communities.	⇨	Comparison of HQs for soil invertebrates to a target HQ of 1. Medium-specific HQs are calculated for individual chemicals by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of soil invertebrates.

Assessment Endpoints		Measurement Endpoints
Growth, survival, and reproduction of terrestrial plant communities.	⇨	Comparison of HQs for terrestrial plants to a target HQ of 1. Medium-specific HQs are calculated for individual chemicals by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of terrestrial plants.
Growth, survival, and reproduction of avian terrestrial insectivore.	⇨	Comparison of HQs for robin to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.
Growth, survival, and reproduction of mammalian terrestrial insectivore.	⇨	Comparison of HQs for short-tailed shrew to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.
Growth, survival, and reproduction of mammalian terrestrial herbivore.	⇨	Comparison of HQs for meadow vole to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by toxicity values that are associated with NOAELs and LOEALs.
Growth, survival, and reproduction of avian terrestrial carnivores.	⇨	Comparison of HQs for American kestrel to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.
Growth, survival, and reproduction of carnivorous terrestrial mammals.	⇨	Comparison of HQs for red fox to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.

7.7.2 Analysis

The ecological exposure estimation was conducted as described in Section 3.4. Site-specific modifications are addressed below.

7.7.2.1 Site-Specific Ecological Effects Evaluation

No adjustments based on site-specific media quality parameters were made to the screening values. Average soil TOC was 1.3 percent, less than the minimum default value of 2 percent for the several TOC-adjustable screening values.

7.7.2.2 Site-Specific Ecological Exposure Estimation

Exposure parameters (i.e., ingestion rates and dietary composition) for each receptor species are presented in Table 7-9. The diet of the American robin is for a 7-day old hatchling. It includes earthworms and soil, but no plant material.

7.7.3 Screening-Level Risk Calculations

The SERA indicated that some inorganics detected at the site may impact the growth, survival and/or reproduction of soil invertebrates, plants, insectivorous birds and mammals, herbivorous mammals, and top-level avian consumers (Tables 7-10 and 7-11). Preliminary COPCs for soil invertebrates and plants include multiple chemicals from all

classes. Most of these preliminary COPCs were chemicals that were not detected but had maximum detection limits in excess of screening values, or chemicals for which no medium-specific screening value was available. Preliminary COPCs for food chain effects included arsenic, cadmium, chromium, lead, mercury, selenium, and zinc, and a few organic compounds for which no reference toxicity values were available. Due to the identification of preliminary COPCs, the risk assessment process was continued to Step 3A.

7.7.4 Refinement of Conservative Exposure Assumptions (Step 3A)

In Step 3A, exposure assumptions are refined and risk estimates (i.e., HQs) are recalculated. Risk is again characterized and uncertainties associated with the conclusions are described. If re-evaluation of the conservative exposure assumptions supports an acceptable risk determination then the site may exit the ecological risk assessment process (CNO, 1999).

7.7.4.1 Exposure Assumption Refinements

The results of Steps 1 and 2 (i.e., the SERA) indicated that, based on a set of conservative assumptions, there are multiple chemicals that may pose a risk to several receptor communities/species used in the screening assessment. The set of preliminary COPCs includes chemicals with HQs in excess of 1 and chemicals for which assessment data were unavailable.

Assumptions and methods that were modified for the calculation of medium-specific and food chain hazard quotients are listed below, along with justification for each modification.

- Maximum chemical concentrations were replaced by average chemical concentrations. For individual mammalian and avian receptors, average chemical concentrations provide a better estimate of the likely level of chemical exposure because each of the receptors would be expected to forage in several different areas of the site, and, in many cases, off the site. With adequate spatial coverage, central tendency measures are appropriate for evaluating impacts to populations of soil invertebrates and plants. While locations of maximum concentration may be important to individuals, the average value at the site can be more instructive with regard to the level of impact that might be expected at the population level.
- Central tendency estimates for body weight and ingestion rate were used to develop exposure estimates, rather than minimum body weights and maximum ingestion rates. The use of central tendency parameters is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.

Exposure parameters for each species are presented in Table 7-12.

7.7.4.2 Refined Risk Calculations

For soil invertebrates and plants, the mean concentrations of six metals (aluminum, arsenic, chromium, iron, mercury, and vanadium exceeded soil screening values (Table 7-13). HQs ranged from 1.5 to 124.

Refined risk calculations for food chain receptors are shown in Table 7-14. There were no exceedances of LOAEL-based HQs. For NOAEL-based HQs, the only exceedance was for arsenic for the short-tailed shrew (HQ = 3.5).

7.7.4.3 Risk Characterization

The concentrations of aluminum, arsenic, chromium, iron, mercury, and vanadium exceeded soil screening values. Of these, aluminum, chromium, iron, and vanadium were present at concentrations that are consistent with NDWIH background levels (Brown and Root, 1997), as demonstrated below.

Inorganic	Site Average (mg/kg) (n = 17)	Surface Soil Background Average (mg/kg) (n = 12 or 14)	Ratio	Surface/ Subsurface Soil Background Average (mg/kg) (n = 24 or 28)	Ratio
Aluminum	6218	7874	0.8	10754	0.6
Arsenic	14.6	2.2	6.6	3.4	4.3
Chromium	14.7	12	1.2	16.9	0.9
Iron	16442	10290	1.6	17421	0.9
Mercury	0.23	0.043	5.3	0.04	5.8
Vanadium	29.3	19.2	1.5	25	1.2

There are two types of background data used in the comparison: surface soil and the combination of surface soil and subsurface soil. Much of the surface soil at Site 21 has been transported to the site. Imported soils were likely collected in the vicinity, but at various depths. The low TOC in the collected soil samples also suggests that the soils have come from below surface. As such, the comparison to background levels for combined surface and subsurface soil data are likely more appropriate.

Arsenic and mercury were present at higher concentrations than those found at background locations at the base. The maximum concentrations of arsenic and mercury were detected at IS21SS14 and IS21SS06, respectively.

The average arsenic concentration was 14.6 mg/kg. The screening value of 10 mg/kg was reported in Efroymson et al. (1997a). Corn, grown from seed, experienced fresh weight reductions of less than 10 percent when exposed to three forms of As(V) at 10 ppm. The effect was relatively minor. At Site 21, there are no indications that the vegetation is being impacted. In locations that have not been recently disturbed there is good grass cover. Arsenic is also thought to pose a minimal risk to ecological receptors at Site 21 because the average site concentration is less than the screening benchmarks of 60 mg/kg developed by Efroymson et al. (1997a) for earthworms. This benchmark is greater than the site average of 14.6 mg/kg.

The average mercury concentration on the site was 0.23 mg/kg. The screening value of 0.1 mg/kg was obtained from Efroymson et al. (1997b). In the study, earthworms were exposed to 0.5 mg/kg mercuric chloride ($HgCl_2$). Survival and cocoon reproduction were reduced, but the number of juveniles produced was not affected. In developing a screening level, Efroymson et al. (1997b) applied a safety factor of 5 to this study, resulting in a screening value of 0.1 mg/kg. The mercury in the laboratory test was applied as a soluble salt. Mercuric chloride is highly toxic (Merck, 1989). Because the average concentration at the site is below the concentration that produced an effect in the study and because divalent

forms usually do not exist as ionic species in nature (Stein et al. 1996), the observed mercury concentrations at Site 21 are not expected to pose a significant risk to soil invertebrates. In addition, the average mercury concentration at the site is lower than the 0.3 mg/kg screening benchmark for toxicity to plants provided by Efroymson et al. (1997a).

7.7.4.4 Uncertainty

There is uncertainty associated with the fact that there were some chemicals that were not detected, but had mean concentrations (based on one-half the detection limits) that exceeded direct contact screening values. These occurrences were limited (5 percent of the cases). Of these, the average detection limit to site average ratio was low at 2.1.

Screening values were also not available for some organics. The majority of these occurrences were for compounds that were not detected. The relatively few detections of SVOCs, VOCs, and explosives tended to be at low concentrations, and, for those with screening values, HQs were all less than 1. Overall, the frequency of detection and magnitude of detections clearly indicated that organics are not of concern at the site. As such, the lack of screening values for some organics carries a limited amount of uncertainty.

The few unavailable ingestion-based screening values were associated with compounds that were not detected at the site.

7.7.4.5 Risk Conclusion

The results of the risk assessment indicate that chemicals in the soil at Site 21 pose minimal risk to ecological receptors. Supporting evidence is as follows:

- There were no LOAEL-based HQs in excess of 1 for upper trophic level for the average exposure case;
- Concentrations of several of the metals that exceeded screening values were comparable to background; and
- Toxicity evaluations for the two metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely.

Additionally, likely future action at the site includes a soil cover for the landfill and filling in of the stormwater management pond. These actions will address any remaining risk issues. An active bald eagle nest is located off the eastern edge of the site. The presence of this nest may affect the timing of any construction on the site.

7.8 Summary and Conclusions

7.8.1 General

A remedial investigation was conducted at Site 21. The objectives were to determine the extent of waste at the site and determine whether or not the waste is a source of contamination to soil and groundwater underlying the site. Field activities were conducted between July 27 and August 4, 2000. The work consisted of surface soil sampling, geophysical

surveying, soil boring confirmation, test pit confirmation, monitoring well installation, and groundwater sampling.

The subsurface is characterized by silty sands with clay lenses characteristic of the Quaternary. Quaternary deposits at Site 21 are present to depths greater than 48 ft bgs. Groundwater flow is generally from the northeast to the southwest, discharging to the Mattawoman Creek.

The objectives of the RI generally were met. The thickness and depth of the fill was estimated using a geophysical survey and soil borings and the lateral extent was determined using the survey and test pits. The fill appears to extend from the road to the break in slope that existed before the borrow pit was filled in; in other words, most of the area of the borrow pit contains fill. It is uncertain how much of the fill actually represents waste but the assumption is that most, if not all, of it does except perhaps the upper 5 ft to 10 ft. No soil samples were collected from immediately below the fill in order to avoid penetrating the waste itself. Therefore, it is difficult to be certain that the soil underlying the waste has been affected. However, the fact that the groundwater contains iron, manganese, and some other metals at levels greater than background suggests that there has been an impact by the waste on the underlying groundwater. Alternatively, the groundwater contamination may have been derived from the contamination detected in the surface soil.

7.8.2 Nature and Extent

The nature and extent of contamination at Site 21 was evaluated based on a 'short list' of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

VOCs, SVOCs, and explosives were detected in surface soil; however, observed concentrations of these contaminants were very low. Similarly, VOCs and explosives were observed in groundwater at two locations; however, detected concentrations were very low and did not warrant further discussion.

Arsenic was detected in all surface soil samples. Further, every sample contained concentrations greater than or equal to the background 95 percent UCL. Arsenic was not detected in groundwater at elevated concentrations.

Manganese was not detected in surface soil samples at elevated concentrations. The five groundwater samples, however, contained concentrations as high as 23,100 μg/L. Three samples contained concentrations in excess of the 95 percent UCL.

Based on a review of the data and knowledge of the site, it appears there is little chance for additional contaminant migration. The evidence for this is as follows:

- Surface and subsurface soil contained few contaminants
- With the possible exception of iron and manganese, contaminants were not detected in groundwater
- The distance between the site and the Mattawoman Creek is too large for runoff to be a significant process
- Groundwater occurs in the fill and likely also occurs in the some of waste

7.8.3 Human Health Risk Assessment

The risk assessment indicates that the only human health hazards above USEPA target levels are posed to the future RME child and adult resident. Future residential use of the site in not very likely. Manganese in the groundwater is the dominant contributor to this health hazard, with additional contributions from iron and thallium. The health hazards posed to the future CT child and adult residents are also above USEPA's benchmark HI. The concentration of iron and manganese detected in one well was much higher than that detected in the background sample or either of the other two site-related samples. Due to the limited number of samples, this maximum detected concentrations were used as the sample concentrations, which may result in an over-estimate of the actual risks. Although the total HI to the child resident associated with exposure to surface soil exceeds 1.0, there are no individual constituents or target organ/effects with HIs above 1.0.

7.8.4 Ecological Risk Assessment

The results of the risk assessment indicate that chemicals in the soil at Site 21 pose minimal risk to ecological receptors. Supporting evidence is as follows:

- There were no LOAEL-based HQs in excess of 1 for upper trophic level for the average exposure case;
- Concentrations of several of the metals that exceeded screening values were comparable to background; and

Toxicity evaluations for the two metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely. The likely future action at the site includes a soil cover for the landfill and filling in of the stormwater management pond, which will address risk issues.

7.9 Conclusions

The extent of surface soil contamination has been defined to the extent required for an FS. The presence of human health risks from future residential use of groundwater indicates that an FS should be performed. The results of the pre-FS groundwater sampling indicated that the concentrations of manganese and perchlorate in groundwater detected during the RI were not anomalous. The results of the subsequent perchlorate investigation indicated that perchlorate is not associated with the landfill.

An FS will be conducted to address both the soil and groundwater (for manganese) at the site. The FS will examine a number of alternatives; however, the presumptive remedy for the site is a cap. Capping of the landfill (and the storm water management pond) will prevent contact by humans and wildlife with contaminated soil, and reduce water infiltration that would further mobilize contaminants from soil into groundwater.

7.10 References

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Table 7-1
Detected Compounds in Site 21 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21SO01		IS21SO02		IS21SO03		IS21SO04		IS21SO05		IS21SO06		IS21SO07		IS21SO08	
Sample ID	IS21SS010001		IS21SS020001		IS21SS030001		IS21SS040001		IS21SS050001		IS21SS060001		IS21SS070001		IS21SS080001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
Methyl-tert-butyl ether (MTBE)													13	J		
Styrene							1.5	J								
Toluene													2.6	J		
Xylene, total																
Semi-volatile Organic Compounds (UG/KG)																
2-Methylnaphthalene																
Acetophenone																
Anthracene									45	J						
Benzo(a)anthracene	81	J	83	J			170	J	260	J			120	J	190	J
Benzo(a)pyrene							46	J	81	J	61	J	45	J	49	J
Benzo(b)fluoranthene	130	J	130	J			250	J	350	J			200	J	270	J
Benzo(k)fluoranthene	62	J	42	J			100	J	170	J			79	J	140	J
Chrysene	100	J	100	J			190	J	290	J			140	J	230	J
Dibenz(a,h)anthracene									41	J						
Diethylphthalate																
Fluoranthene	140	J	160	J			320	J	530				190	J	340	J
Indeno(1,2,3-cd)pyrene							61	J	77	J	52	J			57	J
Naphthalene																
Phenanthrene			63	J			110	J	230	J			66	J	120	J
Pyrene			73	J			130	J	220	J	59	J	120	J	170	J
bis(2-Ethylhexyl)phthalate	76	J			45	J	48	J	48	J			45	J		
Explosives (UG/KG)																
Ammonium perchlorate																
HMX											190	J				
Nitroguanidine											68	J				
Total Metals (MG/KG)																
Aluminum	9,830		5,240		6,440		6,780		7,230		7,340		4,130		6,070	
Arsenic	15.1		9		18.5		33		7.2		4.8		3.6		17.8	
Barium	67.6	J	35.9	J	28.5	J	51.1		41.5	J	34.2	J	24.8	J	38.5	J
Beryllium																

J - Estimated Value
K - Biased high
L - Biased low

Table 7-1
Detected Compounds in Site 21 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21SO01		IS21SO02		IS21SO03		IS21SO04		IS21SO05		IS21SO06		IS21SO07		IS21SO08	
Sample ID	IS21SS010001		IS21SS020001		IS21SS030001		IS21SS040001		IS21SS050001		IS21SS060001		IS21SS070001		IS21SS080001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																
Cadmium	0.92	J	1.5										0.52	J		
Calcium	2,640		1,160		277	J	305	J	4,870		208	J	3,290		453	J
Chromium	18.8		16.5		36.6		15.3		16.3		11.9		13.8		12.2	
Cobalt	7.9	J	4.5	J	2.3	J	2.2	J	4	J	3.7	J	3.1	J	2.5	J
Copper	22	K	14.9	K	26.4	K	13.4	K	9.4	K	9.8	K	7.2	K	10.2	K
Cyanide	0.18				0.61		0.64		0.57						0.6	
Iron	25,300		13,400		13,200		29,500		16,300		17,200		9,310		18,800	
Lead	57.1		35.9		18.5		31.4		16.2		16.8		22.7		21.6	
Magnesium	1,370	J	936	J	534	J	559	J	1,630		560	J	1,260		592	J
Manganese	131		127		50.2		32.6		127		345		86.4		41.7	
Mercury	0.19		0.085	J	0.082	J	0.29		0.06	J	1.5				0.34	
Nickel	18.5		13.4		5.2	J	7.2	J	11		6.1	J	17.2		8.9	J
Potassium	650	J	393	J	352	J	720	J	441	J	491	J	473	J	528	J
Selenium					1.1	L										
Silver																
Sodium							208	J	117	J						
Vanadium	45.3		22.1		21.9		33.5		21.6		29.2		32.2		36.5	
Zinc	81.7	J	60.9	J	17.3	J	19.1	J	30.2	J	49.4	J	26.9	J	20.2	J
Wet Chemistry (MG/KG)																
% Moisture	43.2		12.1		17.7		21.4		12.5		11.3		20.1		17	
% Solids	58.7		88.1		81.5		84.4		78.5		92.5		83		83.8	
Total organic carbon (TOC)	16,400		10,600		12,700		3,460		3,460		5,150		31,700		15,500	
pH	6.6		6.7		5.6		4.3		7.1		5.3		7.4		5.4	

J - Estimated Value
K - Biased high
L - Biased low

Table 7-1
Detected Compounds in Site 21 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21SO09		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15	
Sample ID	IS21SS090001		IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
Methyl-tert-butyl ether (MTBE)																
Styrene																
Toluene	6.3	J														
Xylene, total					1.8	J										
Semi-volatile Organic Compounds (UG/KG)																
2-Methylnaphthalene																
Acetophenone																
Anthracene																
Benzo(a)anthracene	72	J	160	J			220	J	110	J	51	J	150	J		
Benzo(a)pyrene			45	J			60	J								
Benzo(b)fluoranthene	110	J	250	J			380	J	150	J	64	J	250	J		
Benzo(k)fluoranthene			120	J			130	J	84	J			99	J		
Chrysene	87	J	180	J			330	J	140	J	55	J	190	J		
Dibenz(a,h)anthracene							48	J								
Diethylphthalate							1,200									
Fluoranthene	130	J	190	J			490		300	J	100	J	350	J		
Indeno(1,2,3-cd)pyrene			47	J			81	J								
Naphthalene																
Phenanthrene	63	J	63	J			340	J	200	J	50	J	220	J		
Pyrene	85	J	110	J			280	J					220	J		
bis(2-Ethylhexyl)phthalate	45	J	51	J			49	J	43	J			67	J		
Explosives (UG/KG)																
Ammonium perchlorate											81	J				
HMX																
Nitroguanidine																
Total Metals (MG/KG)																
Aluminum	5,760		5,680		5,320		5,070		7,100		7,270		5,260		3,820	
Arsenic	9.7		15.5		6.2		20.6		11.5		11.7	L	51.8		4.1	
Barium	39	J	28.3	J	32.2	J	34.1	J	36.7	J	39.7	J	45.5		41.5	J
Beryllium											0.066	J				

J - Estimated Value
K - Biased high
L - Biased low

Table 7-1
Detected Compounds in Site 21 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21SO09		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15	
Sample ID	IS21SS090001		IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																
Cadmium					0.15	J	0.6	J			0.15	J	0.37	J	0.54	J
Calcium	902	J	1,490		614	J	2,280		1,420		1,770		3,220		722	J
Chromium	12.7		11.2		11.6		12.5		12.3		12.6		13.8		10.7	
Cobalt	4.5	J	4.2	J	2.5	J	4.7	J	4.2	J	4.3	J	3	J	5.8	J
Copper	7.8	K	24.6	K	10.7	K	14.4	K	48.1	K	48	K	32.7	K	8.5	K
Cyanide	0.6		0.61		0.65				0.58		0.62		0.57		0.66	
Iron	15,100		13,600		13,900		14,200		17,100		15,000		26,600		11,200	
Lead	25.6		32.3		13.2		29.9	L	41.6		37.2		49.1		15.5	
Magnesium	560	J	1,050	J	535	J	747	J	811	J	884	J	1,000	J	943	J
Manganese	85.7		90		41		212		94.7		105		45.5		398	
Mercury	0.14				0.067	J	0.14		0.13		0.073	J	0.56			
Nickel	7.3	J	12		5.2	J	12.6		9	J	8.6	J	19.2		13.1	
Potassium	357	J	357	J	403	J	500	J	495	J	450	J	520	J	317	J
Selenium							1.6	L					2.7	L		
Silver													16.5			
Sodium			107	J									166	J		
Vanadium	20		20.7		26.4		29.4		21.3		21.8		65.1		25.1	
Zinc	24.6	J	134	J	15.5	J	40.7	J	64.2	J	61.2	J	26.3	J	23.5	J
Wet Chemistry (MG/KG)																
% Moisture	17.2		17.4		23.6		18.4		14.3		19.3		11.7		23.8	
% Solids	84.8		89		77.6		78.2		86.2		87.1		90.3		80.9	
Total organic carbon (TOC)	7,750		5,970		10,400		43,800		7,010		4,970		23,100		10,900	
pH	5.6		7.7		4.7		7.6		7.2		7.6		3.7		6.6	

J - Estimated Value
K - Biased high
L - Biased low

Table 7-1
Detected Compounds in Site 21 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21SO15		IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS150001P		IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name												
Volatile Organic Compounds (UG/KG)												
Methyl-tert-butyl ether (MTBE)												
Styrene												
Toluene												
Xylene, total												
Semi-volatile Organic Compounds (UG/KG)												
2-Methylnaphthalene											73	L
Acetophenone									63	J		
Anthracene												
Benzo(a)anthracene												
Benzo(a)pyrene												
Benzo(b)fluoranthene			49	J								
Benzo(k)fluoranthene												
Chrysene												
Dibenz(a,h)anthracene												
Diethylphthalate	76	J										
Fluoranthene			63	J	46	J						
Indeno(1,2,3-cd)pyrene												
Naphthalene											110	L
Phenanthrene												
Pyrene			65	J								
bis(2-Ethylhexyl)phthalate			43	J								
Explosives (UG/KG)												
Ammonium perchlorate												
HMX												
Nitroguanidine												
Total Metals (MG/KG)												
Aluminum	3,120		5,620		8,850		4,510		5,940		10,100	
Arsenic	3.4	L	4.9		14		3.3		5.9		7.7	
Barium	22.6	J	31.2	J	58.4		17.4	J	45.3	J	42.2	J
Beryllium												

J - Estimated Value
K - Biased high
L - Biased low

Table 7-1
Detected Compounds in Site 21 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21SO15		IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS150001P		IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name												
Cadmium	0.22	J	0.2	J	0.21	J					0.16	J
Calcium	868	J	651	J	1,460		83.9	J	235	J	609	J
Chromium	9.2		10.4		13		8.9		16.1		19.6	
Cobalt	3.8	J	5.2	J	4.6	J	1.8	J	4.7	J	3.9	J
Copper	8.2	K	7.1	K	9.9	K	3.8	K	4.9	K	9.7	K
Cyanide	0.64				0.65		0.59		0.73		0.65	
Iron	9,120		12,100		12,700		8,280		12,200		22,200	
Lead	15.3		10.5		27.5		17.1		25.7		16.8	
Magnesium	1,070	J	591	J	1,040	J	353	J	582	J	390	J
Manganese	103		260		175		66.1		279		397	
Mercury	0.12	J			0.11	J	0.076	J			0.12	J
Nickel	13.3		6.2	J	10.7		3.2	J	7	J	4.5	J
Potassium	262	J	499	J	394	J	236	J	324	J	636	J
Selenium												
Silver												
Sodium					271	J						
Vanadium	21.6		18.7		28.3		18.3		29		36.4	
Zinc	24.6	J	18.8	J	25.9	J	8.8	J	19	J	22.9	J
Wet Chemistry (MG/KG)												
% Moisture	22.4		14.9		22.6		14.6		31.4		23.4	
% Solids	78.6		81.8		82.1		78		77.9		73.1	
Total organic carbon (TOC)	12,800		16,400		10,700		26,000		31,000		37,600	
pH	6.5		6.2		7.4		5.2		4.5		5.4	

J - Estimated Value
K - Biased high
L - Biased low

Table 7-2
Detected Compounds in Site 21 Monitoring Well Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03				IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,4-Dichlorobenzene			1.3	J						
Acetone	2.7	J								
Chlorobenzene			2.2	J						
Toluene			1.4	J						
Explosives (UG/L)										
1,3,5-Trinitrobenzene			0.19	J						
1,3-Dinitrobenzene	0.053	J							0.049	J
2,4-Dinitrotoluene			0.13	J			0.098	J		
Ammonium perchlorate	2	J							2,000	
Total Metals (UG/L)										
Aluminum	190	J	2,060		2,100		5,180		729	
Arsenic							3.6	J		
Barium	35.2	J	108	J	41	J	50.9	J	32.4	J
Cadmium					0.57	J	0.76	J	0.47	J
Calcium	1,720	J	29,700		22,100	J	23,200	J	3,380	J
Chromium			103		58.4		83.2		3.9	J
Cobalt	9.5	J	161		25.7	J	27.5	J	42.9	J
Copper	5.3	J	27.9		38.3		47.5		6.4	J
Cyanide			1.7	L			1.7	L		
Iron	97.3	J	24,200		2,820		6,820		1,790	
Lead			3.9		6.7		9		2.1	J
Magnesium	1,090	J	18,000		29,900		31,100		1,200	J
Manganese	66.5	J	23,100		682	J	709	J	601	J
Mercury			0.1		0.12	J				
Nickel	6.8	J	85.7		71.5		84.4			
Potassium	2,120	J	7,590		4,110	J	4,400	J	1,120	J
Silver			1.3	J						
Sodium	12,400		72,700		58,200		59,400		74,900	
Vanadium			6.5	J	4.9	J	12.5	J	5.2	J
Zinc	30.7	J	164		77.3	J	87.1	J	19.9	J

J - Estimated Value
K - Biased high
L - Biased low

Table 7-2
Detected Compounds in Site 21 Monitoring Well Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03				IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
Dissolved Metals (UG/L)										
Aluminum					705		667			
Barium	33.3	J	113	J	37.7	J	36.5	J	11.9	J
Cadmium					0.59	J	0.74	J		
Calcium	1,890	J	34,400		25,700	J	24,800	J	2,930	J
Chromium					5.8	J	7	J		
Cobalt	8.9	J	179		29.1	J	29.2	J	33.6	J
Copper	7.3	J	7.8	J	28.9		26.3			
Iron			16,300		180		335		331	
Lead					4		3.7			
Magnesium	1,050	J	20,900		34,600		33,000		1,050	J
Manganese	64.6	J	24,700		776	J	748	J	492	J
Nickel			46.9		48.9		67.5			
Potassium	2,080	J	8,460		4,190	J	3,970	J	1,140	J
Silver			2.4	J						
Sodium	12,100		82,600		65,900		62,300		87,800	
Thallium	6.2	J							5.5	J
Zinc	49.9	J	209		69.9	J	69.5	J	26.6	J

J - Estimated Value
K - Biased high
L - Biased low

TABLE 7-3
Conceptual Site Model for Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Surface Soil:

- Limited leaching of organic and inorganic contaminants from the surface soil to the subsurface soil via the infiltration of precipitation.
- Some bioaccumulation of inorganic and organic compounds in ecological receptors.
- Very slow biodegradation of organic compounds.
- Entrainment of inorganics and perhaps some SVOCs on soil into the air by wind.

Subsurface Soil:

- Limited leaching of inorganic contaminants to the groundwater via the infiltration of precipitation.

Groundwater:

- Movement of dissolved contaminants with the groundwater flow southward or southeastward from the site to Mattawoman Creek. Contaminant concentration will decrease with distance from the source area due to the dilution caused by advection and dispersion and due to the removal of inorganics from the aqueous phase via precipitation and transformation.

Table 7-4
Summary of Data Quantitatively Used in Risk Assessment
Site 21
NDWIH
Indian Head, Maryland

Medium	Date of Sampling	Sample	Parameters
Groundwater			
	09/07/2000	IS21MW010900	EXPLO, FMETAL, METAL, SVOA, VOA
	09/08/2000	IS21MW030900	EXPLO, FMETAL, METAL, SVOA, VOA
	09/08/2000	IS21MW030900P	EXPLO, FMETAL, METAL, SVOA, VOA
	09/11/2000	IS21MW020900	EXPLO, FMETAL, METAL, SVOA, VOA
Background Groundwater			
	09/08/2000	IS21MW040900	EXPLO, FMETAL, METAL, SVOA, VOA
Soil			
Surface Soil	08/01/2000	IS21SS010001	EXPLO, METAL, SVOA, VOA
(0 to 6 inches)	08/01/2000	IS21SS020001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS030001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS040001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS050001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS060001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS070001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS080001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS090001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS100001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS110001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS120001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS130001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS130001P	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS140001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS150001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS150001P	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS160001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS170001	EXPLO, METAL, SVOA, VOA
Background Soil			
Surface Soil	08/01/2000	IS21SS180001	EXPLO, METAL, SVOA, VOA
(0 to 6 inches)	08/01/2000	IS21SS190001	EXPLO, METAL, SVOA, VOA
	08/01/2000	IS21SS200001	EXPLO, METAL, SVOA, VOA

Table 7-5
Summary of Chemicals of Potential Concern for the HHRA (based on comparison to RBCs)
Site 21
NDWIH
Indian Head, Maryland

Groundwater	Soil
Shallow Aquifer	**Surface Soil**
1,4-Dichlorobenzene	Aluminum
Ammonium perchlorate	Arsenic
Aluminum*	Chromium
Arsenic*	Iron
Chromium*	Manganese
Cobalt	Vanadium
Iron	
Manganese	
Nickel*	
Thallium**	
Vanadium*	

* COPCs for groundwater for unfiltered scenarios only (construction worker exposure to groundwater).
** COPC for groundwater for filtered scenarios only (residential exposure to groundwater).

Table 7-6
Exposure Pathways
Site 21
NDWIH
Indian Head, Maryland

Media	Exposure Route	Current			Future					
		Industrial Worker	Trespasser/ Visitor		Construction Worker	Industrial Worker	Trespasser/ Visitor		Resident	
			Adult	Adolescents			Adult	Adolescents	Adult	Child
Groundwater - Shallow Aquifer										
	Ingestion								X	X
	Dermal				X				X	X
	Inhalation				X				X	
Surface Soil										
	Ingestion	X*	X*	X*		X*	X*	X*	X*	X*
	Dermal	X*	X*	X*		X*	X*	X*	X*	X*
	Inhalation	NC	NC	NC		NC	NC	NC	NC	NC

X Quantitative evaluation (if COPCs selected for pathway).

* Current and Future scenario are the same.

NC No COPCs identified, therefore, not evaluated quantitatively.

Table 7-7
Summary of RME Cancer Risks and Hazard Indices-Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current Trespasser/Visitor Adolescent	Surface Soil	Ingestion	1.2E-06				0.055	
		Dermal Contact	1.9E-07				0.030	
		Inhalation	NA				NA	
		Total	1.4E-06				0.085	
	All Media	Total	1.4E-06				0.085	
Current Trespasser/Visitor Adult	Surface Soil	Ingestion	2.4E-06				0.040	
		Dermal Contact	5.2E-07				0.031	
		Inhalation	NA				NA	
		Total	2.9E-06				0.071	
	All Media	Total	2.9E-06				0.071	
Current Industrial Worker	Surface Soil	Ingestion	1.2E-05				0.19	
		Dermal Contact	6.1E-06				0.31	
		Inhalation	NA				NA	
		Total	1.8E-05				0.50	
	All Media	Total	1.8E-05				0.50	
Future Resident Adult	Groundwater	Ingestion	NA				38	Iron, Manganese, Thallium
		Dermal Contact	NA				1.7	Manganese
		Inhalation	N/A				0.00027	
		Total	N/A				40	
	Surface Soil	Ingestion	N/A				0.27	
		Dermal Contact	N/A				0.38	
		Inhalation	N/A				NA	
		Total	N/A				0.65	
	All Media	Total	NA				40	
Future Resident Child	Groundwater	Ingestion	NA				89	Iron, Manganese, Thallium
		Dermal Contact	NA				4.9	Manganese
		Inhalation	NA				NA	
		Total	NA				94	
	Surface Soil	Ingestion	NA				2.5	
		Dermal Contact	NA				0.50	
		Inhalation	NA				NA	
		Total	NA				3.0	
	All Media	Total	NA				97	
Future Resident Child/Adult	Groundwater	Ingestion	4.7E-07				NA	
		Dermal Contact	2.9E-07				NA	
		Inhalation	4.7E-07				NA	
		Total	1.2E-06				NA	
	Surface Soil	Ingestion	5.3E-05		Arsenic		NA	
		Dermal Contact	8.4E-06			Arsenic	NA	
		Inhalation	NA				NA	
		Total	6.2E-05				NA	
	All Media	Total	6.3E-05				NA	
Future Construction Worker Adult	Groundwater	Ingestion	NA				NA	
		Dermal Contact	7.4E-09				2.2	Manganese
		Inhalation	1.9E-08				0.000030	
		Total	2.6E-08				2.2	
	All Media	Total	2.6E-08				2.2	

NA - Not applicable, pathway incomplete.

Table 7-8
Summary of CT Cancer Risks and Hazard Indices-Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Resident Adult	Groundwater	Ingestion	NA				1.8	
		Dermal Contact	NA				0.11	
		Inhalation	NA				NA	
		Total	NA				1.9	
	All Media	Total	NA				1.9	
Future Resident Child	Groundwater	Ingestion	NA				22	Manganese, Thallium
		Dermal Contact	NA				0.98	
		Inhalation	NA				NA	
		Total	NA				23	
	Surface Soil	Ingestion	NA				0.57	
		Dermal Contact	NA				0.21	
		Inhalation	NA				NA	
		Total	NA				0.78	
	All Media	Total	NA				23	
Future Construction Worker Adult	Groundwater	Ingestion	NA				NA	
		Dermal Contact	NA				0.78	
		Inhalation	NA				NA	
		Total	NA				0.78	
	All Media	Total	NA				0.78	

NA - Not applicable, pathway incomplete.

Table 7-9
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American kestrel	0.083	Palmer 1988	0.01685	allometric equation	0.01192	USEPA 1993
American robin	0.0635	USEPA 1993	0.01287	allometric equation	0.00735	Levey and Karasov 1989
Mammals						
Meadow vole	0.03	Silva and Downing 1995	0.01334	USEPA 1993	0.00310	USEPA 1993
Red fox	3.17	Silva and Downing 1995	0.41154	allometric equation	0.14763	Sample and Suter 1994
Short-tailed shrew	0.01331	USEPA 1993	0.00475	USEPA 1993	0.00189	USEPA 1993

Table 7-9
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
IHDIV-NSWC
Indian Head, Maryland

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American kestrel	0	38	60	0	0	0	USEPA 1993	2	Assumed based on diet
American robin	51.6	43.6	0	0	0	0	Martin et al. 1951	4.8	Sample and Suter 1994
Mammals									
Meadow vole	95.6	2	0	0	0	0	USEPA 1993	2.4	Beyer et al. 1994
Red fox	7	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994

Table 7-10
Step 2 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Inorganics (MG/KG)						
Aluminum	4.2 - 6.6	17 / 17	9,830	IS21SS010001	50.0	196.60
Antimony	0.97 - 1.5	0 / 17	--	--	5	0.30
Arsenic	0.81 - 1.3	17 / 17	51.8	IS21SS140001	10.0	5.18
Barium	0.090 - 0.14	17 / 17	67.6	IS21SS010001	500	0.14
Beryllium	0.045 - 0.070	1 / 17	0.066	IS21SS130001	10.0	0.01
Cadmium	0.090 - 0.14	10 / 17	1.5	IS21SS020001	4	0.38
Chromium	0.45 - 0.70	17 / 17	36.6	IS21SS030001	0.40	91.50
Cobalt	0.50 - 0.78	17 / 17	7.9	IS21SS010001	20.0	0.40
Copper	0.43 - 0.67	17 / 17	48.1	IS21SS130001	50.0	0.96
Cyanide	0.56 - 0.88	12 / 17	0.66	IS21SS150001	27.5	0.02
Iron	6.2 - 9.6	17 / 17	29,500	IS21SS040001	200	147.50
Lead	0.29 - 0.46	17 / 17	57.1	IS21SS010001	50.0	1.14
Manganese	0.090 - 0.14	17 / 17	398	IS21SS150001	500	0.80
Mercury	0.056 - 0.088	14 / 17	1.5	IS21SS060001	0.10	15.00
Nickel	0.43 - 0.67	17 / 17	19.2	IS21SS140001	30.0	0.64
Selenium	0.97 - 1.5	3 / 17	2.7	IS21SS140001	1	2.70
Silver	0.70 - 1.1	1 / 17	16.5	IS21SS140001	2	8.25
Thallium	1.2 - 1.9	0 / 17	--	--	1	1.90
Vanadium	0.32 - 0.49	17 / 17	65.1	IS21SS140001	2	32.55
Zinc	0.14 - 0.21	17 / 17	134	IS21SS100001	50.0	2.68
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	370 - 580	0 / 17	--	--	NSV	NSV
2,2'-Oxybis(1-chloropropane)	370 - 580	0 / 17	--	--	NSV	NSV
2,4,5-Trichlorophenol	940 - 1,500	0 / 17	--	--	430	3.49
2,4,6-Trichlorophenol	370 - 580	0 / 17	--	--	580	1.00
2,4-Dichlorophenol	370 - 580	0 / 17	--	--	13,400	0.04
2,4-Dimethylphenol	370 - 580	0 / 17	--	--	100	5.80
2,4-Dinitrophenol	940 - 1,500	0 / 17	--	--	20,000	0.08
2-Chloronaphthalene	370 - 580	0 / 17	--	--	1,033	0.56
2-Chlorophenol	370 - 580	0 / 17	--	--	100	5.80
2-Methylnaphthalene	370 - 580	0 / 17	--	--	1,730	0.34
2-Methylphenol	370 - 580	0 / 17	--	--	100	5.80
2-Nitroaniline	940 - 1,500	0 / 17	--	--	NSV	NSV
2-Nitrophenol	370 - 580	0 / 17	--	--	NSV	NSV
3,3'-Dichlorobenzidine	370 - 580	0 / 17	--	--	NSV	NSV
3-Nitroaniline	940 - 1,500	0 / 17	--	--	NSV	NSV
4,6-Dinitro-2-methylphenol	940 - 1,500	0 / 17	--	--	NSV	NSV
4-Bromophenyl-phenylether	370 - 580	0 / 17	--	--	NSV	NSV
4-Chloro-3-methylphenol	370 - 580	0 / 17	--	--	100	5.80
4-Chloroaniline	370 - 580	0 / 17	--	--	NSV	NSV

NSV - No Screening Value

Table 7-10
Step 2 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
4-Chlorophenyl-phenylether	370 - 580	0 / 17	--	--	NSV	NSV
4-Methylphenol	370 - 580	0 / 17	--	--	100	5.80
4-Nitroaniline	940 - 1,500	0 / 17	--	--	NSV	NSV
4-Nitrophenol	940 - 1,500	0 / 17	--	--	380	3.95
Acenaphthene	370 - 580	0 / 17	--	--	2,500	0.23
Acenaphthylene	370 - 580	0 / 17	--	--	1,730	0.34
Acetophenone	370 - 580	0 / 17	--	--	NSV	NSV
Anthracene	370 - 580	1 / 17	45.0	IS21SS050001	1,730	0.03
Atrazine	370 - 580	0 / 17	--	--	NSV	NSV
Benzaldehyde	370 - 580	0 / 17	--	--	NSV	NSV
Benzo(a)anthracene	370 - 580	11 / 17	260	IS21SS050001	1,730	0.15
Benzo(a)pyrene	370 - 580	7 / 17	81.0	IS21SS050001	1,730	0.05
Benzo(b)fluoranthene	370 - 580	12 / 17	380	IS21SS120001	1,730	0.22
Benzo(g,h,i)perylene	370 - 580	0 / 17	--	--	1,730	0.34
Benzo(k)fluoranthene	370 - 580	10 / 17	170	IS21SS050001	1,730	0.10
Butylbenzylphthalate	370 - 580	0 / 17	--	--	NSV	NSV
Caprolactam	370 - 580	0 / 17	--	--	NSV	NSV
Carbazole	370 - 580	0 / 17	--	--	NSV	NSV
Chrysene	370 - 580	11 / 17	330	IS21SS120001	1,730	0.19
Di-n-butylphthalate	370 - 580	0 / 17	--	--	200,000	0.00
Di-n-octylphthalate	370 - 580	0 / 17	--	--	NSV	NSV
Dibenz(a,h)anthracene	370 - 580	2 / 17	48.0	IS21SS120001	1,730	0.03
Dibenzofuran	370 - 580	0 / 17	--	--	NSV	NSV
Diethylphthalate	370 - 580	2 / 17	1,200	IS21SS120001	13,400	0.09
Dimethyl phthalate	370 - 580	0 / 17	--	--	10,640	0.05
Fluoranthene	370 - 580	13 / 17	530	IS21SS050001	1,730	0.31
Fluorene	370 - 580	0 / 17	--	--	1,730	0.34
Hexachlorobenzene	370 - 580	0 / 17	--	--	100,000	0.01
Hexachlorobutadiene	370 - 580	0 / 17	--	--	NSV	NSV
Hexachlorocyclopentadiene	370 - 580	0 / 17	--	--	1,000	0.58
Hexachloroethane	370 - 580	0 / 17	--	--	NSV	NSV
Indeno(1,2,3-cd)pyrene	370 - 580	6 / 17	81.0	IS21SS120001	1,730	0.05
Isophorone	370 - 580	0 / 17	--	--	NSV	NSV
Naphthalene	370 - 580	0 / 17	--	--	1,730	0.34
Pentachlorophenol	900 - 1,400	0 / 17	--	--	3,000	0.47
Phenanthrene	370 - 580	10 / 17	340	IS21SS120001	1,730	0.20
Phenol	370 - 580	0 / 17	--	--	1,880	0.31
Pyrene	370 - 580	11 / 17	280	IS21SS120001	1,730	0.16
bis(2-Chloroethoxy)methane	370 - 580	0 / 17	--	--	NSV	NSV
bis(2-Chloroethyl)ether	370 - 580	0 / 17	--	--	NSV	NSV
bis(2-Ethylhexyl)phthalate	370 - 580	11 / 17	76.0	IS21SS010001	6,010	0.01

NSV - No Screening Value

Table 7-10
Step 2 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
n-Nitroso-di-n-propylamine	370 - 580	0 / 17	--	--	NSV	NSV
n-Nitrosodiphenylamine	370 - 580	0 / 17	--	--	1,090	0.53
Explosives (UG/KG)						
1,3,5-Trinitrobenzene	250 - 250	0 / 17	--	--	NSV	NSV
1,3-Dinitrobenzene	250 - 250	0 / 17	--	--	NSV	NSV
2,4,6-Trinitrotoluene	250 - 250	0 / 17	--	--	10,000	0.03
2,4-Dinitrotoluene	250 - 250	0 / 17	--	--	NSV	NSV
2,6-Dinitrotoluene	250 - 250	0 / 17	--	--	NSV	NSV
2-Amino-4,6-dinitrotoluene	250 - 250	0 / 17	--	--	80,000	0.00
2-Nitrotoluene	250 - 250	0 / 17	--	--	NSV	NSV
3-Nitrotoluene	250 - 250	0 / 17	--	--	NSV	NSV
4-Amino-2,6-dinitrotoluene	250 - 250	0 / 17	--	--	NSV	NSV
4-Nitrotoluene	250 - 250	0 / 17	--	--	NSV	NSV
Ammonium perchlorate	4.6 - 4.6	1 / 17	81.0	IS21SS130001	NSV	NSV
HMX	500 - 500	1 / 17	190	IS21SS060001	50,000	0.00
Nitrobenzene	250 - 250	0 / 17	--	--	2,260	0.11
Nitroglycerin	1,100 - 1,700	0 / 17	--	--	NSV	NSV
Nitroguanidine	100 - 100	1 / 17	68.0	IS21SS060001	NSV	NSV
PETN	2,500 - 2,500	0 / 17	--	--	NSV	NSV
RDX	500 - 500	0 / 17	--	--	50,000	0.01
Tetryl	650 - 650	0 / 17	--	--	25,000	0.03
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	11.0 - 18.0	0 / 17	--	--	300	0.06
1,1,2,2-Tetrachloroethane	11.0 - 18.0	0 / 17	--	--	300	0.06
1,1,2-Trichloro-1,2,2- trifluoroethane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
1,1,2-Trichloroethane	11.0 - 18.0	0 / 17	--	--	300	0.06
1,1-Dichloroethane	11.0 - 18.0	0 / 17	--	--	300	0.06
1,1-Dichloroethene	11.0 - 18.0	0 / 17	--	--	NSV	NSV
1,2,4-Trichlorobenzene	11.0 - 18.0	0 / 17	--	--	1,270	0.01
1,2-Dibromo-3-chloropropane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
1,2-Dibromoethane	11.0 - 18.0	0 / 17	--	--	5,000	0.00
1,2-Dichlorobenzene	11.0 - 18.0	0 / 17	--	--	100	0.18
1,2-Dichloroethane	11.0 - 18.0	0 / 17	--	--	401	0.04
1,2-Dichloroethene (total)	12.0 - 12.0	0 / 1	--	--	300	0.04
1,2-Dichloropropane	11.0 - 18.0	0 / 17	--	--	38,800	0.00
1,3-Dichlorobenzene	11.0 - 18.0	0 / 17	--	--	100	0.18
1,4-Dichlorobenzene	11.0 - 18.0	0 / 17	--	--	1,280	0.01
2-Butanone	11.0 - 18.0	0 / 17	--	--	NSV	NSV
2-Hexanone	11.0 - 18.0	0 / 17	--	--	NSV	NSV
4-Methyl-2-pentanone	11.0 - 18.0	0 / 17	--	--	10,000	0.00
Acetone	11.0 - 18.0	0 / 17	--	--	NSV	NSV

NSV - No Screening Value

Table 7-10
Step 2 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Benzene	11.0 - 18.0	0 / 17	--	--	105	0.17
Bromodichloromethane	11.0 - 18.0	0 / 17	--	--	45,000	0.00
Bromoform	11.0 - 18.0	0 / 17	--	--	114,700	0.00
Bromomethane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Carbon disulfide	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Carbon tetrachloride	11.0 - 18.0	0 / 17	--	--	1,000,000	0.00
Chlorobenzene	11.0 - 18.0	0 / 17	--	--	2,400	0.01
Chloroethane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Chloroform	11.0 - 18.0	0 / 17	--	--	1,000	0.02
Chloromethane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Cumene	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Cyclohexane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Dibromochloromethane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Dichlorodifluoromethane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Ethylbenzene	11.0 - 18.0	0 / 17	--	--	5,005	0.00
Methyl acetate	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Methyl-tert-butyl ether (MTBE)	11.0 - 18.0	1 / 17	13.0	IS21SS070001	NSV	NSV
Methylcyclohexane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Methylene chloride	11.0 - 18.0	0 / 17	--	--	1,001	0.02
Styrene	11.0 - 18.0	1 / 17	1.5	IS21SS040001	10,010	0.00
Tetrachloroethene	11.0 - 18.0	0 / 17	--	--	401	0.04
Toluene	11.0 - 18.0	2 / 17	6.3	IS21SS090001	13,005	0.00
Trichloroethene	11.0 - 18.0	0 / 17	--	--	6,000	0.00
Trichlorofluoromethane	11.0 - 18.0	0 / 17	--	--	NSV	NSV
Vinyl chloride	11.0 - 18.0	0 / 17	--	--	300	0.06
Xylene, total	11.0 - 18.0	1 / 17	1.8	IS21SS110001	2,505	0.00
cis-1,2-Dichloroethene	11.0 - 18.0	0 / 17	--	--	300	0.06
cis-1,3-Dichloropropene	11.0 - 18.0	0 / 17	--	--	300	0.06
trans-1,2-Dichloroethene	11.0 - 18.0	0 / 17	--	--	300	0.06
trans-1,3-Dichloropropene	11.0 - 18.0	0 / 17	--	--	300	0.06

NSV - No Screening Value

Table 7-11
Summary of Hazard Quotients for Food Web Exposures, Step 2 - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		Meadow vole		Red fox		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	20.04	2.00	2.75	0.27	0.79	0.08	0.44	0.15	0.36	0.12
Cadmium	1.37	0.14	0.10	0.01	0.09	<0.01	0.44	0.03	0.51	0.04
Chromium	0.16	0.02	0.01	<0.01	0.02	<0.01	0.81	0.16	1.07	0.21
Copper	0.30	0.23	0.06	0.05	0.05	0.04	0.04	0.03	0.05	0.04
Lead	0.39	0.04	0.05	<0.01	0.04	<0.01	1.18	0.12	0.39	0.04
Mercury	7.45	1.49	1.82	0.36	0.07	0.04	0.29	0.14	0.25	0.12
Nickel	0.10	0.05	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.03	0.02
Selenium	1.85	1.12	0.82	0.50	0.16	0.10	0.55	0.16	0.44	0.13
Silver	0.13	0.01	0.04	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.26	0.13	0.04	0.02	0.18	0.02	1.41	0.16	1.72	0.19
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02	<0.01
Hexachlorobenzene	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	0.67	0.07	0.86	0.09
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.29	0.03	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

Table 7-12
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American kestrel	0.114	USEPA 1993	0.01377	allometric equation	0.00882	USEPA 1993
American robin	0.0452	USEPA 1993	0.00741	allometric equation	0.00162	Levey and Karasov 1989
Mammals						
Meadow vole	0.0428	Silva and Downing 1995	0.00899	USEPA 1993	0.00209	USEPA 1993
Red fox	4.06	Silva and Downing 1995	0.34939	allometric equation	0.12308	Sample and Suter 1994
Short-tailed shrew	0.01687	USEPA 1993	0.00376	USEPA 1993	0.00149	USEPA 1993

Table 7-12
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American kestrel	0	38	60	0	0	0	USEPA 1993	2	Assumed based on diet
American robin	0	95	0	0	0	0	Martin et al. 1951	5	Sample and Suter 1994
Mammals									
Meadow vole	95.6	2	0	0	0	0	USEPA 1993	2.4	Beyer et al. 1994
Red fox	7	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994

Table 7-13
Step 3 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Inorganics (MG/KG)							
Aluminum	4.2 - 6.6	17 / 17	9,830	IS21SS010001	6,218	50.0	124.36
Antimony	0.97 - 1.5	0 / 17	--	--	0.53	5	0.11
Arsenic	0.81 - 1.3	17 / 17	51.8	IS21SS140001	14.6	10.0	1.46
Barium	0.090 - 0.14	17 / 17	67.6	IS21SS010001	39.5	500	0.08
Beryllium	0.045 - 0.070	1 / 17	0.066	IS21SS130001	0.064	10.0	0.01
Cadmium	0.090 - 0.14	10 / 17	1.5	IS21SS020001	0.32	4	0.08
Chromium	0.45 - 0.70	17 / 17	36.6	IS21SS030001	14.7	0.40	36.75
Cobalt	0.50 - 0.78	17 / 17	7.9	IS21SS010001	4.06	20.0	0.20
Copper	0.43 - 0.67	17 / 17	48.1	IS21SS130001	16.3	50.0	0.33
Cyanide	0.56 - 0.88	12 / 17	0.66	IS21SS150001	0.43	27.5	0.02
Iron	6.2 - 9.6	17 / 17	29,500	IS21SS040001	16,442	200	82.21
Lead	0.29 - 0.46	17 / 17	57.1	IS21SS010001	27.4	50.0	0.55
Manganese	0.090 - 0.14	17 / 17	398	IS21SS150001	138	500	0.28
Mercury	0.056 - 0.088	14 / 17	1.5	IS21SS060001	0.23	0.10	2.30
Nickel	0.43 - 0.67	17 / 17	19.2	IS21SS140001	10.8	30.0	0.36
Selenium	0.97 - 1.5	3 / 17	2.7	IS21SS140001	0.76	1	0.76
Silver	0.70 - 1.1	1 / 17	16.5	IS21SS140001	1.34	2	0.67
Thallium	1.2 - 1.9	0 / 17	--	--	0.67	1	0.67
Vanadium	0.32 - 0.49	17 / 17	65.1	IS21SS140001	29.3	2	14.64
Zinc	0.14 - 0.21	17 / 17	134	IS21SS100001	40.0	50.0	0.80
Semivolatile Organic Compounds (UG/KG)							
1,1-Biphenyl	370 - 580	0 / 17	--	--	206	NSV	NSV
2,2'-Oxybis(1-chloropropane)	370 - 580	0 / 17	--	--	206	NSV	NSV
2,4,5-Trichlorophenol	940 - 1,500	0 / 17	--	--	519	430	1.21
2,4,6-Trichlorophenol	370 - 580	0 / 17	--	--	206	580	0.35
2,4-Dichlorophenol	370 - 580	0 / 17	--	--	206	13,400	0.02
2,4-Dimethylphenol	370 - 580	0 / 17	--	--	206	100	2.06
2,4-Dinitrophenol	940 - 1,500	0 / 17	--	--	519	20,000	0.03
2-Chloronaphthalene	370 - 580	0 / 17	--	--	206	1,033	0.20
2-Chlorophenol	370 - 580	0 / 17	--	--	206	100	2.06
2-Methylnaphthalene	370 - 580	0 / 17	--	--	206	1,730	0.12
2-Methylphenol	370 - 580	0 / 17	--	--	206	100	2.06
2-Nitroaniline	940 - 1,500	0 / 17	--	--	519	NSV	NSV
2-Nitrophenol	370 - 580	0 / 17	--	--	206	NSV	NSV
3,3'-Dichlorobenzidine	370 - 580	0 / 17	--	--	206	NSV	NSV
3-Nitroaniline	940 - 1,500	0 / 17	--	--	519	NSV	NSV
4,6-Dinitro-2-methylphenol	940 - 1,500	0 / 17	--	--	519	NSV	NSV
4-Bromophenyl-phenylether	370 - 580	0 / 17	--	--	206	NSV	NSV
4-Chloro-3-methylphenol	370 - 580	0 / 17	--	--	206	100	2.06
4-Chloroaniline	370 - 580	0 / 17	--	--	206	NSV	NSV
4-Chlorophenyl-phenylether	370 - 580	0 / 17	--	--	206	NSV	NSV
4-Methylphenol	370 - 580	0 / 17	--	--	206	100	2.06
4-Nitroaniline	940 - 1,500	0 / 17	--	--	519	NSV	NSV
4-Nitrophenol	940 - 1,500	0 / 17	--	--	519	380	1.37
Acenaphthene	370 - 580	0 / 17	--	--	206	2,500	0.08
Acenaphthylene	370 - 580	0 / 17	--	--	206	1,730	0.12

NSV - No Screening Value

Table 7-13
Step 3 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Acetophenone	370 - 580	0 / 17	--	--	206	NSV	NSV
Anthracene	370 - 580	1 / 17	45.0	IS21SS050001	197	1,730	0.11
Atrazine	370 - 580	0 / 17	--	--	206	NSV	NSV
Benzaldehyde	370 - 580	0 / 17	--	--	206	NSV	NSV
Benzo(a)anthracene	370 - 580	11 / 17	260	IS21SS050001	167	1,730	0.10
Benzo(a)pyrene	370 - 580	7 / 17	81.0	IS21SS050001	147	1,730	0.08
Benzo(b)fluoranthene	370 - 580	12 / 17	380	IS21SS120001	209	1,730	0.12
Benzo(g,h,i)perylene	370 - 580	0 / 17	--	--	206	1,730	0.12
Benzo(k)fluoranthene	370 - 580	10 / 17	170	IS21SS050001	144	1,730	0.08
Butylbenzylphthalate	370 - 580	0 / 17	--	--	206	NSV	NSV
Caprolactam	370 - 580	0 / 17	--	--	206	NSV	NSV
Carbazole	370 - 580	0 / 17	--	--	206	NSV	NSV
Chrysene	370 - 580	11 / 17	330	IS21SS120001	188	1,730	0.11
Di-n-butylphthalate	370 - 580	0 / 17	--	--	206	200,000	0.00
Di-n-octylphthalate	370 - 580	0 / 17	--	--	206	NSV	NSV
Dibenz(a,h)anthracene	370 - 580	2 / 17	48.0	IS21SS120001	188	1,730	0.11
Dibenzofuran	370 - 580	0 / 17	--	--	206	NSV	NSV
Diethylphthalate	370 - 580	2 / 17	1,200	IS21SS120001	215	13,400	0.02
Dimethyl phthalate	370 - 580	0 / 17	--	--	206	10,640	0.02
Fluoranthene	370 - 580	13 / 17	530	IS21SS050001	239	1,730	0.14
Fluorene	370 - 580	0 / 17	--	--	206	1,730	0.12
Hexachlorobenzene	370 - 580	0 / 17	--	--	206	100,000	0.00
Hexachlorobutadiene	370 - 580	0 / 17	--	--	206	NSV	NSV
Hexachlorocyclopentadiene	370 - 580	0 / 17	--	--	206	1,000	0.21
Hexachloroethane	370 - 580	0 / 17	--	--	206	NSV	NSV
Indeno(1,2,3-cd)pyrene	370 - 580	6 / 17	81.0	IS21SS120001	158	1,730	0.09
Isophorone	370 - 580	0 / 17	--	--	206	NSV	NSV
Naphthalene	370 - 580	0 / 17	--	--	206	1,730	0.12
Pentachlorophenol	900 - 1,400	0 / 17	--	--	497	3,000	0.17
Phenanthrene	370 - 580	10 / 17	340	IS21SS120001	176	1,730	0.10
Phenol	370 - 580	0 / 17	--	--	206	1,880	0.11
Pyrene	370 - 580	11 / 17	280	IS21SS120001	161	1,730	0.09
bis(2-Chloroethoxy)methane	370 - 580	0 / 17	--	--	206	NSV	NSV
bis(2-Chloroethyl)ether	370 - 580	0 / 17	--	--	206	NSV	NSV
bis(2-Ethylhexyl)phthalate	370 - 580	11 / 17	76.0	IS21SS010001	93.9	6,010	0.02
n-Nitroso-di-n-propylamine	370 - 580	0 / 17	--	--	206	NSV	NSV
n-Nitrosodiphenylamine	370 - 580	0 / 17	--	--	206	1,090	0.19
Explosives (UG/KG)							
1,3,5-Trinitrobenzene	250 - 250	0 / 17	--	--	125	NSV	NSV
1,3-Dinitrobenzene	250 - 250	0 / 17	--	--	125	NSV	NSV
2,4,6-Trinitrotoluene	250 - 250	0 / 17	--	--	125	10,000	0.01
2,4-Dinitrotoluene	250 - 250	0 / 17	--	--	125	NSV	NSV
2,6-Dinitrotoluene	250 - 250	0 / 17	--	--	125	NSV	NSV
2-Amino-4,6-dinitrotoluene	250 - 250	0 / 17	--	--	125	80,000	0.00
2-Nitrotoluene	250 - 250	0 / 17	--	--	125	NSV	NSV
3-Nitrotoluene	250 - 250	0 / 17	--	--	125	NSV	NSV
4-Amino-2,6-dinitrotoluene	250 - 250	0 / 17	--	--	125	NSV	NSV

NSV - No Screening Value

Table 7-13
Step 3 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
4-Nitrotoluene	250 - 250	0 / 17	--	--	125	NSV	NSV
Ammonium perchlorate	4.6 - 4.6	1 / 17	81.0	IS21SS130001	51.02941176	NSV	NSV
HMX	500 - 500	1 / 17	190	IS21SS060001	246	50,000	0.00
Nitrobenzene	250 - 250	0 / 17	--	--	125	2,260	0.06
Nitroglycerin	1,100 - 1,700	0 / 17	--	--	618	NSV	NSV
Nitroguanidine	100 - 100	1 / 17	68.0	IS21SS060001	51.1	NSV	NSV
PETN	2,500 - 2,500	0 / 17	--	--	1,250	NSV	NSV
RDX	500 - 500	0 / 17	--	--	250	50,000	0.01
Tetryl	650 - 650	0 / 17	--	--	325	25,000	0.01
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
1,1,2,2-Tetrachloroethane	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
1,1,2-Trichloro-1,2,2- trifluoroethane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
1,1,2-Trichloroethane	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
1,1-Dichloroethane	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
1,1-Dichloroethene	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
1,2,4-Trichlorobenzene	11.0 - 18.0	0 / 17	--	--	6.21	1,270	0.00
1,2-Dibromo-3-chloropropane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
1,2-Dibromoethane	11.0 - 18.0	0 / 17	--	--	6.21	5,000	0.00
1,2-Dichlorobenzene	11.0 - 18.0	0 / 17	--	--	6.21	100	0.06
1,2-Dichloroethane	11.0 - 18.0	0 / 17	--	--	6.21	401	0.02
1,2-Dichloroethene (total)	12.0 - 12.0	0 / 1	--	--	6	300	0.02
1,2-Dichloropropane	11.0 - 18.0	0 / 17	--	--	6.21	38,800	0.00
1,3-Dichlorobenzene	11.0 - 18.0	0 / 17	--	--	6.21	100	0.06
1,4-Dichlorobenzene	11.0 - 18.0	0 / 17	--	--	6.21	1,280	0.00
2-Butanone	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
2-Hexanone	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
4-Methyl-2-pentanone	11.0 - 18.0	0 / 17	--	--	6.21	10,000	0.00
Acetone	11.0 - 18.0	0 / 17	--	--	3.05	NSV	NSV
Benzene	11.0 - 18.0	0 / 17	--	--	6.21	105	0.06
Bromodichloromethane	11.0 - 18.0	0 / 17	--	--	6.21	45,000	0.00
Bromoform	11.0 - 18.0	0 / 17	--	--	6.21	114,700	0.00
Bromomethane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Carbon disulfide	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Carbon tetrachloride	11.0 - 18.0	0 / 17	--	--	6.21	1,000,000	0.00
Chlorobenzene	11.0 - 18.0	0 / 17	--	--	6.21	2,400	0.00
Chloroethane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Chloroform	11.0 - 18.0	0 / 17	--	--	6.21	1,000	0.01
Chloromethane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Cumene	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Cyclohexane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Dibromochloromethane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Dichlorodifluoromethane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Ethylbenzene	11.0 - 18.0	0 / 17	--	--	6.21	5,005	0.00
Methyl acetate	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Methyl-tert-butyl ether (MTBE)	11.0 - 18.0	1 / 17	13.0	IS21SS070001	6.59	NSV	NSV
Methylcyclohexane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV

NSV - No Screening Value

Table 7-13
Step 3 Soil Screening - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Methylene chloride	11.0 - 18.0	0 / 17	--	--	5.33	1,001	0.01
Styrene	11.0 - 18.0	1 / 17	1.5	IS21SS040001	5.91	10,010	0.00
Tetrachloroethene	11.0 - 18.0	0 / 17	--	--	6.21	401	0.02
Toluene	11.0 - 18.0	2 / 17	6.3	IS21SS090001	5.99	13,005	0.00
Trichloroethene	11.0 - 18.0	0 / 17	--	--	6.21	6,000	0.00
Trichlorofluoromethane	11.0 - 18.0	0 / 17	--	--	6.21	NSV	NSV
Vinyl chloride	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
Xylene, total	11.0 - 18.0	1 / 17	1.8	IS21SS110001	5.93	2,505	0.00
cis-1,2-Dichloroethene	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
cis-1,3-Dichloropropene	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
trans-1,2-Dichloroethene	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02
trans-1,3-Dichloropropene	11.0 - 18.0	0 / 17	--	--	6.21	300	0.02

NSV - No Screening Value

Table 7-14
Summary of Hazard Quotients for Food Web Exposures, Step 3A - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		Meadow vole		Red fox		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	3.52	0.35	0.36	0.04	0.15	0.01	0.06	0.02	0.06	0.02
Cadmium	0.18	0.02	0.01	<0.01	0.01	<0.01	0.06	<0.01	0.06	<0.01
Chromium	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	0.04	0.23	0.05
Copper	0.06	0.05	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	0.12	0.01	0.01	<0.01	0.01	<0.01	0.30	0.03	0.10	0.01
Mercury	0.71	0.14	0.13	0.03	<0.01	<0.01	0.02	0.01	0.02	0.01
Nickel	0.04	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.32	0.20	0.11	0.07	0.03	0.02	0.06	0.02	0.07	0.02
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.05	0.02	<0.01	<0.01	0.03	<0.01	0.24	0.03	0.28	0.03
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.15	0.02	0.15	0.02
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

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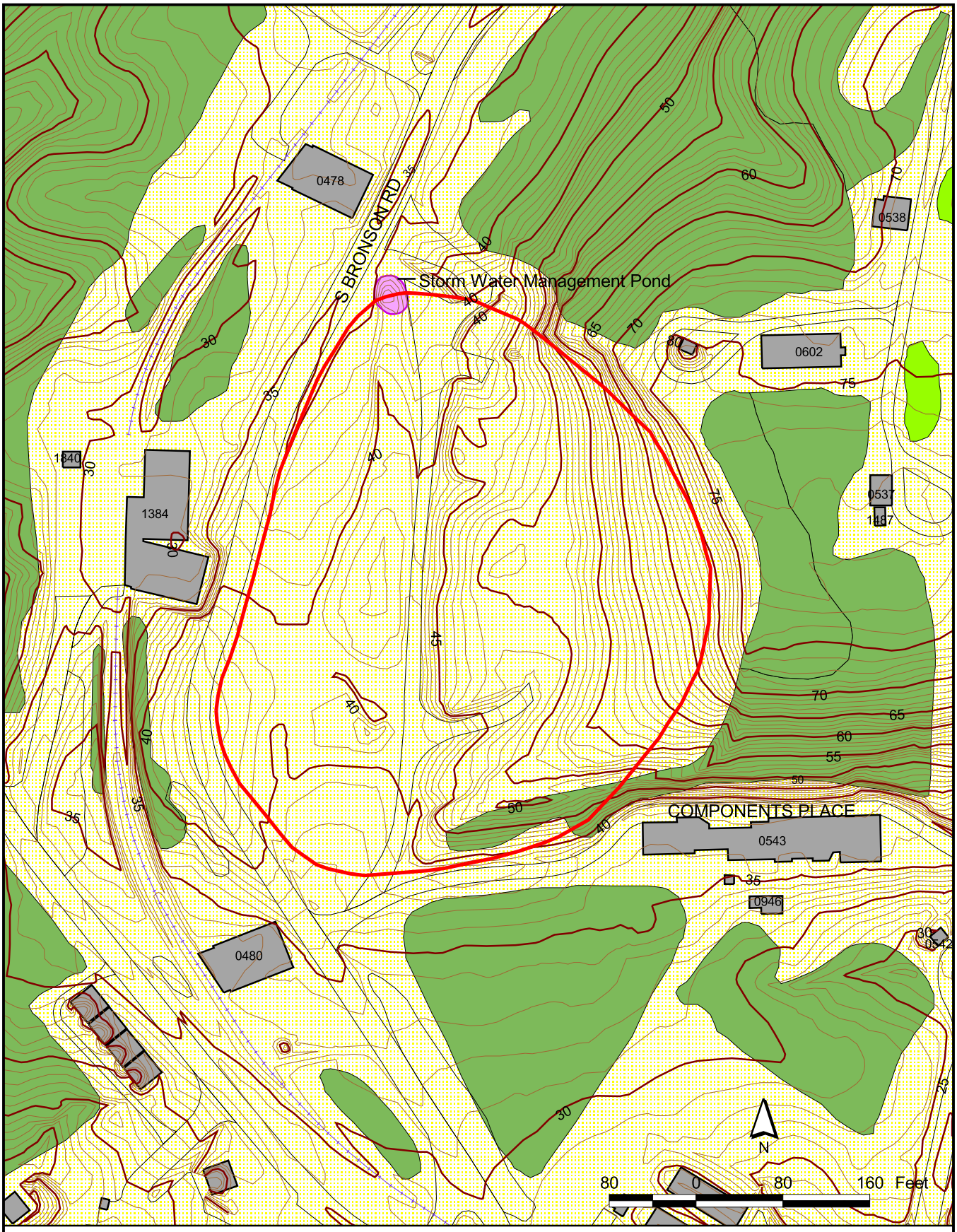

LEGEND

- IR Sites
- Buildings
- Railroads
- Road
- Wooded Area
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)

Figure 7-1
Site 21 Topography
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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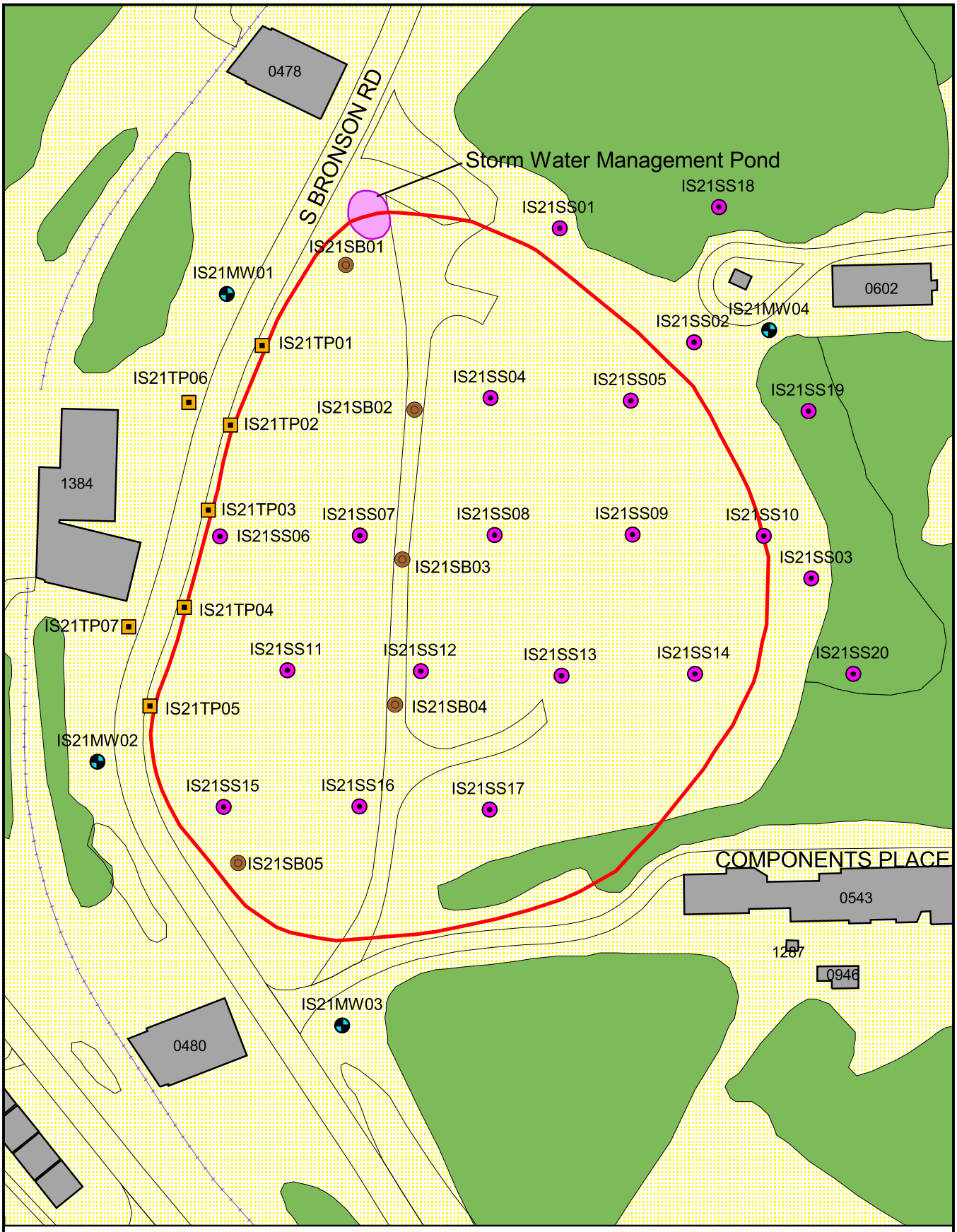

LEGEND

- Monitoring Wells
- Soil
- IR Sites
- Buildings
- Railroads
- Soil Boring
- Test Pits
- Road
- Wooded Area

N

50 0 50 100 Feet

Figure 7-2
Site 21 Sampling Locations
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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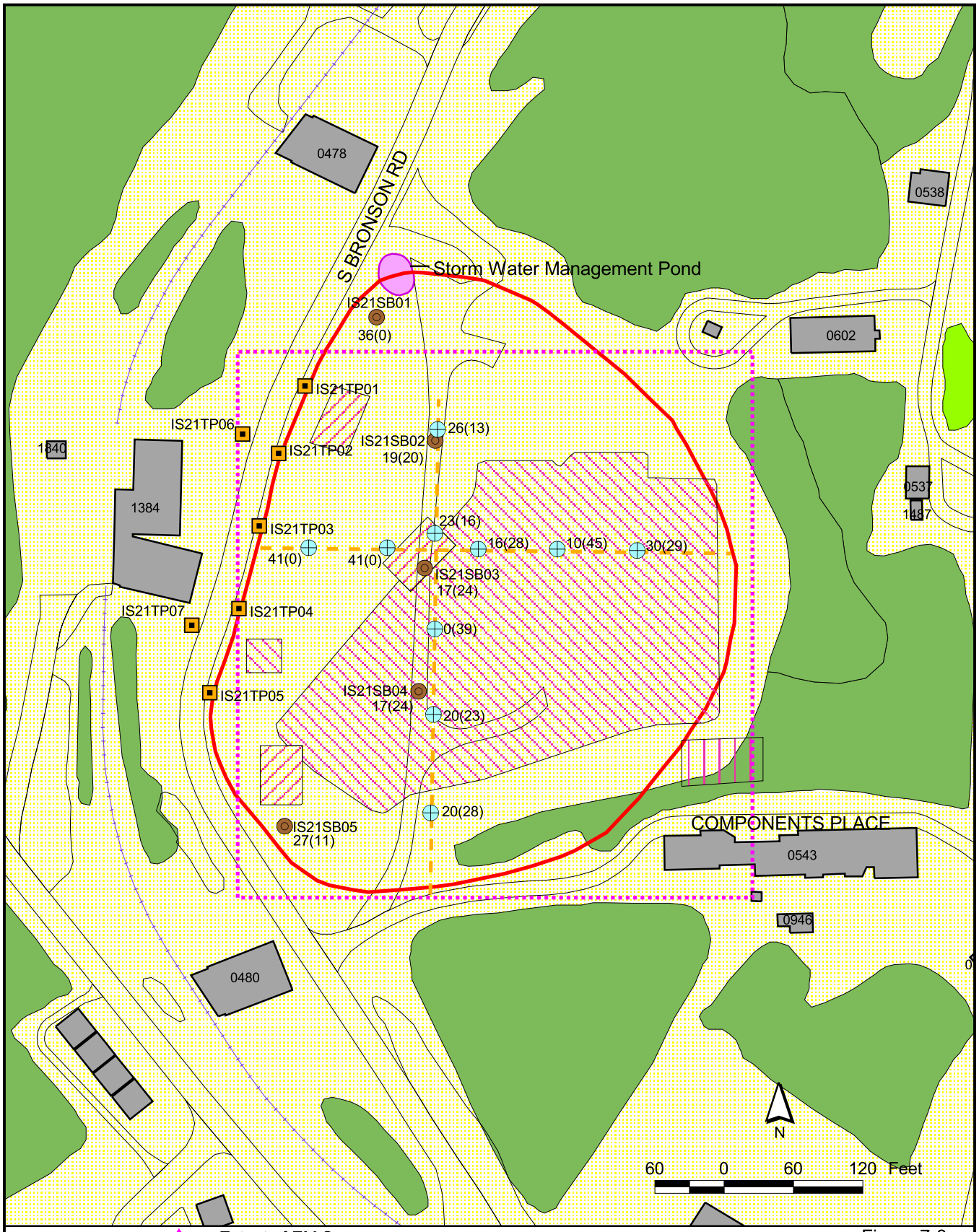

LEGEND

- Soil Boring
- Test Pits
- IR Sites
- Buildings
- Railroads
- Road
- Wooded Area (11) = Estimated Thickness of Fill (ft)
- Extent of EM Survey
- Buried Metal Debris
- Buried Metal and Non-metal Debris
- Surface and Buried Metal Debris
- Electrical Resistivity Profile
- Data Point Along Electrical Resistivity Profile
- 27 = Estimated Elevation of Bottom of Fill (ft. above msl)

Figure 7-3
Site 21 Estimated Areal Extent, Thickness, and Bottom Elevation of the Fill and Results of the Geophysical Surveys
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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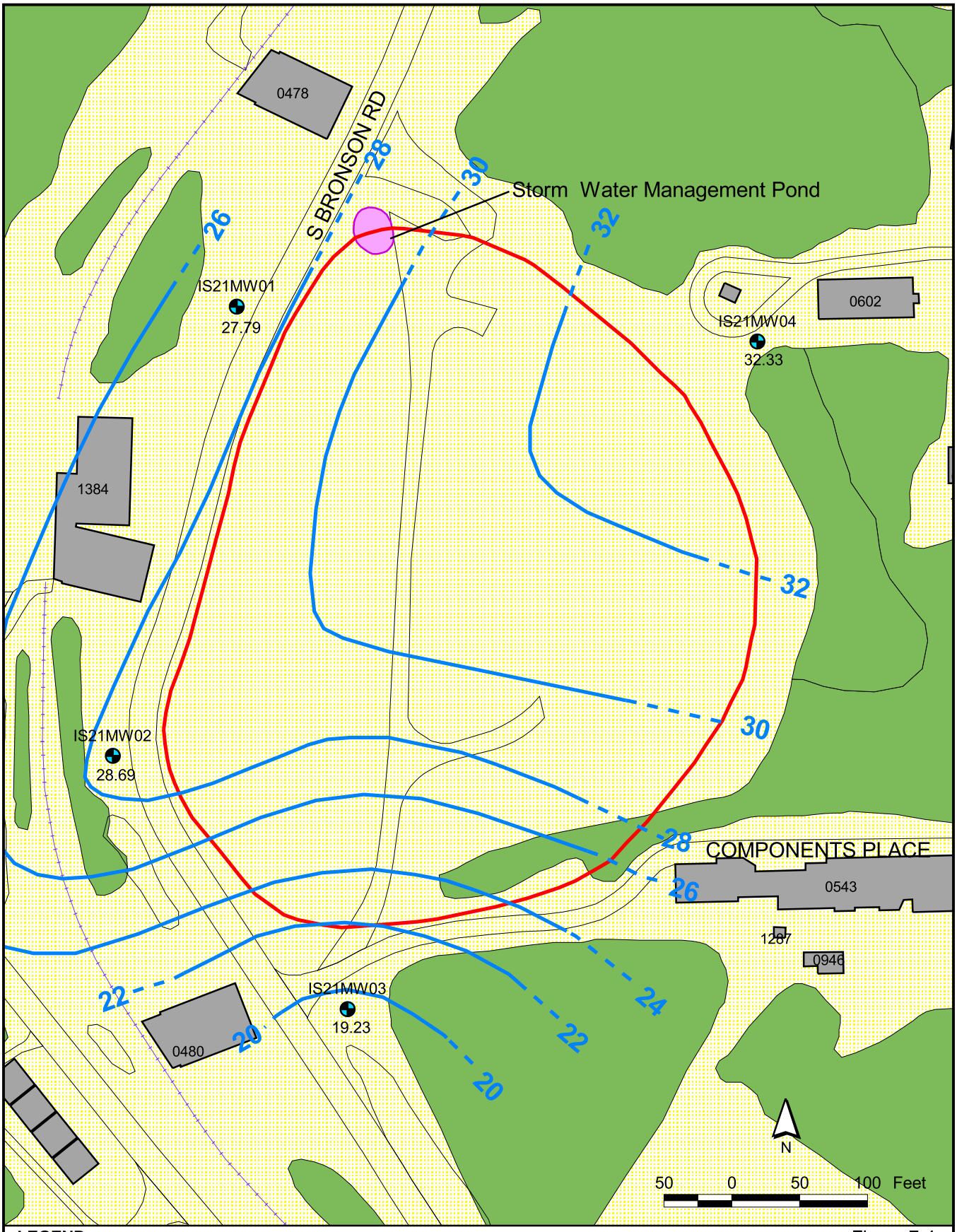

LEGEND

- Monitoring Wells
- Interpolated Groundwater Contour (feet above MSL)
- Inferred Groundwater Contour (feet above MSL)
- IR Sites
- Buildings
- Railroads
- Road
- Wooded Area

22.25 = Feet above msl

Figure 7-4
Site 21
Groundwater Contour Map
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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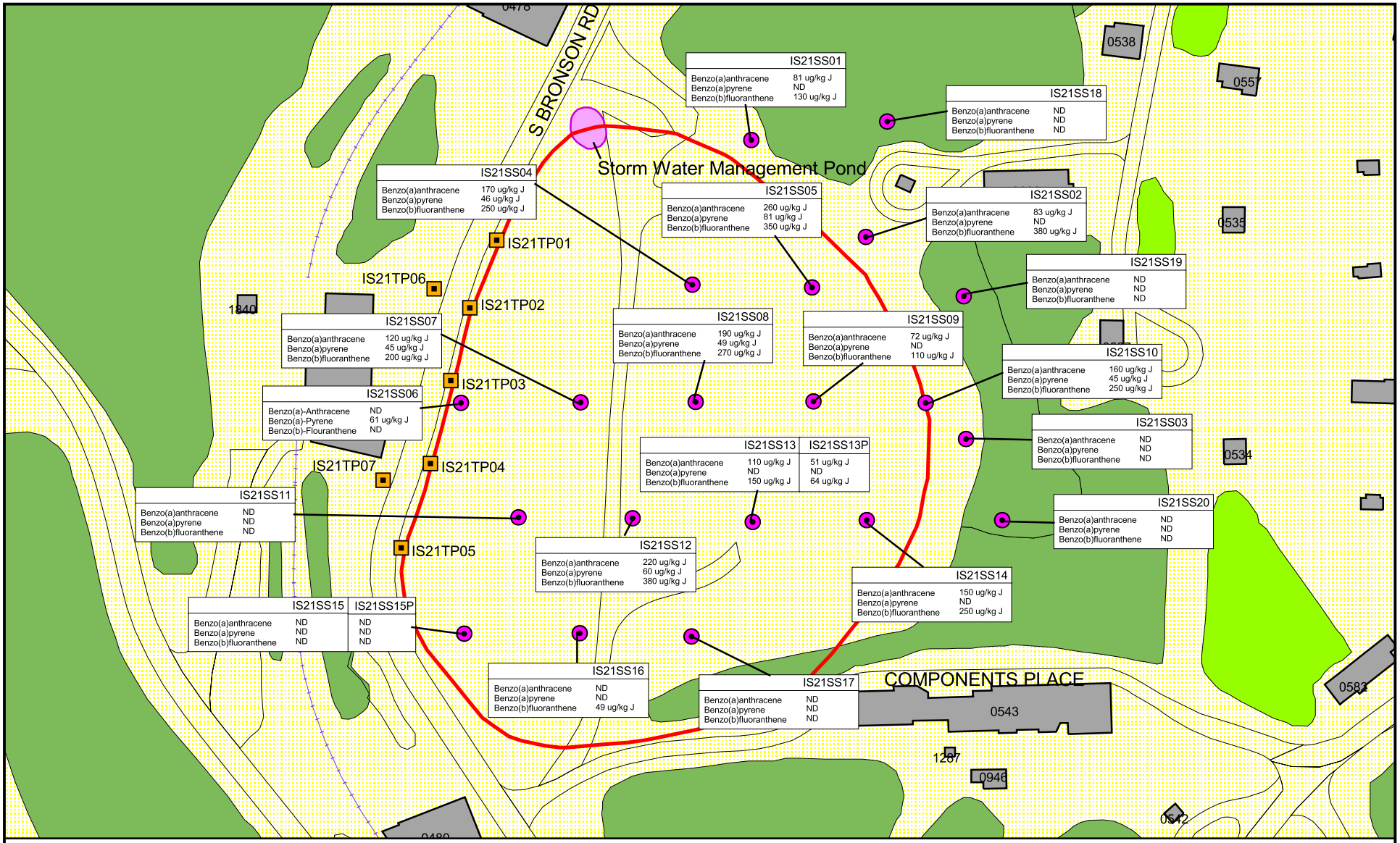

LEGEND

- Surface Soil
- Test Pit Locations
- IR Site Boundary
- Buildings
- Railroad
- Road
- Wooded Area

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/kg = Micrograms per kilogram

N

60 0 60 120 Feet

Figure 7-5
Site 21 - SVOCs
In Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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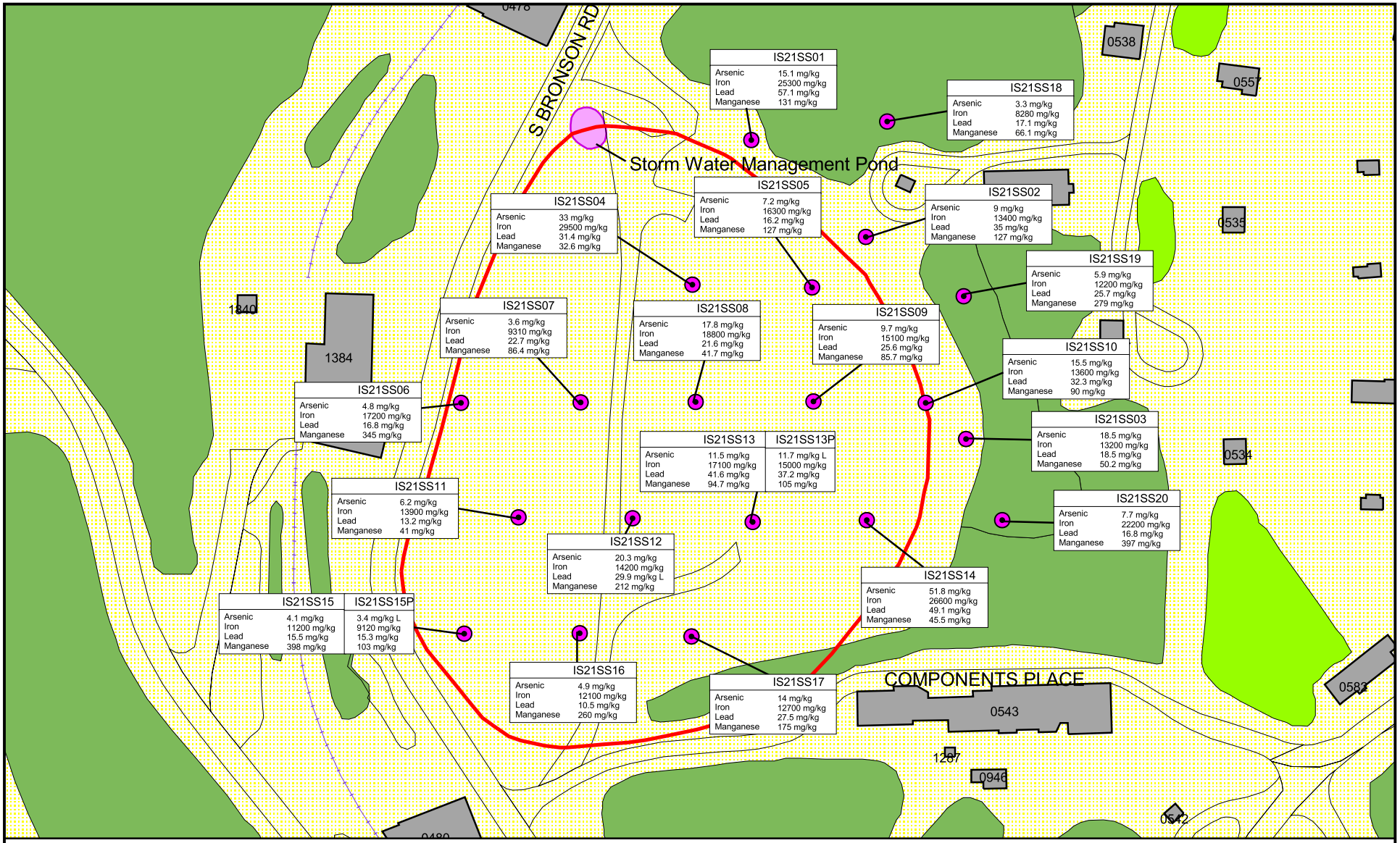

LEGEND

- Surface Soil
- IR Sites
- Buildings
- Railroad
- Road
- Wooded Area
- L = Biased Low
- mg/kg = Milligrams per kilogram

N

60 0 60 120 Feet

Figure 7-6
Site 21 - Metals
In Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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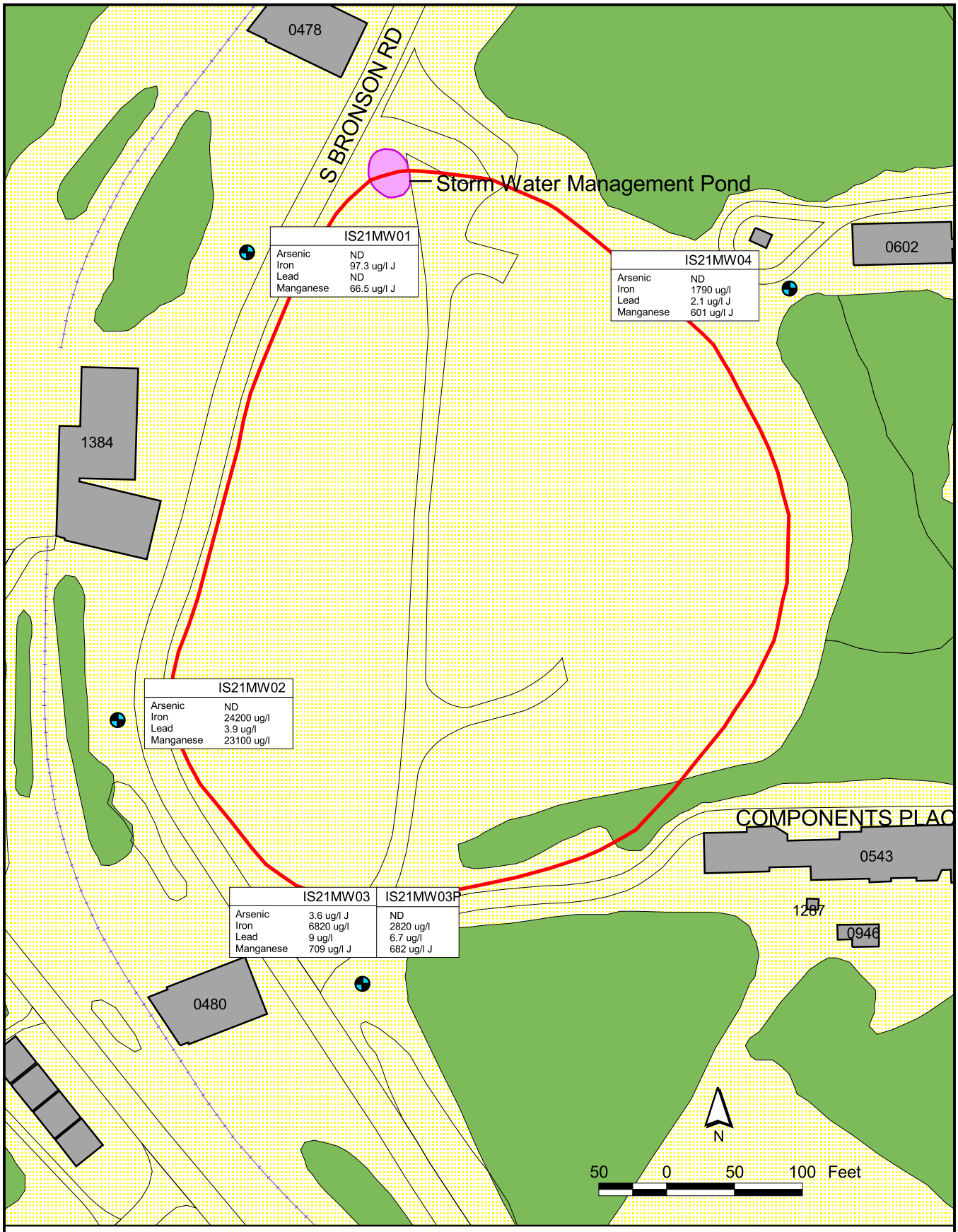

LEGEND

- Monitoring Wells
- IR Sites
- Buildings
- Railroads
- Road
- Wooded Area

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/l = Micrograms per liter

Figure 7-7
Site 21 - Total Arsenic, Iron, Lead, and Manganese in Groundwater
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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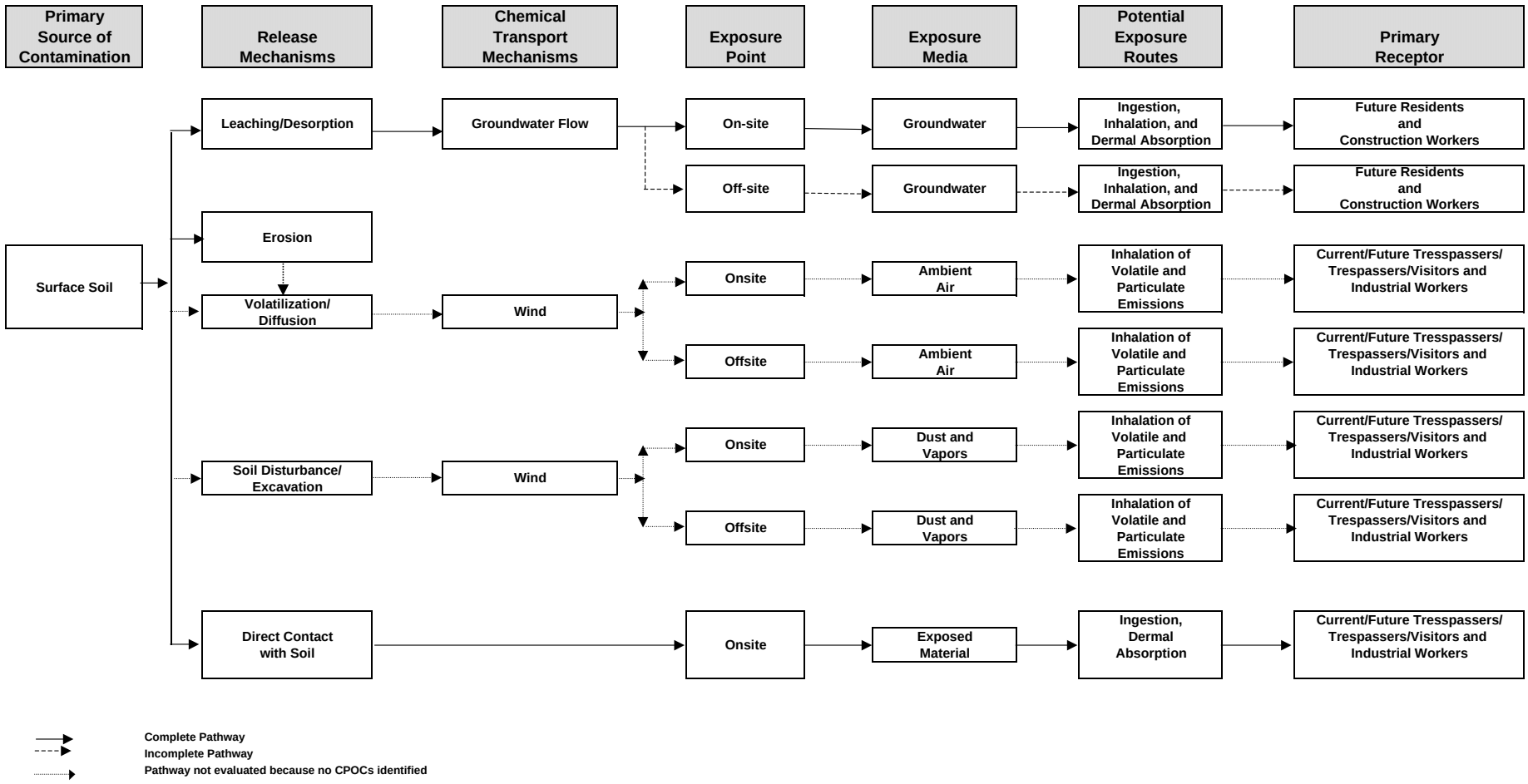

Figure 7-8
Conceptual Model for Potential Human Exposures-Site 21
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

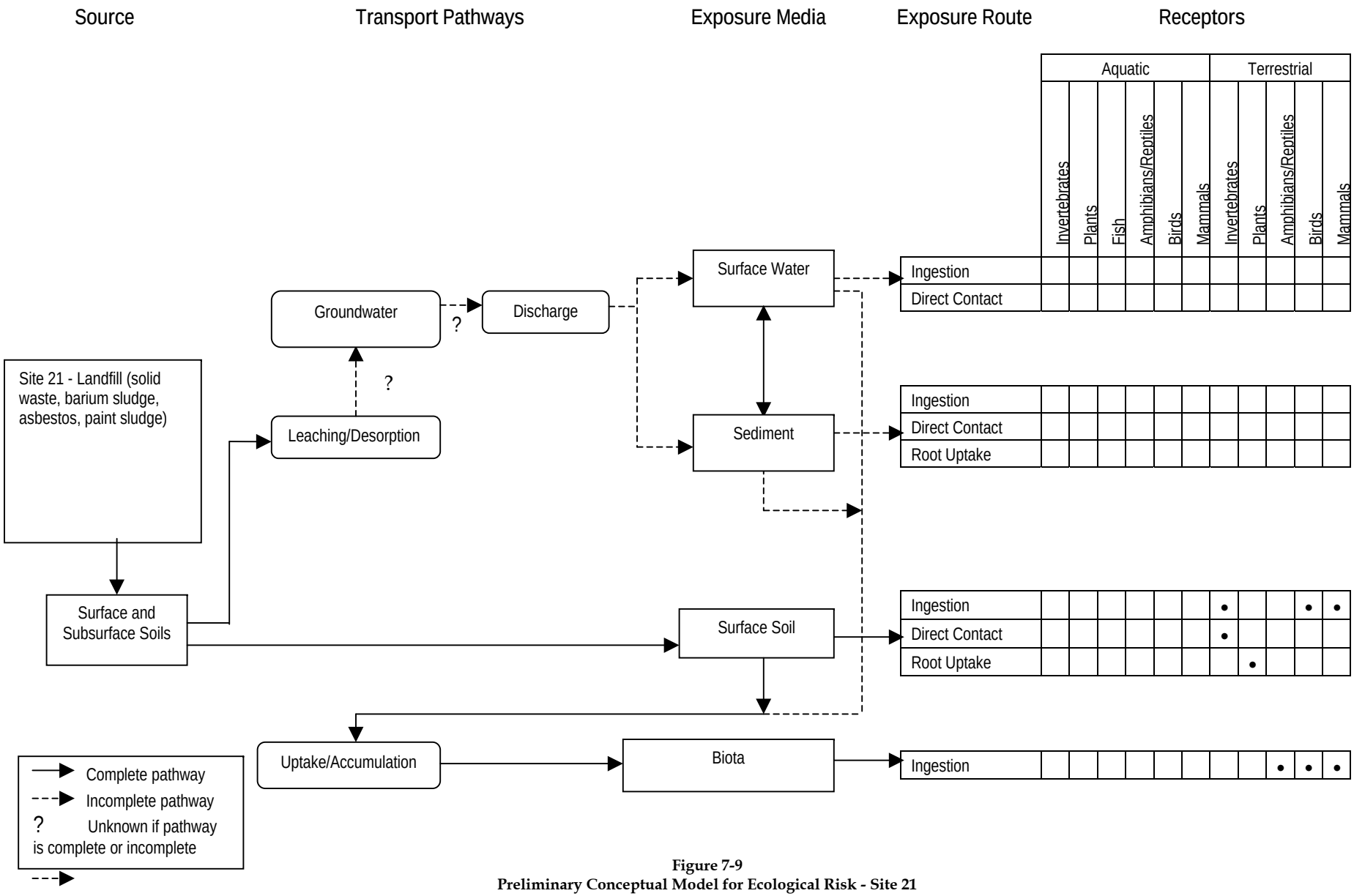

Figure 7-9
Preliminary Conceptual Model for Ecological Risk - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

SECTION 8

Site 25 Hypo Discharges from X-ray Building No. 2, Building 588

An RI was conducted at Site 25, Hypo Discharges from X-ray Building No. 2, Building 588 (Figure 8-1). The objective of the RI conducted at Site 25 was to determine whether the untreated wastewater discharged from Building 588 into the IW46 drainage area contaminated the underlying soil and groundwater. The RI objective was met by the activities performed, as discussed in this chapter.

8.1 Investigation Activities

The field activities were conducted between July 17 and October 24, 2000 and on February 26, 2002. The work consisted of:

- Surface soil sampling
- Subsurface soil sampling,
- Monitoring well installation
- Two rounds of groundwater sampling

Sampling locations are shown in Figure 8-2.

8.1.1 Surface Soil Sampling

Twenty-two surface soil samples (IS25SS01 through IS25SS22), including two background samples, were collected on July 18 and 19, 2000, and on October 11, 2000, at the locations described below and shown in Figure 8-2. Based on historical information, sample analysis was limited to VOCs, SVOCs, TAL inorganics, and NG. It should be noted that, since these soil samples were collected, construction activities adjacent to Site 25 resulted in the removal of the surface soil in the vicinity of sample IS25SS21. The excavated soil was disposed of offsite.

- **IS25SS01 and IS25SS02**—collected southeast of Building 3006.
- **IS25SS03 through IS25SS06**—collected in the vicinity of Building 588**.**
- **IS25SS07**—collected southwest of Building 3006.
- **IS25SS08 through IS25SS14**—collected in the ditch located west of Building 588.
- **IS25SS15**—collected south of Building 588 at the base of the hill 16.5 ft from the road at the outlet of the drainage swale.
- **IS25SS16 and IS25SS17**—collected west of Building 871.
- **IS25SS18**—(background sample) collected northwest of Building 588.

- **IS25SS19**—(background sample) collected northeast of Building 588.
- **IS25SS20 through IS25SS22**—collected east of Building 588.

8.1.2 Subsurface Soil Sampling

Six subsurface soil samples (IS25SB01, IS25SB04, IS25SB07, and IS25SB20 through IS25SB22) were collected on October 11, 2000, at the locations described below and shown in Figure 8-2. All samples were collected at a depth of 2 ft to 3 ft bgs. Based on historical information, sample analysis was limited to VOCs, SVOCs, TAL inorganics, and NG. It should be noted that, since these soil samples were collected, a construction job adjacent to Site 25 resulted in the removal of the shallow subsurface soil in the vicinity of sample IS25SB21. The excavated soil was disposed of offsite.

- **IS25SB01**—collected at the same location as IS25SS01.
- **IS25SB04**—collected at the same location as IS25SS04.
- **IS25SB07**—collected at the same location as IS25SS07.
- **IS25SB20**—collected at the same location as IS25SS20.
- **IS25SB21**—collected at the same location as IS25SS21.
- **IS25SB22**—collected at the same location as IS25SS22.

8.1.3 Monitoring Well Installation

Two shallow groundwater-monitoring wells (IS25MW01 and IS25MW02) were installed on October 10, 2000 at the locations described below and shown in Figure 8-2.

- **IS25MW01 and IS25MW02**—installed at the base of the hill located south of Building 588.

Boring logs are provided in Appendix A. Monitoring well construction diagrams are provided in Appendix B.

8.1.4 Monitoring Well Sampling

Shallow groundwater samples (IS25MW01 and IS25MW02) were collected from the newly installed monitoring wells on October 24, 2000. Based on historical information, sample analysis was limited to TCL VOCs and SVOCs, total and dissolved TAL inorganics, and NG.

To confirm the metals concentrations observed during the first round of sampling, a second round of groundwater samples were collected from both wells on February 26, 2002. These samples were analyzed for TAL inorganics (total and dissolved) only.

8.2 Geology

In order to obtain site-specific geologic information, two boreholes were installed during the RI field activities. Both boreholes were converted to monitoring wells. Boring logs are presented in Appendix A. Monitoring well construction diagrams are presented in Appendix B.

The subsurface at IS25MW01 is characterized by light gray to light brown to orange dense clay and silty clay with traces of sand and pebbles to 10 ft bgs. This is underlain by a fine to medium-grained well-sorted sand that was encountered at a depth of approximately 13 ft bgs.

The subsurface at IS25MW02 is characterized by the light gray to light brown to orange dense clay and silty clay with traces of sand and pebbles observed at IS25MW01; however, there was no change in lithology observed to the total depth of 24 ft bgs.

8.3 Hydrogeology

As discussed in Section 8.2, the site appears to be immediately underlain by dense clay and silty clay with some sand.

In most surficial aquifers, the water table configuration closely resembles the surface topography. Because the site slopes steeply to the south, towards the Mattawoman Creek (Figure 8-1), it is likely that this is the general flow direction of groundwater. The movement of groundwater at Site 25 is not fully understood, however, partly because only two monitoring wells were installed at the site.

The measured water levels are significantly different between IS25MW01 and IS25MW02, whereas it was anticipated that the levels would be similar because the wells were installed at similar elevations. In October 2000, the groundwater elevation at IS25MW01 was 13.50 ft above msl, which is above the ground surface elevation of 12.40 ft above msl. At the same time, the groundwater elevation at IS25MW02 was 9.92 ft above msl, which is below the ground surface elevation of 12.87 ft above msl. In February 2002, the groundwater elevation at IS25MW01 was 12.39 ft above msl, while the groundwater elevation at IS25MW02 was 9.93 ft above msl. Between October 2000 and February 2002, the water level at IS25MW01 decreased by 1.11 ft, while that at IS25MW02 changed by only 0.01 ft.

It is likely that the elevation of the water table at well IS25MW02 is reasonably representative of the vicinity. There is not enough information to asses the difference in water levels between IS25MW01 and ISMW02, several explanations are probable including the presence of confined aquifers, as well as the presence of a production well 50 ft south east of IS25MW02.

8.4 Nature and Extent of Contamination

This section discusses the nature and extent of contamination found in surface soil, subsurface soil, and groundwater at Site 25. Detected analytical results for all samples analyzed are presented in tables throughout the section. Complete analytical results for all media are provided on the accompanying CD (Appendix L).

The discussion presented below focuses on the contaminants that are most prevalent at Site 25. Some contaminants from each contaminant group (i.e., VOCs, SVOCs, metals, etc.) are discussed. Regulatory and human health-based criteria were not used to select contaminants; however, preference was given to contaminants that are generally recognized to pose the greatest risks to human health and the environment.

The focus on this "short list" of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus this discussion. The baseline human health risk assessment and ecological risk assessment presented in Sections 8.6 and 8.7, respectively, of this chapter, formally screen and evaluate all chemicals analyzed for in the various media at Site 25 in accordance with established EPA Region III guidance.

In order to identify metals that may be of potential concern at Site 25, the data for inorganic analytes were compared to data presented in the BIR prepared by Brown and Root Environmental (B&RE, 1997b). The BIR was conducted to establish a facilitywide background database to be used for current and future investigations. Samples were collected for the various media from areas outside the sites known to be impacted from facility operations. The facilitywide background statistics for each media are presented in Appendix E.

Sampling results for inorganic analytes in various media at Site 25 were compared to background concentrations as follows:

- Maximum detected concentrations for data collected during this investigation (provided in Appendix F) were compared to the UCLs of the facilitywide background data.
- For analytes found to have maximum concentrations above the facilitywide UCLs, site-specific background maximum detected concentrations were compared to the UCLs of the facilitywide background data.
- Where, based on the analysis described above, analytes were found above background and considered site-related, the background means were compared to the sampling means.

In some instances, where an inorganic analyte is discussed in one medium (e.g., surface soil), the analyte may be discussed in another medium (e.g., subsurface soil) even if the concentrations in the second medium do not exceed background. This is to allow a more complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

It should be noted that the groundwater background data set is based on unfiltered metals concentrations. The comparisons presented in this discussion are also based on unfiltered metals concentrations.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a compound in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used; (2) if a compound was detected in a sample and a corresponding duplicate, the higher of the two values was used; and (3) samples collected upslope or upgradient for the purpose of evaluating "background conditions" are excluded from the descriptive statistics and following discussion except with respect to whether or not the observed concentrations of certain analytes may be site-related.

8.4.1 Surface Soil

Surface soil sampling activities conducted at Site 25 consisted of 22 samples (IS25SS01 through IS25SS22). Note that some sampling took place outside of the site as originally defined by the red line in the figures, also construction has occurred at the site and

conditions described might have been modified . The results of the surface soil sampling are presented in Table 8-1.

8.4.1.1 VOCs and SVOCs

Four VOCs were detected at low levels in the surface soils at Site 25: acetone, methyl acetate, methylene chloride, and toluene (Table 8-1 and Figure 8-3). Acetone was detected in sample IS25SS01 at a concentration of 8.9 µg/kg, in sample IS25SS02 at a concentration of 3.9 µg/kg, and in sample IS25SS17 at a concentration of 2.6 µg/kg. Methyl acetate was detected in sample IS25SS17 at a concentration of 2.1 µg/kg. Methylene chloride was detected in sample IS25SS04 at a concentration of 1.9 µg/kg and in sample IS25SS05 at a concentration of 1.9 µg/kg, both located west of Building 588. Toluene in sample IS25SS15 at a concentration of 1.5 µg/kg, located at the base of the hill south of Building 588.

Twenty-six SVOCs were detected in the surface soils at Site 25 (Table 8-1). A short list of the following five SVOCs was selected for further discussion based on frequency of detection, maximum concentrations, and general toxicity: benzaldehyde, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, fluoranthene, and pyrene (Figure 8-3).

Benzaldehyde was detected in four surface soil samples: IS25SS02, IS25SS07, IS25SS19, and IS25SS20. Concentrations ranged from 55 µg/kg in sample IS25SS02 to 2,400 µg/kg in sample IS25SS20. Benzaldehyde was detected south and east of Building 588.

Benzo(a)pyrene was detected in nine surface soil samples: IS25SS02, IS25SS03, IS25SS07, IS25SS08, IS25SS10, IS25SS12, IS25SS14, IS25SS17 and IS25SS21. Concentrations ranged from 45 µg/kg in sample IS25SS12, located south of Building 588 in the southern end of the IW46 drainage swale, to 400 µg/kg in sample IS25SS08, located west of Building 588 in the northern end of the IW46 drainage swale.

Bis(2-ethylhexyl)phthalate was detected in six surface soil samples: IS25SS03, IS25SS08, IS25SS10, IS25SS18, IS25SS20, and IS25SS21. Concentrations ranged from 51 µg/kg in sample IS25SS18 to 17,000 µg/kg in sample IS25SS03. Detections of bis(2-ethylhexyl)phthalate were located south, west, and east of Building 588.

Fluoranthene was detected in 15 surface soil samples: IS25SS01, IS25SS02, IS25SS03, IS25SS06, IS25SS07, IS25SS08, IS25SS10, IS25SS12, IS25SS13, IS25SS14, IS25SS15, IS25SS17, IS25SS20, IS25SS21, and IS25SS22. Concentrations ranged from 39 µg/kg in sample IS25SS20 to 2,300 µg/kg in sample IS25SS21, both of which are located east of Building 588. The surface soil in and around the location of IS25SS21 was removed during excavation for a construction project since the date of sample collection. The detections of fluoranthene were distributed across the site; south, east and west of Building 588; along the IW46 drainage ditch and at the base of the hill south of the site; and along the drainage channels that lead to the Mattawoman Creek.

Pyrene was detected in 14 surface soil samples: IS25SS01, IS25SS02, IS25SS03, IS25SS06, IS25SS07, IS25SS08, IS25SS10, IS25SS12, IS25SS13, IS25SS14, IS25SS15, IS25SS17, IS25SS21, and IS25SS22. Concentrations ranged from 61 µg/kg in sample IS25SS06 to 990 µg/kg in sample IS25SS21. As mentioned above, since sample IS25SS21 was collected, the surface soil in that area was removed during a construction project. The detections of pyrene were distributed in the same manner as the detections of fluoranthene; south, east and west of

Building 588; along the IW46 drainage ditch and at the base of the hill south of the site; and along the drainage channels that lead to the Mattawoman Creek.

In general, the highest concentrations and the most frequent detections of SVOCs were in samples IS25SS01, IS25SS03, and IS25SS07, all located on the southeast or south sides of Building 588; samples IS25SS08 and IS25SS10, located in the ravine west of Building 588; and sample IS25SS21, located east of Building 588.

8.4.1.2 TAL Inorganics

Twenty-two metals were detected in the surface soils at Site 25 (Table 8-1). Twelve of these metals were detected in all 20 surface soil samples. All of the metals had one or more detected concentrations that exceeded the facilitywide background 95 percent UCL (Table F-5 in Appendix F). A short list of the following five inorganics was selected for further discussion: arsenic, cadmium, copper, mercury, and silver. The distributions of these analytes are presented in Figure 8-4.

Arsenic was detected in the surface soil in all 22 of the surface soil samples. Concentrations ranged from 3.7 mg/kg in sample IS25SS16 to 23.8 mg/kg in sample IS25SS21. With the removal of soil from the vicinity of IS25SS21, the maximum arsenic concentration is 21.4 mg/kg in sample IS25SS20. Including IS25SS21, the calculated mean concentration of 7.52 mg/kg is greater than 3.4 times the background mean of 2.18 mg/kg. Additionally, all 22 of the arsenic detections exceeded the facilitywide background 95 percent UCL of 2.56 mg/kg. Site-specific background samples IS25SS18 and IS25SS19 contained arsenic at 6.5 mg/kg and 4.4 mg/kg, respectively, on the order of most of the surface soil samples collected at the site and its vicinity. However, there appears to be some site-related contamination by arsenic.

Cadmium was detected in the surface soil in all 22 of the surface soil samples. Concentrations ranged from 0.092 mg/kg in sample IS25SS20 to 47.2 mg/kg in sample IS25SS03; the latter value is unusually high compared to other detections of cadmium at Site 25. The facilitywide background 95 percent UCL of 0.26 mg/kg was exceeded by 18 cadmium detections, located across the entire site. Site-specific background samples IS25SS18 and IS25SS19 contained cadmium below the detection limit and 2.5 mg/kg, respectively, similar to most of the surface soil samples collected at the site and its vicinity. However, there appears to be some site-related contamination by cadmium.

Copper was detected in the surface soil in 19 of the surface soil samples. Concentrations ranged from 6.1 mg/kg in sample IS25SS17 to 108 mg/kg in sample IS25SS03. The facilitywide background 95 percent UCL of 6.72 mg/kg, was exceeded by 17 detections of copper, located across the site. Site-specific background samples IS25SS18 and IS25SS19 contained copper at 6.8 mg/kg and 5.4 mg/kg, respectively, somewhat lower than most of the surface soil samples collected at the site and its vicinity. Therefore, there appears to be site-related contamination by copper.

Mercury was detected in the surface soil in 16 of the surface soil samples. Concentrations ranged from 0.064 J mg/kg in sample IS25SS10 to 0.39 mg/kg in sample IS25SS02. The facilitywide background 95 percent UCL of 0.049 mg/kg was exceeded by all 16 detections of mercury, located across the site. Site-specific background samples IS25SS18 and IS25SS19 contained mercury below the detection limit and 0.083 mg/kg, respectively, similar to most

of the surface soil samples collected at the site and its vicinity. However, there appears to be some site-related contamination by mercury.

Silver was detected in the surface soil in nine of nineteen surface soil samples. Concentrations ranged from 0.9 mg/kg in sample IS25SS20 to 201 mg/kg in sample IS25SS21. Silver was detected in the following samples: IS25SS01, IS25SS02, IS25SS03, IS25SS07, located in the woods south of Buildings 588 and 3006; IS25SS10, IS25SS14, located west and south of Building 588 at the northern and southern ends of the IW46 drainage swale; and IS25SS20, IS25SS21, and IS25SS22, located east of Building 588 along the fence. As noted previously, the soil in and around the location of IS25SS21 was removed during excavation for a construction project. With the removal of the IS25SS21 soil from Site 25, the maximum silver concentration is 20.6 mg/kg in sample IS25SS02.

Silver was not detected in any of the facility-wide surface soil samples nor was silver detected in either of the two site-specific background samples (IS25SS18 and IS25SS19). Therefore, the data suggest that silver related operations at building 588 have impacted the surface soils.

Many of the highest concentrations of metals were detected in sample IS25SS03 (located on the southeast side of Building 588) and sample IS25SS21 (located east of Building 588).

8.4.1.3 Explosives

Only nitroglycerin was analyzed for and it was not detected in any of the surface soil samples at Site 25.

8.4.2 Subsurface Soil

Six subsurface soil samples (IS25SB01, IS25SB04, IS25SB07, and IS25SB20 through IS25SB22) were collected at Site 25. Note that some sampling took place outside of the site as originally defined by the red line in the figures. The results of the subsurface soil sampling are presented in Table 8-2. As previously noted, since the date of sample collection, a construction project removed the shallow subsurface soil from the area of sample IS25SB21.

8.4.2.1 VOCs and SVOCs

Two VOCs were detected in the subsurface soils at Site 25, both in sample IS25SB20, located east of Building 588: PCE with a concentration of 1.8 µg/kg, and TCE concentration of 3.1 µg/kg (Table 8-2).

Pyrene was the only SVOC detected in the subsurface soils at Site 25 (Table 8-2). Pyrene was detected in sample IS25SB07, located south of Building 588 in the woods, at a concentration of 130 µg/kg.

The VOC and SVOC detections are presented in Figure 8-5.

8.4.2.2 TAL Inorganics

Twenty metals were detected in the subsurface soils at Site 25 (Table 8-2). Fifteen of these metals were detected in all six subsurface soil borings. Six of these metals had one or more detected concentrations that exceeded the facilitywide background 95 percent UCL (Table F-5 in Appendix F): antimony, cadmium, calcium, mercury, silver, and zinc. The following

three inorganics were selected for further discussion because of the frequency of detection, the degree to which they exceeded the background data, and their general risk concern: cadmium, mercury, and silver (Figure 8-6).

Cadmium was detected in all six of the subsurface soil samples. Concentrations ranged from 0.092 mg/kg in sample IS25SB04 to 0.32 mg/kg in sample IS25SB22. The calculated mean concentration of 0.17 mg/kg is less than the background mean of 0.22 mg/kg. Additionally, only one of the subsurface soil cadmium detections exceeded the background 95 percent UCL of 0.204 mg/kg.

Mercury was detected in the subsurface soil in two of the subsurface soil samples. The concentrations were 0.075 mg/kg in sample IS25SB20 and 0.1 mg/kg in sample IS25SB21. The facilitywide background 95 percent UCL, 0.0458 mg/kg, was exceeded by both mercury detections.

Silver was detected in the subsurface soil in two of the subsurface soil samples. The concentrations were 4.8 mg/kg in sample IS25SB22 and 18.3 mg/kg in sample IS25SB21, both located in borings east of Building 588, adjacent to the fence. The calculated mean concentration of 3.93 mg/kg is greater than 11 times the background mean of 0.35 mg/kg. Additionally, both of the silver subsurface soil detections exceeded the background 95 percent UCL of 0.63 mg/kg. It should be noted that the shallow subsurface soil in and around the location of IS25SB21 was removed from the site.

8.4.2.3 Explosives

Nitroglycerin was the only explosive sampled for and it was not detected in any of the subsurface soil samples at Site 25.

8.4.3 Groundwater

The groundwater monitoring wells were sampled in October 2000 and February 2002. The October 2000 samples were analyzed for VOCs, SVOCs, total and dissolved inorganics, and NG, while the February 2002 samples were analyzed only for total and dissolved metals. The analytical data are presented in Table 8-3 and 8-4.

8.4.3.1 VOCs and SVOCs

Only one VOC was detected in groundwater at Site 25: 1,1,2-trichloro-1,2,2–trifluoroethane at a concentration of 3.6 µg/L in sample IS25MW02 (Table 8-3). No SVOCs were detected in groundwater at Site 25. This VOC is used in fire extinguishers and as a dry-cleaning solvent.

8.4.3.2 TAL Inorganics

In the unfiltered samples collected from IS25MW01 and IS25MW02 during October 2000, fourteen metals were detected (Table 8-3). Eight of these metals had one or more detections that exceeded the facilitywide background 95 percent UCL (Table F-5 in Appendix F): barium, beryllium, cobalt, magnesium, manganese, nickel, sodium, and zinc. In the February 2002 unfiltered samples, eleven metals were detected (Table 8-3). Aluminum, copper and vanadium were detected in the October 2000 samples but not in the February 2002 samples. For the February 2002 samples, the same metals exceeded the facilitywide background 95 percent UCLs as for the October 2000 samples. Although the February 2002

concentrations were typically lower than the October 2000 concentrations, these differences were not substantial.

This discussion focuses on barium, beryllium, cobalt, and manganese. These metals were selected because of their frequencies of detection, the degrees to which they exceeded the background data, and their general risk concerns. The distributions of these analytes are presented in Figure 8-7.

Barium was detected in the October 2000 and February 2002 groundwater samples from both monitoring wells. In October 2000, barium concentrations were 98.8 μg/L in sample IS25MW02 and 352 μg/L in sample IS25MW01. The calculated mean concentration of 225.4 μg/L was greater than 3.5 times the background mean of 64 μg/L, and the maximum concentration of 352 μg/L exceeded the background 95 percent UCL of 139 μg/L. In the February 2002 samples, the barium concentrations were 243 μg/L (IS25MW01) and 110 μg/L (IS25MW02). Although lower than the October 2000 maximum concentration, the maximum February 2002 barium concentration still exceeded the background 95 percent UCL, and the February 2002 mean concentration, 177 μg/L, was 2.8 times the background mean.

Beryllium was detected in one monitoring well, IS25MW01, at a concentration of 2.4 μg/L in October 2000 and a concentration of 1.8 μg/L in February 2002. Beryllium was not detected in the background data set.

Cobalt was detected in all four groundwater samples. In October 2000, the cobalt concentrations were 28.5 μg/L in IS25MW02 and 64.7 μg/L in IS25MW01. Both concentrations were above the background 95 percent UCL of 15.6 μg/L. Additionally, the calculated mean concentration of 46.6 μg/L was greater than 7 times the background mean of 6.48 μg/L. In February 2002, sample IS25MW01 had 44.4 μg/L cobalt, and sample IS25MW02 had 6.2 μg/L cobalt. The cobalt concentration of the February 2002 sample from IS25MW02 was consistent with background levels.

Manganese was detected in all groundwater samples collected from monitoring wells IS25MW01 and IS25MW02. In the October 2000 samples, manganese concentrations were 2,040 μg/L (IS25MW01) and 343 μg/L (IS25MW02). The manganese concentration observed in sample IS25MW01 exceeded the background 95 percent UCL of 824 μg/L by 2.5 times, while the manganese concentration in sample IS25MW02 was consistent with background concentrations. A similar pattern was observed with the February 2002 samples. In the February 2002 samples, IS25MW01 contained 1,470 μg/L of manganese and IS25MW02 had 262 μg/L. The manganese concentration in sample IS25MW01 exceeded the background 95 percent UCL by 1.8 times. The manganese concentration in sample IS25MW02 was consistent with facilitywide background levels.

The elevated manganese concentration in well IS25MW01 is hypothesized to be predominantly a result of naturally-occurring manganese. Manganese is not associated with the processes used at Site 25. In addition, the manganese concentrations in the surface and shallow subsurface soils were consistent with background levels. The Site 25 surface soil manganese concentrations ranged from 156 mg/kg to 971 mg/kg, with a 95 percent UCL (log-transformed) of 498 mg/kg. In the facilitywide background surface soil samples, the manganese concentrations ranged from 22.7 mg/kg to 882 mg/kg, with a 95 percent UCL

(log-transformed) of 569 mg/kg. Only one Site 25 surface soil sample, IS25SS07, had a manganese concentration above the range of concentrations detected in the facilitywide background samples. The 95 percent UCL for the Site 25 surface soil samples is less than the background 95 percent UCL. The maximum subsurface soil manganese concentration was 103 mg/kg, which is less than one tenth the background 95 percent UCL of 1,270 mg/kg. These data do not support the presence of a manganese source in the soil at Site 25.

Manganese dissolution in the soil occurs under acidic or reducing conditions (McBride, 1994). The pH of the Site 25 surface soil samples ranged from 4.2 to 6.8. Three samples were in the pH 4 range, three samples were in the pH 5 range, and eleven samples had pHs between 6.0 and 6.8. These results indicate that the soil at Site 25 was acidic, and would promote the dissolution of manganese. The presence of the acid soil likely resulted from the heavy leaf litter across the ravine between Building 588 and the groundwater monitoring wells at the base of the hill. Leaf litter promotes a high organic content of the underlying soil. A high dissolved organic carbon content may promote reduction of manganese oxides present in the soil (McBride, 1994), thereby mobilizing manganese for transport to the groundwater. In addition, studies indicate that, because of accumulation of manganese in tree leaves, the leaf litter itself may be a manganese source for stormwater runoff and rainwater that percolates through the soil (McBride, 1994).

The water quality characteristics of the groundwater samples further support the hypothesis that the elevated manganese concentration observed in IS25MW01 resulted from naturally-occurring manganese. The pH of the groundwater sample IS25MW01 in October 2000 was 4.2, while, at the same time, the pH of the groundwater sample IS25MW02 was 6.5. In February 2002, sample IS25MW01 had a pH of 4.3 and a DO concentration of 1.47 mg/L, while sample IS25MW02 had a pH of 6.0 and a DO content of 2.93 mg/L. The low DO content and the very acidic (for groundwater) pH of IS25MW01 would promote the dissolution of manganese (McBride, 1994). The background groundwater samples had pH's ranging from 5.5 to 6.7 (Tetra Tech NUS, 2002). The pH of IS25MW02 was consistent with the background values. In addition, the manganese concentration of IS25MW02 was consistent with background concentrations. Based on the dissolution of manganese under acidic conditions, it is possible that the elevated manganese concentration in IS25MW01 resulted from enhanced dissolution of naturally-occurring manganese caused by pH and redox conditions.

In general, there was little difference between concentrations of any of the metals in filtered and unfiltered samples, indicating that there was little turbidity in the unfiltered samples. Typically, well IS25MW01 had the higher concentrations between the two wells. As described for manganese, the concentration differences between wells IS25MW01 and IS25MW02 might have resulted from the substantially lower pH of groundwater in IS25MW01 as compared to the groundwater in IS25MW02. The solubility of cobalt, nickel, and zinc are increased under acidic conditions (McBride, 1994). The concentrations of these three metals were higher in IS25MW01 than IS25MW02.

8.4.3.3 Explosives

Only nitroglycerin was analyzed for in groundwater and it was not detected in any of the groundwater samples at Site 25.

8.5 Fate and Transport

The fate and transport of chemicals found in soil and groundwater at Site 25 at NSWC Indian Head are discussed in this section. The fate and transport are described to support the human-health and ecological risk assessments and to aid in defining remedial alternatives. At the end of the subsection is a summary of the conceptual model of fate and transport at Site 25.

8.5.1 Contaminant Fate

Analytes will adsorb onto and desorb from solid material at the site. This includes soil that is in contact with infiltrating water and sediment deposited in the Mattawoman Creek. Such sorption will be a function of the partitioning coefficient of the analyte and will be greater for most SVOCs and many metals than for VOCs and some SVOCs and metals. Analytes, particularly metals, also may be dissolved from the solids while they are in contact with water. The commonly occurring contaminants at Site 25 are SVOCs and metals; therefore, adsorption is expected to be a significant fate process at this site.

Few VOCs were detected at the site. Therefore, volatilization is not expected to play a significant rope in contaminant fate at the site.

Some of the organic compounds may be subject to transformation through microbial activity. The vegetated nature of the site would support a strong microbial community in the surface soil. The majority of the SVOCs observed at Site 25, such as pyrene and benzo(a)pyrene, are recalcitrant to microbial activity and would be transformed at a slow rate. Due to the nature of the organic compounds detected at Site 25, microbial degradation is unlikely to play an important role in their fate.

Some of the metals at the site could vary in their migration behavior with change in valence state. This is particularly true for arsenic, which will become more mobile in its lower valence state.

Bioaccumulation is the process by which contaminants are ingested by ecological receptors and concentrated within the tissues of those receptors. Because of the wooded nature of the site, it is likely that ecological receptors (e.g., mammals) visit the area. While foraging, these receptors may ingest contaminated surface soil. Those compounds with a tendency to associate with the soil, such as SVOCs (e.g., pyrene and benzo[a]pyrene) and inorganics (e.g., arsenic and silver) may accumulate in these ecological receptors over time.

8.5.2 Contaminant Migration at Site 25

This section discusses the site-specific source areas and potential mechanisms for contaminant release and migration from the source areas at Site 25. The discussion is organized by media within the site that may contribute to contaminant movement.

Fundamental to describing fate and transport at the site is the conceptual site model, which is described in Section 8.5.3.

8.5.2.1 Source Area

Based on the chemical and physical data gathered for the site and information provided by IHDIV-NSWC, the following potential contaminant source area has been identified:

- The IW46 drainage swale, where hypo discharges appear to have occurred.

It should be noted that the expected contamination at this site was silver, which was contained in the released liquids.

8.5.2.2 Releases from Soil to the Atmosphere

Wind erosion and vehicular traffic are typically the primary mechanisms for the release of surface soil or exposed subsurface soil to the air. A contaminant associated with the entrained soil particles will be transported away from the contaminant source. Inorganics and many SVOCs tend to bind strongly to the soil, particularly the fine particulates that are more readily suspended by wind or vehicular traffic. Because the site is in the woods behind Building 588, there is no vehicular traffic across the site soil. Most of the site is heavily wooded and the soil is covered with either vegetation, such as grass, or a layer of leaf litter. The vegetation and the leaf litter inhibit wind erosion. Therefore, the potential for release of site contaminants to the atmosphere via this mechanism is considered to be minimal.

Volatilization, which is the primary mechanism for the transfer of volatile contaminants from soil to the atmosphere, is not considered to be a significant part of potential contaminant release at this site. Few VOCs were observed at the site, and their detected concentrations were low. Therefore, this pathway is not considered a significant transport process at Site 25.

8.5.2.3 Transport from Surface Soil to Subsurface Soil or from One Area to Another

The primary mechanisms for the release of contaminants from surface soil to subsurface soil or from one area to another are infiltration, runoff, and soil erosion caused by runoff.

Site 25 is well-vegetated, so that runoff is reduced. However, the site slopes steeply to the west and south, thereby encouraging runoff. When erosion does occur, the eroded soil would tend to be deposited in flat parts of the drainage swale and in the marshy area at the base of the drainage swale. Any adsorbed contaminants associated with the eroded soil will be transported in this manner. Because contaminants tend to associate with finer particulates, and because finer particulates are more easily suspended and transported, this transport process could be a means of contaminant movement around the site. In particular, SVOCs, because of their tendency to sorb, could be transported in this manner. Some inorganics such as silver and lead also may be transported in this manner.

Arsenic and other metals associated with surface soil may also dissolve into the surrounding soil water. The data show that contaminant levels in subsurface soil typically are less than those in surface soil (e.g., for silver, as shown in Figures 8-4 and 8-6), suggesting that there is only limited migration along this pathway due to the tendency for the site contaminants to adsorb. It is likely that vertical leaching of arsenic is occurring to some extent.

8.5.2.4 Releases from Soil to Sediment and Surface Water

During storm events and in the spring during snowmelt, contaminants associated with the surface soil may dissolve into the surrounding soil water and be transported away from the source in overland flow (runoff) or through horizontal leaching in the uppermost soil horizon. Runoff in the vicinity comes from the Building 588 area, at an elevation of 78 ft above msl, down to the Building 871 area at an elevation of 12 ft above msl. Some of the water that runs off the surface of the ground at the site flows to the drainage ditch along the northwest side of the Building 871 perimeter driveway. This ditch then drains to the southwest toward a stormwater culvert that discharges at outfall IW46 into the Mattawoman Creek. The Master Work Plan (B&RE, 1997a) reports that most natural drainage from the facility is to the Mattawoman Creek. In addition, there is surface water at the site, in the marshy area at the base of the hill south of Building 588.

VOCs tend to be mobile in the soil due to their low partition coefficients. Because few VOCs were detected at the site, leaching of VOCs from surface soil is unlikely to be significant transport pathway at Site 25. SVOCs tend to be resistant to leaching because of their strong tendency to sorb to soil. Therefore, it is unlikely that leaching of SVOCs into surface water from the surface soil is a substantial transport pathway at the site. Inorganic contaminants associated with surface soil may also dissolve into the surrounding soil water. The more mobile inorganics, such as arsenic, may be transported in this manner.

During storm events, the finer particles from the surface soil will be suspended and transported with the stormwater runoff downgrade until the particles settle out of solution. At Site 25, the eroded surface soil will tend to be deposited along the flat portions of the drainage swale and in the marshy area at the base of the drainage swale. Any contaminants associated with the eroded soil will be transported in this manner. Because contaminants tend to associate with finer particulates, and because finer particulates are more easily suspended and transported, this transport process is likely an important means of contaminant movement from the upper slopes behind the building to the swale and, ultimately, into the Mattawoman Creek. In particular, SVOCs such as pyrene and benzo(a)pyrene, because of their tendency to sorb, will be transported in this manner. Less mobile inorganics, such as iron in its oxidized form, will also be transported with the eroded soil. The steeply sloped nature of the area behind Building 588 contributes to the erosion potential for Site 25. This erosion potential is mitigated to some extent by the leaf litter layer.

The distribution of the SVOCs, such as pyrene and benzo(a)pyrene (Figure 8-3) along the top of the hill and in the drainage ditch suggests that organic contaminants are transported via erosion at Site 25. It appears that some of the inorganic contaminants, such as silver, are also being transported in this manner.

Once the eroded surface soil has been deposited as sediment, it becomes a potential source for the desorption of organic contaminants and the dissolution of inorganic contaminants into surface water. After the contaminants have moved from sediment into the surface water, the contaminants may be transported to the Mattawoman Creek and then into the Potomac River. Due to the fact that contaminants transported via soil erosion have a greater tendency to remain associated with the soil than to move into surrounding water, it is unlikely that sediments pose a substantial threat to the Mattawoman Creek or the Potomac River.

A work plan was developed to evaluate the discharge of point IW46 in Mattawoman Creek. Investigations revealed that there was no discharge pit associated with Site 25, and therefore the evaluation was not necessary

8.5.2.5 Releases from Soil to Groundwater

Percolation of rainfall and snowmelt through the unsaturated soil can dissolve contaminants from the soil, and then transport them to the underlying groundwater. Both surface and subsurface soil can serve as sources of contaminants for deeper soil horizons and groundwater.

Six subsurface soil samples were collected. One SVOC (pyrene) was detected in one of these samples. Two VOCs (PCE and TCE) were detected in one of the subsurface soil samples and both detects were at very low concentrations. In addition, only one organic contaminant, 1,1,2-trichloro-1,2,2-trifluoroethane (a solvent often used in fire extinguishers), was detected at a low concentration in one of the groundwater samples. These data indicate that the vertical movement of organic contaminants at Site 25 from the surface soil is not an important transport pathway.

Although there appears to be vertical leaching of silver from surface soil into subsurface soil, this inorganic contaminant has not yet reached groundwater. Other inorganic contaminants, such as iron, were detected in surface soil, subsurface soil, and groundwater.

8.5.2.6 Migration of Contaminants in Groundwater

It appears that the water table slopes generally to the south from most of the site, and groundwater discharges into the Mattawoman Creek. The water table is recharged by precipitation that infiltrates the ground surface.

No groundwater samples were obtained upgradient of the site. Due to the detection of only a single VOC at a very low concentration, the transport of organic contaminants in groundwater will not be discussed for this site.

Dissolved inorganic compounds will be transported with the groundwater flow, and may discharge into the Mattawoman Creek. During this transport process, advection and dispersion will dilute the inorganic contaminant concentration. In addition, the inorganic contaminants may precipitate or associate with the subsurface media, further decreasing the inorganic contaminant concentration. It should be noted that silver, the primary site contaminant, was not detected in either monitoring well, indicating that silver is not being transported in groundwater at the site.

8.5.2.7 Releases from Groundwater to Surface Water

The Mattawoman Creek is the final recipient of all groundwater from Site 25. Significant past or ongoing releases of organics or explosives from groundwater to surface water are unlikely due to the low concentrations at the site and the low mobility of these in groundwater.

Releases of inorganics from groundwater to surface water is part of the natural hydrologic cycle and is on-going. There are no data on surface water from the Mattawoman Creek near the site, so no determination can be made about impacts of the site. However, the absence of

silver in groundwater suggests that the site is not impacting the creek via the groundwater pathway.

8.5.3 Conceptual Site Model

The above fate and transport discussions may be summarized into a conceptual site model that describes the fate and transport mechanisms at Site 25. The conceptual model is provided in Table 8-4.

8.6 Baseline Human Health Risk Assessment

This section presents the results of the HHRA for Site 25, Hypo Discharges from Building 588. This HHRA is based only on the data collected between July 2000 and October 2000. Even though the February 2002 groundwater data and the removal of the soil from the area of IS25SS21/IS25SB21 would affect the HHRA results, it was decided to not change the quantitative analysis. Instead, a qualitative discussion of the potential effects of recent data and construction projects on the HHRA results was included as a separate section (Section 8.6.5).

8.6.1 Data Summary

The only data collected at Site 25 were collected during the RI. The RI data used in the risk assessment are presented in this section. Table 8-5 lists the samples that were used to estimate potential exposure and risks in each medium for Site 25. Figure 8-2 identifies the sampling locations for surface and subsurface soil and for groundwater.

Twenty-two surface soil samples (including two duplicate samples) were collected at Site 25 in July and October of 2000 and analyzed for VOCs, SVOCs, explosives, and inorganics (Figure 8-2). Seven subsurface soil samples (including one duplicate) were collected in October 2000 and analyzed for the same parameters as the surface soil samples. Four surface soil samples were collected from background locations and were not used to evaluate the risks associated with exposure to site soil.

Groundwater data collected in October 2000 as part of the RI were evaluated in the risk assessment. Groundwater samples were collected from two shallow monitoring wells (Figure 8-2). Groundwater samples were analyzed for VOCs, SVOCs, nitroglycerin, and inorganics (filtered and unfiltered).

The full set of data used for the HHRA is presented in Appendix G.5a. Appendix G.5b includes the detected constituents only, and Appendix G.5c is the sample statistics. The sample statistics include frequency of detection, minimum and maximum detected values, normal and lognormal arithmetic mean, normal and lognormal standard deviation, results of W-test, and 95 percent UCL based on the normal and lognormal distribution.

8.6.2 Identification of Chemicals of Potential Concern

Table 8-6 lists the COPCs retained for Site 25. The COPCs for the soil under the future use scenario were determined by pooling the analytical results for the surface soil and subsurface soil samples. This pooling is based on the assumption that the future exposed soil is a mixture of the current surface soil and the current subsurface soil. The COPCs for

the soil under both current (surface soil) and future (surface and subsurface soil) use scenarios consist of four SVOCs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and dibenz[a,h]anthracene) and nine metals (aluminum, arsenic, cadmium, chromium, iron, manganese, silver, thallium, and vanadium). The COPCs for groundwater were barium, iron, and manganese.

8.6.3 Exposure Assessment

The site-specific exposure assessment includes the information necessary to develop the exposure scenarios applicable to Site 25. This process includes identification of the exposure setting, the current and future site use, the potentially exposed populations, and the potential exposure pathways.

8.6.3.1 Exposure Setting

Site 25 is the drainage ditch that runs from the Rocket Motor Loading Building (Building 588) into the industrial wastewater outfall IW46. Flow in the ditch is intermittent, occurring only during stormwater runoff events or when there is discharge from the building. Water draining from Building 588 flows southwest down a steep slope into the ditch. The drainage ditch then flows south for approximately 500 ft until it reaches the road that leads to Building 871. At this point, the drainage ditch takes a sharp turn to the west and follows the road for about 100 ft before flowing under the road. The outfall into the Mattawoman Creek is approximately 100 ft south of this road. The Rocket Motor Loading Building, constructed in 1944, contained facilities used for X-ray film developing. The X-ray section of this building is no longer in use. The nearest potable water well is Well A, 400 ft southeast of the site.

Runoff in the vicinity of Site 25 comes from the Building 588 area, at an elevation of 78 ft above msl, down to the Building 871 area where the two wells are located, at an elevation of 12 ft above msl. Some of the water that runs off the surface of the ground at the site flows to the drainage ditch along the northwest side of the Building 871 perimeter driveway. The Master Work Plan (B&RE, 1997a) reports that most natural drainage from the facility is to the Mattawoman Creek.

The water table is recharged by precipitation that infiltrates the ground surface. Groundwater moves generally to the south and east toward the Mattawoman Creek. The movement of groundwater at Site 25 is not fully understood as only two groundwater data points exist at the site.

8.6.3.2 Potentially Exposed Populations

Site 25 is an unfenced wooded area near Building 588. There are no current or projected future uses of the wooded area.

Because the wooded area is unused, but Building 588 is currently in use, the current receptors that are expected at Site 25 include the adolescent trespasser/visitor, the adult trespasser/visitor, and the industrial worker.

Because the projected future use of the site is consistent with current activities (unused wooded area), the adult trespasser/visitor and adolescent trespasser/visitor are included for evaluation under the future use scenario. Because continued use of Building 588 is

expected, the industrial worker is also retained as a potential future receptor. It is also assumed that the site could be developed and used for industrial and/or residential activities in the future. It is not expected that the site will be developed for residential use, however, the residential scenario is conservatively included in this evaluation, per Navy policy. Therefore, the future potentially exposed populations include the construction worker and adult and child resident, in addition to the adult trespasser/visitor, adolescent trespasser/visitor, and industrial worker.

8.6.3.3 Potential Exposure Pathways

A complete exposure pathway has five elements: a source, a mechanism for release and migration, an environmental transport medium, a point of potential human contact, and a route of intake. These elements as they apply to Site 25 are discussed below.

Contaminant Sources For the period beginning in 1944 and ending circa 1964, wastewater discharges from Building 588 included fixer (sodium thiosulfate), developer (hydroquinone), and silver (discharged in a silver thiosulfate complex). The silver represents the most significant contaminant from the standpoint of potential adverse environmental impacts. Team site reconnaissance for the IAS indicated no vegetation stress or contamination immediately behind the building at the point of outfall discharge. However, there was evidence of disposal of paint materials and accessories, including paint brushes, empty solvent cans, and trash. Thus, other possible contaminants include VOCs and SVOCs from paint and solvent use.

Building 588 has a temporary waste accumulation area. The concrete pad, which is located on the southwest corner of the building, is currently used as a satellite accumulation area for the storage of nonexplosive hazardous waste (i.e., waste acetone). Secondary containment is provided when the site is used (i.e., a drum in a drum or a mobile secondary containment pad with corer). However, prior to 1996, the concrete pad held a dumpster which was used for the storage of solid explosive hazardous waste.

As described in Section 8.1, Site 25 soil and groundwater samples were analyzed for metals, VOCs, SVOCs, nitroglycerin, and cyanide.

Release and Transport Mechanisms The primary transport mechanisms at Site 25 appear to be surface runoff and erosion to the drainage swale, and possibly vertical leaching to subsurface soils and groundwater. The maximum detected concentration of about eight metals exceeds the SSL for soil to groundwater, indicating that they may be a contributing source to groundwater contamination. However, only one of these constituents was actually detected in the groundwater.

The risk assessment also considered the transfer of COPCs to air from soil through volatilization and fugitive dust emissions.

Potential Exposure Points and Exposure Routes Exposure points are locations where humans could contact contamination. Onsite exposure points include surface soil. It is assumed that current trespassers/visitors and industrial workers could be exposed to surface soils through dermal absorption and incidental ingestion. All future receptors could be exposed to future exposed soils (a mixture of surface soil and subsurface soil) through dermal absorption and incidental ingestion. Inhalation of fugitive emissions from both current

surface soil and future exposed soil are not complete exposure pathways because no COPCs were retained for these pathways (Appendix G.5d, Tables 2.2 and 2.8).

Groundwater from Site 25 is not currently used as a potable water supply at the base nor is it expected to be used as such in the future. However, use of the groundwater downgradient of the site as a future potable water supply cannot be ruled out. Therefore, the groundwater data from the site was used as a conservative assessment of groundwater quality for future offsite or onsite residents. It is assumed that adult residents could be exposed to groundwater contaminants through ingestion of the groundwater, dermal contact with groundwater while showering, and inhalation of vapors while showering. Child residents could be exposed to groundwater contaminants through ingestion of the groundwater and dermal contact with the groundwater while bathing. None of the COPCs retained for groundwater are volatile; therefore, inhalation of vapors while showering is not a complete exposure pathway.

In addition, groundwater may be encountered during future construction activities either at the site or downgradient from the site. The use of the groundwater data collected from the onsite wells provides a conservative exposure point concentration for future onsite and offsite construction workers. Construction workers could be exposed to groundwater contaminants through dermal contact with the groundwater while working in excavation pits that encroach on the water table. As mentioned above, none of the groundwater COPCs is volatile, and, therefore, inhalation of vapors from the groundwater is not a complete exposure pathway.

Existing and potential future exposure pathways are illustrated in the conceptual exposure model (Figure 8-8). Exposure scenarios and potentially complete pathways of exposure evaluated in this risk assessment are presented in Table 8-7 and Appendix G.5d, Table 1. Appendix G.5d, Table 4 presents the exposure parameter values that were used for the HHRA.

Current Exposure Routes The only medium of potential concern currently accessible at the site is surface soil. Based on current site use, potential receptors include trespassers/visitors and industrial workers. The current land use exposure routes for quantitative evaluation include:

- Trespasser/visitor (adult and adolescent): incidental ingestion of and dermal contact with surface soil.
- Industrial Worker (adult): incidental ingestion of and dermal contact with surface soil.

Future Exposure Routes As discussed above, potential future site use may be industrial or residential. Future industrial workers, trespassers, residents, and/or construction workers may be exposed to the combined surface and subsurface soil. In addition, future residents and construction workers may be exposed to groundwater.

In summary, the future land use exposure routes include the following:

- Industrial Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).

- Trespassers/Visitors (adult and adolescent): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil).
- Resident (adult and child): incidental ingestion of and dermal contact with soil (combined surface and subsurface soil); ingestion of groundwater and dermal contact with groundwater during showers (adult) or baths (child).
- Construction Worker: incidental ingestion of and dermal contact with soil (combined surface and subsurface soil); dermal contact with groundwater in a shallow excavation pit.

All of the chemicals detected in the soil samples were screened against RBCs. Only those chemicals for which the maximum detected concentration exceeded the RBC were quantitatively evaluated in the risk assessment. The results of the screening process are summarized in Appendix G.5d, Tables 2.1 through 2.8. Because the estimated ambient air concentrations of contaminants released by the surface soils and the groundwater are below their corresponding RBCs, the risk from inhalation was not quantified. The exposure concentrations used to calculate potential risks to each of the receptors are presented in Appendix G.5d, Tables 3.1 through 3.4. The exposure parameters and equations used to calculate the risks are presented in Appendix G.5d, Tables 4.1 through 4.26.

8.6.4 Risk Characterization

Risks were evaluated for all of the complete exposure pathways identified in Section 8.6.3.3. The calculated risks are discussed below.

8.6.4.1 Soil

Risks were evaluated for exposure to surface soil for current use scenarios. For the future scenario, the soil concentration was estimated by pooling the results from the analysis of surface soil samples and subsurface soil samples. This approach is based on the assumption that the surface soil mixes with the underlying subsurface soil during any construction or excavation activities at the site.

8.6.4.2 Surface Soil

RME risk estimates for exposure to current surface soil were calculated for an adolescent trespasser/visitor, an adult trespasser/visitor, and an industrial worker (Appendix G.5d, Tables 7.1.RME, 7.2.RME, and 7.3.RME for noncarcinogenic hazards, and Tables 8.1.RME, 8.2.RME, and 8.3.RME for carcinogenic risks). The results are summarized in Table 8 and 8-9. As stated in Section 8.6.3, the risk associated with the inhalation of fugitive emissions from the surface soil was not quantified because all of the COPC concentrations were below the applicable screening level (Appendix G.5d, Table 2.2).

Under the current use scenario, the noncarcinogenic hazard posed by the surface soil COPCs to the adolescent trespasser/visitor is estimated to be a HI of 0.089, substantially less than the HI of 1.0 that is considered to be protective of human health. The carcinogenic risk for this exposure scenario $9x10^{-7}$, which is below the USEPA target risk range of 10^{-4} to 10^{-6}. There are no unacceptable risks to the adult trespasser/visitor for exposure to surface soil. The HI is 0.076, and the total excess lifetime cancer risk is $2x10^{-6}$.

The HI for the current industrial worker is 0.61. The cancer risk posed to the current industrial worker $1x10^{-5}$. The HI is below USEPA's target HI, and the cancer risk is within USEPA's target risk range.

8.6.4.3 Combined Surface and Subsurface Soil

RME risk estimates for future exposure to soil were calculated for an adult and child resident, a construction worker, an industrial worker, and an adult and adolescent trespasser/visitor (Appendix G.5d., Tables 7.7.RME through 7.12.RME for noncarcinogenic hazards, and Tables 8.6.RME through 8.10.RME for carcinogenic risks). The results are summarized in Table 8-8. It was assumed that these receptors would be exposed to soil through incidental ingestion and dermal contact. As with the current use scenario, the risk associated with the inhalation of fugitive emissions from the future exposed soil was not quantified because all of the COPC concentrations were below the applicable screening level (Appendix G.5d, Table 2.8).

The HI for future adult residents exposed to soil is estimated to be 0.72, which is less than the USEPA benchmark of 1.0. At 3.0, the HI for future child residents exceeds the USEPA benchmark value. None of the individual constituents pose a HI above 1.0, and the HIs separated by target organ are all below 1.0. The dominant contributors to this hazard are the ingestion of iron, manganese, vanadium, and arsenic.

Under the future use scenario, the carcinogenic risk to the future lifetime resident was estimated to be $3x10^{-5}$, which is within the USEPA target risk range of 10^{-4} to 10^{-6}.

The noncarcinogenic hazards and carcinogenic risks were estimated for potential future construction workers exposed to soil at Site 25. The HI for this scenario is 1.1, while the excess lifetime cancer risk is $1x10^{-6}$. The HI is above the USEPA benchmark value and the cancer risk is within the USEPA target risk range. None of the individual constituents pose a HI above 1.0, and the HIs separated by target organ are all below 1.0.

Under the future use exposure scenario, the HI for the industrial worker is 0.61. This HI is below the USEPA benchmark value. The cancer risk to the industrial worker is $1x10^{-5}$, which is within the USEPA target risk range of 10^{-4} to 10^{-6}.

Under the future use scenario, the HI for the adolescent trespasser/visitor is estimated to be 0.089. At $8x10^{-7}$, the carcinogenic risk associated with future use by this receptor is below the USEPA target risk range. The health risks associated with the future use of the site by the adult trespasser/visitor are a HI of 0.076 and an excess lifetime cancer risk of $2x10^{-6}$, both below or within USEPA target levels.

Because the HIs for the future child resident exceeds 1.0 and construction worker, the central tendency (CT) exposure scenario for these receptors was evaluated. The results of this assessment are presented in Appendix G.5d, Tables 7.15.CT and 7.16.CT. The central tendency HI for the child resident is 0.81, and the central tendency HI for the construction worker is 0.60, which are both less than the USEPA benchmark value of 1.0.

8.6.4.4 Groundwater

RME risk estimates for future exposure to Site 25 groundwater were calculated for an adult and child resident, and for a construction worker (Appendix G.5d, Tables 7.4.RME through 7.6.RME, Table 8.4.RME, and Table 8.5.RME, and summarized in Table 8-8).

The future consumption of onsite groundwater poses a HI of 3.2 for the RME adult resident. The majority of the hazard is due to the ingestion of manganese. The RME future child resident scenario results in a HI of 7.5. As with the adult resident, the majority of the hazard is due to the ingestion of manganese.

The cancer risk to the future lifetime resident is estimated to be zero because none of the groundwater COPCs are carcinogenic.

The HI for contact with groundwater by the future construction worker is 0.18, which is less than the USEPA benchmark. Because the groundwater COPCs are not carcinogens, the excess lifetime cancer risk is zero.

Because the HI for the RME adult resident and the RME child resident exceed 1.0, the CT exposure scenario was evaluated for both receptors. The CT results are provided in Table 8-9 (and Appendix G.5d, Table 7.13.CT and Table 7.14.CT). The future consumption of onsite groundwater poses a HI of 0.88 for the CT adult resident, and a HI of 2.9 for the CT child resident. In both cases, the majority of the hazard is due to the ingestion of manganese.

8.6.4.5 Summary of Total Risks Across Pathways and Media

Table 8-8 and Appendix G.5d, Tables 9.1.RME through 9.10.RME summarize the RME potential noncarcinogenic hazards and carcinogenic risks to each receptor across all exposure pathways. Table 8-9 and Appendix G.5d, Tables 9.11.CT through 9.13.CT summarize the CT potential hazards and risks to each receptor that have HIs in excess of 1.0 or carcinogenic risks greater than $1x10^{-4}$. Potential risks were summarized for a current adolescent trespasser/visitor, current adult trespasser/visitor, current industrial worker, future adult resident, future child resident, future lifetime resident, future construction worker, future industrial worker, future adult trespasser/visitor, and future adolescent trespasser/visitor. Appendix G.5d, Tables 10.1.RME through 10.4.CT show only the chemicals that contributed a hazard greater than 0.1 or a carcinogenic risk greater than 10^{-6} for scenarios with total HIs greater than 1.0 or total carcinogenic risks greater than 10^{-4}.

The risk assessment results may be summarized as follows:

- **Current Trespasser/Visitor, Adolescent** (Appendix G.5d, Table 9.1.RME): The HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Current Trespasser/Visitor, Adult** (Appendix G.5d, Table 9.2.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.
- **Current Industrial Worker** (Appendix G.5d, Table 9.3.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to surface soil.

- **Future Resident, Adult** (Appendix G.5d, Table 9.4.RME): The HI greater than 1.0 from exposure to groundwater. Manganese in groundwater contributes an HI above 1.0. The CT hazard is below USEPA's benchmark value. HI below 1.0 from exposure to combined surface and subsurface soil.
- **Future Resident, Child** (Appendix G.5d, Table 9.5.RME): The HI exceeds 1.0 due to exposure to groundwater and soil. Manganese in groundwater contributes an HI above 1.0. None of the individual soil COPCs contribute a HI above 1.0, however, iron contributes the greatest to the HI. The CT future child resident also has a HI above the USEPA benchmark value due to exposure to groundwater (Appendix G.5d, Table 9.12.CT).
- **Future Lifetime Resident** (Appendix G.5d, Table 9.6.RME): The carcinogenic risk is within the target USEPA risk range. This calculated risk is associated with exposure to soil because none of the groundwater COPCs is carcinogenic.
- **Future Construction Worker** (Appendix G.5d, Table 9.7.RME): The HI is above USEPA benchmark value due to exposure to soil. However, none of the individual constituents pose a HI above 1.0, the HIs separated by target organ are all below 1.0, and the CT HI is below 1.0. The carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to groundwater and combined surface and subsurface soil.
- **Future Industrial Worker** (Appendix G.5d, Table 9.8.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Trespasser/Visitor, Adolescent** (Appendix G.5d, Table 9.9.RME): The HI is below USEPA benchmark value and carcinogenic risk is below USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.
- **Future Trespasser/Visitor, Adult** (Appendix G.5d, Table 9.10.RME): The HI is below USEPA benchmark value and carcinogenic risk is within USEPA target risk range. No unacceptable health threats are posed to this receptor for exposure to combined surface and subsurface soil.

8.6.5 Potential Effects of Recent Data and Events on the HHRA

As described in Section 8.1.4, additional groundwater samples from Site 25 were collected and analyzed in February 2002. The HHRA was not revised to reflect these results. Because the metals concentrations were generally lower in February 2002 than in October 2000, use of the February 2002 results in place of the October 2000 data would reduce the HIs calculated for the groundwater exposure pathways. If the February 2002 groundwater data were used in place of the October 2000 groundwater data, the only analyte to be quantitatively evaluated would be manganese. The maximum concentrations of all other analytes were below the RBCs. Although less than the HIs from the October 2000 data, the HIs from the February 2002 data for the future RME adult resident, future RME child resident and future CT child resident would exceed 1.0. These results were consistent with

the results obtained from the October 2000 groundwater data. The HHRA would not be substantially affected by using the February 2002 data in place of the October 2000 data.

As a result of excavation for a construction project, surface soil and shallow subsurface soil in and around the locations of samples IS25SS21 and IS25SB21 were removed and disposed offsite. Elevated concentrations of some metals, in particular silver, were observed in these samples. By including the concentrations of the soil affected by the construction project, the HHRA may overestimate the risks associated with the soil that remains on site. If the HHRA were revised to reflect current conditions, then benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene and silver would be removed from the COPC list. The majority of the exposure point concentrations for the remaining COPCs, however, would be minimally affected. The HIs and the cancer risks for each exposure scenario would be less than those specified in the HHRA, but the future RME child resident would still be characterized by an HI greater than 1.0. Retaining the IS25SS21 and IS25SB21 data in the HHRA appears to minimally affect the results.

8.7 Ecological Risk Assessment (Steps 1–3A)

8.7.1 Screening Problem Formulation

Problem formulation involves preparing descriptions of environmental setting, sources, fate and transport of site chemicals, chemical ecotoxicity, and potential receptors. This information is used to build the conceptual model. The conceptual model includes a discussion of exposure pathways, as well as assessment and measurement endpoints.

8.7.1.1 Environmental Setting

Site 25 is the drainage ditch, most of which is located in a ravine, that runs from the Rocket Motor Loading Building (Building 588) into the industrial wastewater outfall IW46 (Figure 8-2). Flow is intermittent, occurring only during storm water runoff events or when there was discharge from the building. Water draining from the area around Building 588 flows southwest down a steep slope into the ditch. The drainage then flows south for approximately 500 ft until it reaches the road that leads to Building 871. At the road, the direction of flow turns sharply west and continues for about 100 ft. At that point, the flow is conveyed under the road to an outfall on the Mattawoman Creek. Note that there are no more wastewater discharges occurring at the site.

The Rocket Motor Loading Building, constructed in 1944, contained facilities used for X-ray film developing. The X-ray section of this building is no longer in use. For the period beginning in 1944 and ending circa 1964, wastewater discharges from this facility included fixer (sodium thiosulfate), developer (hydroquinone), and silver, discharged in a silver thiosulfate complex. Building 588 has a temporary waste accumulation area. The concrete pad, which is located on the southwest corner of the building, is currently used as a satellite accumulation area for the storage of nonexplosive hazardous waste (i.e., waste acetone). Drainage in the pad area is directed to the south.

The ravine is forested. The forest is mature and dominated by oaks including white oak (*Q. alba*), red oak (*Quercus falcata*), and chestnut oak (*Quercus prinus*). The understory is dominated by American holly (*I. opaca*). The channel at the bottom of the ravine is

approximately 1 ft wide. The channel intercepts a ditch along Hersey Road, which runs parallel to the Mattawoman Creek. The portion of the ditch upgradient of the intersection supports wetlands vegetation.

8.7.1.2 Summary of Available Analytical Data

A total of 20 surface soil samples were collected from Site 25 (Figure 8-2). All were collected from 0 to 6 in. bgs. Samples were collected from the drainage ditch and the areas surrounding Buildings 588 and 871. Two additional samples were collected upslope of Site 25. The surface soil samples were analyzed for TCL VOCs and SVOCs, TAL metals, cyanide, and NG.

8.7.1.3 Ecotoxicity and Potential Receptors

Silver is of potential concern at and downslope of the site in the Mattawoman Creek. Silver adheres strongly to clay particles found in suspended particulates and sediments. The impact of silver is most likely to occur at the soil/water interface. It is acutely toxic to scuds (small freshwater crustaceans) at <6 μg/L and midges (fly larvae that inhabit freshwater sediments)at <5 μg/L. Aquatic plants are less sensitive to silver exposure. Not much information is available regarding the toxicity of silver to terrestrial animals. However, a study conducted on mice indicated that a dose of 18.1 mg/kg/day caused hyperactivity (Rungby and Danscher, 1984).

Receptors potentially exposed to soil contaminants at Site 25 include organisms that have significant direct contact with soil or consume prey that live in the soil or leaf litter. At Site 25, these could include plants, soil invertebrates, and birds or mammals that consume plants and invertebrates. If chemicals that biomagnify are present, top consumers such as raptors or foxes could also be exposed to potentially significant levels of chemicals in their diet.

Aquatic receptors in the Mattawoman Creek could also be exposed to chemicals transported from Site 25. The potential risk from chemicals disposed of in or transported to the Mattawoman Creek is being addressed under the Mattawoman Creek Study. However, there is no silver data available from the Mattawoman Creek Study in close proximity to Site 25 that can be used to determine if there is evidence of historical discharge of silver from the main building at Site 25. Therefore, additional sampling associated with the Site 25 ERA is planned to address this issue.

8.7.1.4 Preliminary Conceptual Model

Information on the habitat features and the fate and transport of the chemicals detected at the site were used to build the preliminary conceptual model (Figure 8-9). The conceptual model addresses complete exposure pathways, receptors, and endpoints.

Exposure Pathways. The soils at Site 25 are known to have been impacted by past disposal activities. Key exposure routes for ecological receptors include ingestion of chemicals adsorbed to soil (invertebrates) and direct contact with chemicals in the soil (invertebrates and plants). Other organisms that forage in the area are also potentially exposed to chemicals by direct contact, incidental ingestion of soil, and ingestion of invertebrates

and/or plants that have accumulated body burdens. There are no surface water bodies on the site.

Assessment and Measurement Endpoints. The conclusion of problem formulation includes the selection of assessment and measurement endpoints, based on the preliminary conceptual model. Based on the habitat and types of contaminants potentially present, seven assessment endpoints were chosen to evaluate the potential risk to ecological receptor populations from chemicals spilled or disposed of at Site 25. Each assessment endpoint and corresponding representative species or community is described below.

1. ***Growth, survival, and reproduction of soil invertebrate communities —*** Soil invertebrates, such as earthworms, promote soil fertility by breaking down organic matter and releasing nutrients. They also improve aeration, drainage, and aggregation of soil, and serve as a forage base for many terrestrial species. The soils at the site will support fewer insectivorous birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of soil invertebrate communities.

2. ***Growth, survival, and reproduction of terrestrial plant communities —***Plants provide food, cover, and nesting material for many animals. The soils at the site will support fewer birds and mammals if chemical concentrations are limiting the growth, survival, and reproduction of plants.

3. ***Growth, survival, and reproduction of avian terrestrial insectivores*** – These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. A juvenile American robin (*Turdus migratorius*) was chosen to represent this assessment endpoint. Robins live in a variety of habitats, including woodlands, swamps, suburbs, and parks. Robins forage on the ground in open areas, along edge habitats, or along the edges of streams. They forage along the ground for ground-dwelling invertebrates and search for fruit and foliage-dwelling insects in low tree branches (USEPA, 1993). While growing in the nest, earthworms constitute the majority of the diet of the juvenile robin.

4. ***Growth, survival, and reproduction of mammalian terrestrial insectivores—***These receptors consume insects or other soil invertebrates. They are second order consumers, and thus susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant direct contact with soils while foraging. Short-tailed shrew (*Blarina brevicauda*) was chosen to represent this assessment endpoint. Short-tailed shrews live in a wide variety of habitats and need cool, moist conditions (Randolf, 1973). They eat insects, worms, snails, and other invertebrates (Robinson and Brodie, 1982).

5. ***Growth, survival, and reproduction of avian terrestrial carnivores*** – These receptors are top level predators and are susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial food chains. The red-tailed hawk (*Buteo jamaicensis*) was chosen to represent this endpoint**.** Red-tailed hawks nest primarily in woodlands. They feed in open country on a wide variety of small- to medium-sized prey (USEPA, 1993).

6. ***Growth, survival, and reproduction of omnivorous terrestrial mammals —*** These receptors are second order consumers and thus are susceptible to exposure to

bioaccumulative chemicals. The white-footed mouse (*Peromyscus leucopus*) was chosen to represent this endpoint. White-footed mice serve as a prey for carnivorous birds and mammals.

7. ***Growth, survival, and reproduction of carnivorous terrestrial mammals —*** These receptors are top level consumers and are thus most susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial foodchains. The gray fox (*Urocyon cinereoargenteus*) was chosen to represent this endpoint.

Although potentially complete exposure pathways exist for reptiles and amphibians, they were not specifically selected as receptors because information on the toxicological effects of chemicals on adult amphibians and reptiles via ingestion is limited. The assessment indirectly evaluates these groups because there are receptors included in the assessment that have similar diets to reptiles and amphibians (such as the shrew).

The corresponding measurement endpoints associated with each assessment endpoint were defined as follows:

Assessment Endpoints		Measurement Endpoints
Growth, survival, and reproduction of soil invertebrate communities.	⇨	Comparison of HQs for soil invertebrates to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of soil invertebrates.
Growth, survival, and reproduction of terrestrial plant communities.	⇨	Comparison HQs for terrestrial plants to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of terrestrial plants.
Growth, survival, and reproduction of avian terrestrial insectivore.	⇨	Comparison of HQs for robin to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.
Growth, survival, and reproduction of mammalian terrestrial insectivore.	⇨	Comparison of HQs for short-tailed shrew to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.
Growth, survival, and reproduction of avian terrestrial carnivores.	⇨	Comparison of HQs for red-tailed hawk to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.
Growth, survival, and reproduction of omnivorous mammals.	⇨	Comparison of HQs for white-footed mouse to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.
Growth, survival, and reproduction of carnivorous terrestrial mammals.	⇨	Comparison of HQs for gray fox to a target HQ of 1. Receptor-specific HQs are calculated for individual chemicals by dividing an estimated maximum level of exposure (dose) by NOAELs and LOEALs.

8.7.2 Analysis

The ecological exposure estimation was conducted as described in Section 3.4. Site-specific modifications are addressed below.

8.7.2.1 Site-Specific Ecological Effects Evaluation

The TOC-adjustable soil screening values were adjusted using the average soil TOC of 4.4 percent.

8.7.2.2 Site-Specific Ecological Exposure Estimation

Exposure parameters (i.e., ingestion rates and dietary composition) for each receptor species are presented in Table 8-10. The diet of the American robin is for a 7-day old hatchling. It includes earthworms and soil, but no plant material.

8.7.3 Screening-Level Risk Calculations

The SERA indicated that some inorganics detected at the site may impact the growth, survival and/or reproduction of soil invertebrates, plants, insectivorous birds and mammals, omnivorous mammals, and carnivorous mammals (Tables 8-11 and 8-12). In addition, screening-level risk calculation indicated that three detected organic compounds, fluoranthene, phenanthrene, and bis(2-ethylhexyl)phthalate, may pose a risk to plants and/or soil invertebrates, and hexachlorobenzene may pose a risk to insectivorous birds. Preliminary COPCs for soil invertebrates and plants include multiple chemicals from all classes. The majority of these preliminary COPCs were chemicals that were not detected but had maximum detection limits in excess of screening values, or chemicals for which no medium-specific screening value was available. Preliminary COPCs for food chain effects included arsenic, cadmium, chromium, lead, mercury, selenium, silver, and zinc, and a few organic compounds for which no reference toxicity values were available. Due to the identification of preliminary COPCs, the risk assessment process was continued to Step 3A.

8.7.4 Refinement of Conservative Exposure Assumptions (Step 3A)

In Step 3A, exposure assumptions are refined and risk estimates (i.e., HQs) are recalculated. Risk is again characterized and uncertainties associated with the conclusions are described. If re-evaluation of the conservative exposure assumptions supports an acceptable risk determination then the site may exit the ecological risk assessment process (CNO, 1999).

8.7.4.1 Exposure Assumption Refinements

The results of Steps 1 and 2 (i.e., the SERA) indicated that, based on a set of conservative assumptions, there are multiple chemicals that may pose a risk to several receptor communities/species used in the screening assessment. The set of preliminary COPCs includes chemicals with HQs in excess of 1 and chemicals for which assessment data were unavailable.

Assumptions and methods that were modified for the calculation of medium-specific and food chain hazard quotients are listed below, along with justification for each modification.

- Maximum chemical concentrations were replaced by average chemical concentrations. For individual mammalian and avian receptors, average chemical concentrations

provide a better estimate of the likely level of chemical exposure because each of the receptors would be expected to forage in several different areas of the site, and, in many cases, off the site. With adequate spatial coverage, central tendency measures are appropriate for evaluating impacts to populations of soil invertebrates and plants. While locations of maximum concentration may be important to individuals, the average value at the site can be more instructive with regard to the level of impact that might be expected at the population level.

- Central tendency estimates for body weight and ingestion rate were used to develop exposure estimates, rather than minimum body weights and maximum ingestion rates. The use of central tendency parameters is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.

Exposure parameters are presented in Table 8-13.

8.7.4.2 Refined Risk Calculations

For soil invertebrates and plants, the mean concentrations of seven metals (aluminum, chromium, iron, mercury, silver, vanadium, and zinc) exceeded soil screening values (Table 8-14). HQs ranged from 1.3 to 133.

Refined risk calculations for food chain receptors are shown in Table 8-15. There were no exceedances of LOAEL-based HQs. For NOAEL-based HQs, the only exceedances were for the short-tailed shrew (arsenic and cadmium with HQs of 1.9 and 2, respectively).

8.7.4.3 Risk Characterization

The concentrations of aluminum, chromium, iron, mercury, silver, vanadium, and zinc exceeded soil screening values. The question that must be answered is the following: Do the concentrations of released-related inorganics in site soils pose an unacceptable risk to populations of plants and soil invertebrates at the site? Weights of evidence are discussed below.

Background Comparisons. Of the metals that exceeded soil screening values, aluminum, iron, and vanadium were present at concentrations that are consistent with NDWIH background levels (B&RE, 1997), as demonstrated below.

Inorganic	Site Average (mg/kg) (n = 20)	Surface Soil Background Average (mg/kg) (n = 12 or 14)	Ratio	Surface/ Subsurface Soil Background Average (mg/kg) (n = 24 or 28)	Ratio
Aluminum	6673	7874	0.8	10754	0.6
Chromium	22.7	12	1.9	16.9	1.3
Iron	13985	10290	1.4	17241	0.8
Mercury	0.13	0.043	3.0	0.04	3.3
Silver	13.9	NA	NA	0.35	39.7
Vanadium	26	19.2	1.4	25	1.0
Zinc	82.9	18.1	4.6	19.7	4.2

Inorganic	Site Average (mg/kg) (n = 20)	Surface Soil Background Average (mg/kg) (n = 12 or 14)	Ratio	Surface/ Subsurface Soil Background Average (mg/kg) (n = 24 or 28)	Ratio

There are two types of background data used in the comparison, surface soil and the combination of surface soil and subsurface soil. Much of the surface soil collected at Site 25 is subsurface soil relative to the surrounding topography. Samples were collected within a dry channel which has been eroded over the years. As the "surface soil" in the channel is likely a combination of eroded surface soil and subsurface soils, the comparison to both background data sets is appropriate.

Chromium, mercury, silver, and zinc were present at higher concentrations than those in the NDWIH background data set. Maximum concentrations were detected at sample locations IS25SS03, IS25SS02, IS25SS21, and IS25SS03, respectively. All of these samples were collected near Building 588 (Figure 8-2).

Distribution of Contamination The average chromium concentration at the site was 22.7 mg/kg. Chromium concentrations in surface soil exceeded the screening value across the site. However, excluding the location of maximum detection (IS25SS03 at 124 mg/kg), the average sitewide concentration of 17.4 mg/kg is consistent with NDWIH background for combined surface and subsurface soil (16.9 mg/kg). Sample IS25SS03 may represent a potential hot spot area for ecological receptors. However, this area is of marginal value for soil invertebrates. The area is developed and maintained with compacted soil and little vegetation.

Mercury concentrations exceeded the soil screening value at only seven of the twenty sampling locations. The exceedances were generally near the buildings, with mercury concentrations below the screening value away from the buildings. The average mercury concentration was 0.13 mg/kg, slightly above the screening value of 0.10 mg/kg. Therefore, other than the area immediately surrounding the buildings, where a slightly elevated risk may exist, there appears to be minimal risk to plants and soil invertebrates from mercury. Additionally, the areas surrounding the buildings are of marginal value for soil invertebrates.

Silver was detected in 9 of 19 surface soil samples. The average concentration was 13.9 mg/kg. With the exception of sample IS25SS14 (1 mg/kg), all detections were within 100 ft of site buildings, mostly in areas that have been developed or are maintained to some degree. The soils in these areas are likely compacted and support little cover. The site average was heavily weighted by sample IS25SS21 (201 mg/kg). However, the soil in the area where this sample was collected has since been removed because of the adjacent military construction project. Excluding this sample, the sitewide average is 3.0 mg/kg. Excluding the next highest sample (IS25SS02 at 20.6 mg/kg), the average sitewide concentration drops to 2.0 mg/kg, the screening value for silver. Sample locations which exceeded the screening value for silver included IS25SS01, IS25SS02, IS25SS03, IS25SS07, IS25SS21, and IS25SS22. Only IS25SS07 was located in the drainage leading away from the site. With the exception of one detection at IS25SS14 (1 mg/kg), silver was not detected along the majority of the channel leading to the Mattawoman Creek.

The average zinc concentration was 82.9 mg/kg. The average concentration excluding the location of maximum detection (IS25SS03 at 529 mg/kg) was 59 mg/kg. Zinc concentrations exceeded the soil screening value in one-half of the samples collected. The spatial distribution of zinc concentrations above the screening value was similar to that of mercury, with the majority of the exceedances occurring near the site buildings, where the soil quality is marginal for soil invertebrates.

Toxicological Evaluation The average mercury concentration on the site was 0.13 mg/kg. The screening value of 0.1 mg/kg was obtained from Efroymson et al. (1997b). In the study, earthworms were exposed to 0.5 mg/kg mercuric chloride ($HgCl_2$). Survival and cocoon reproduction were reduced, but the number of juveniles produced was not affected. In developing a screening level, Efroymson et al. (1997b) applied a safety factor of 5 to this study, resulting in a screening value of 0.1 mg/kg. The mercury in the laboratory test was applied as a soluble salt. Mercuric chloride is highly toxic (Merck 1989). Because the average concentration at the site is below the concentration that produced an effect in the study and because divalent forms usually do not exist as ionic species in nature (Stein et al., 1996), the observed mercury concentrations at Site 25 are not expected to pose a significant risk to soil invertebrates. In addition, the average mercury concentration at the site is lower than the 0.3 mg/kg screening benchmark for toxicity to plants provided by Efroymson et al. (1997a).

The average zinc concentration was 82.9 mg/kg. The average concentration excluding the location of maximum detection (IS25SS03 at 529 mg/kg) was 59 mg/kg. The screening level of 50 mg/kg was obtained from a study summarized in Efroymson et al. (1997a). The screening value is equivalent to a 10th percentile LOEC (based on several plant studies). The 50 percentile (akin to an ER-M) would be 250 mg/kg. The common form used in the laboratory studies was a soluble form of zinc called zinc sulfate ($ZnSO_4$), which allowed the zinc to be readily bioavailable. Overall, zinc is not expected to pose a significant risk to populations of plants at Site 25. The screening value is conservatively based on a soluble form of zinc, and the sitewide average, excluding the maximum concentration, is only 1.2 times greater than the conservative screening value. In addition, zinc at the site is not expected to pose a significant risk to soil invertebrates. The average site concentration of 82.9 mg/kg is less than the screening benchmark of 200 mg/kg for earthworms provided by Efroymson et al. (1997b).

8.7.4.4 Uncertainty

There is uncertainty associated with the fact that there were some chemicals that were not detected, but had mean concentrations (based on one-half the detection limits) that exceeded direct contact screening values. These occurrences were limited (5 percent of the cases). Of these, the average detection limit to site average ratio was low at 2.7.

Screening values were also not available for some organics. The majority of these occurrences were for compounds that were not detected. The relatively few detections of SVOCs, VOCs, and explosives tended to be at low concentrations, and, for those with screening values, average-based HQs were all less than 1. Overall, the frequency of detection and magnitude of detections clearly indicated that organics are not of concern at the site. As such, the lack of screening values for some organics carries a limited amount of uncertainty.

The few unavailable ingestion-based screening values were associated with compounds that were not detected at the site.

There is also some uncertainty associated with the toxicological evaluation in the risk characterization section. While some hypotheses about the form of a contaminant (e.g., insoluble or soluble) at the site can be generated relative to the form used in the toxicity testing effort from which the screening values were generated, the form at the site is unknown unless tested. While the weight of these discussion in risk management may not be great, consideration of the applicability of the screening values to the site is important.

8.7.4.5 Risk Conclusion

The results of the risk assessment indicate that chemicals in the soil at Site 25 pose minimal risk to ecological receptors. Supporting evidence is as follows:

- There were no LOAEL-based HQs in excess of 1 for upper trophic level for the average exposure case
- Concentrations of three metals that exceeded screening values for soil invertebrates and plants were consistent with background
- Toxicity evaluations and/or reviews of the distributions of four metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely. The majority of exceedances were observed in maintained areas that are of poor quality for soil invertebrate communities. The potential value of removing soils in these areas is low for the following reasons: 1) most exceedances of screening values are modest; 2) soils in this area will continue to be of low ecological quality due to activity at the site; 3) there could be potential impacts to the surrounding wooded area if the area of excavation expands beyond the portion of the site currently used; and 4) data indicate that the site is not a significant continuing source of contamination to the Mattawoman Creek.
- Review of the distribution of chemicals suggests that there is low surface transport potential from the site to the Mattawoman Creek. However, there is some uncertainty in this conclusion, which will be reduced by future sampling efforts. Several additional surface sediment samples are planned for the location where water flows down the Site 25 ravine and eventually discharges to the Mattawoman Creek. Although silver was not detected in the furthest downgradient sample collected in the ravine, it is possible that silver disposed of outside the building may have been transported into the Mattawoman Creek during storm events. Approximately six additional sediment samples are planned for the area where the ravine discharges into the creek. The samples will likely be collected in a fan pattern, with one located at the outlet, two about 5 meters away, and three more about 10 meters away. These data will help reduce the uncertainty surrounding the conclusion that historical surface transport from the site to the Mattawoman Creek is unlikely. The results of this sampling will be incorporated into the Site 25 ERA.

Additional information regarding a potential transport pathway has become available since the start of the RI process for Site 25. The potential transport pathway involves the existence of a 6-in. terra cotta pipe that may have historically discharged wastewater containing

photographic fixer solution to the Mattawoman Creek. The existence of this pipe was confirmed during a site visit on February 11, 2002. The outlet of this pipe is located approximately 5 meters from the outlet of the ravine described above. Additional sediment samples are planned for this area (in a fan pattern similar to that described above) to investigate the potential historical transport of metals in the fixer solution to the sediments of the creek. The results of this sampling will be incorporated into the Site 25 ERA.

8.8 Summary and Conclusions

8.8.1 General

A RI was conducted at Site 25. The objective was to determine whether the untreated wastewater discharged from Building 588 into the IW46 drainage area contaminated the underlying soil and groundwater. Field activities were conducted between July 17 and October 24, 2000, and on February 26, 2002. The work consisted of surface and subsurface soils sampling, groundwater monitoring well installation, and groundwater sampling.

The subsurface at Site 25 in the area of the groundwater monitoring wells is characterized by the light gray to light brown to orange dense clay and silty clay with discontinuous fine to medium-grained well sorted sand lenses.

Groundwater appears to move southward from the site to discharge into the Mattawoman Creek. The disparity in water levels observed between wells IS25MW01 and IS25MW02 likely is due to well IS25MW01 actually penetrating into a confined water-bearing unit, whereas well IS25MW02 appears to be screened at the water table.

The objective of the RI was met. Very little silver was detected in surface soil in the IW46 drainage swale, and that was limited to one sample near the head of the swale. Also, no silver was detected in groundwater downgradient of the site.

8.8.2 Nature and Extent of Contamination

The nature and extent of contamination at Site 25 was evaluated based on a 'short list' of analytes identified by concentrations and persistence at the site. Additionally, inorganics were compared to facilitywide background concentrations.

Based on analytical data it appears that arsenic, cadmium, and iron were detected in all surface and subsurface soil environmental samples. The presence of these metals in every sample may be indicative of elevated background levels or past land use.

Silver was detected in nine surface soil and two subsurface soil samples. The silver detections in the soil were limited to those sample locations in the woods just south of Building 3006 and the sample locations east of Building 588 along the fence. The surface soil and shallow subsurface soil in and around the sample location IS25SO21 (Figure 8-2) were removed during excavation for an adjacent construction project. The highest silver concentration was observed in the sample from this location. One low concentration of 2.0 mg/kg was also detected in the north of the IW46 trench. The presence of silver in the surface and subsurface soils is likely due to past land use.

Eight SVOCs were detected above their detection limits in two surface soil sample locations (IS25SS08 and IS25SS21). As mentioned above, the surface soil in and around the location of sample IS25SS21 was removed from Site 25 during excavation for a construction project. Vehicular traffic may be responsible for these SVOC detections as both sample locations are adjacent to roads. One SVOC (pyrene) was detected in the subsurface soil at a level below its detection limit.

VOC detections in the surface and subsurface were very low.

Comparisons of the groundwater and soil data to the corresponding background data indicated that the analytes observed at elevated concentrations in the soils differed from those in the groundwater. Except for calcium, iron and potassium, the western well (IS25MW01) exhibited greater concentrations of inorganics than did IS25MW02. In fact, cobalt (only in October 2000) and magnesium were the only analytes in IS25MW02 to exceed background concentrations. These concentration difference between the two monitoring wells may have resulted from differences in pH: the groundwater in IS25MW01 is substantially more acidic than the groundwater in IS25MW02. For many metals, such as manganese and nickel, acidic conditions promote dissolution. It is hypothesized that the acidic conditions of the soil, promoted by the heavy leaf litter across the site, and of the groundwater enhanced the dissolution of naturally-occurring metals in the vicinity of IS25MW01.

8.8.3 Human Health Risk Assessment

The risk assessment indicates that the only potential unacceptable threats to human health are those posed to the future child and adult residents. The dominant contributor to these health hazards is manganese in groundwater, while iron in soil also slightly contributes to this hazard. The four SVOC soil COPCs and the metals silver and cadmium contribute negligibly to these hazards. The other metals that are represented in Appendix G.4d, Tables 10.1.RME to 10.4.CT are barium (groundwater only), manganese, iron, aluminum (soil only), arsenic (soil only), chromium (soil only), thallium (soil only), and vanadium (soil only). It should be noted that, based on the historical land use, silver was expected to have the greatest potential for adverse impact.

8.8.4 Ecological Risk Assessment

The results of the risk assessment indicate that chemicals in the soil at Site 25 pose minimal risk to ecological receptors. Supporting evidence is as follows:

- There were no LOAEL-based HQs in excess of 1 for upper trophic level for the average exposure case;
- Concentrations of three metals that exceeded screening values for soil invertebrates and plants were consistent with background;
- Toxicity evaluations and/or reviews of the distributions of four metals that were present in excess of screening values and background suggest that significant impacts to plants and soils invertebrates are unlikely. The majority of exceedances were observed in maintained areas that are of poor quality for soil invertebrate communities. In addition,

one of the locations of elevated metals concentrations has undergone soil removal as part of a construction project; and

Review of the distribution of chemicals suggests that there is low surface transport potential from the site to the Mattawoman Creek. However, additional sampling is recommended as described in section 8.7.4.5 to reduce the uncertainty of this conclusion.

8.9 Recommendations

No further investigation is recommended for Site 25. Following the soil sampling in 2000, construction activities adjacent to Site 25 resulted in the removal of soil in the vicinity of sample IS25SS21/SB21, an area where many of the highest concentrations of metals were detected. The excavated soil was disposed offsite in accordance with federal and state regulations.

Although there are potential human health risks from future residential use of groundwater, there is no reason to suspect the risk is related to CERCLA release. Therefore, no further action is recommended for this site because risks to human health and the environment were within acceptable values.

8.10 References

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Table 8-1
Detected Compounds in Site 25 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25SO01		IS25SO02		IS25SO03		IS25SO04		IS25SO05		IS25SO06		IS25SO07	
Sample ID	IS25SS010001	IS25SS010001P	IS25SS020001		IS25SS030001		IS25SS040001		IS25SS050001		IS25SS060001		IS25SS070001	
Sample Date	07/18/00	07/18/00	07/18/00		07/18/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
Acetone	7.6 J	8.9 J	3.9 J											
Methyl acetate														
Methylene chloride							1.9 J		1.9 J					
Toluene														
Semi-volatile Organic Compounds (UG/KG)														
2-Methylnaphthalene														
Acenaphthene														
Acenaphthylene														
Acetophenone											51 J			
Anthracene														
Benzaldehyde			55 J										400 J	
Benzo(a)anthracene					200 J								49 J	
Benzo(a)pyrene			55 J		190 J								53 J	
Benzo(b)fluoranthene	240 J	210 J	78 J		230 J								62 J	
Benzo(g,h,i)perylene					130 J									
Benzo(k)fluoranthene	200 J	220 J	64 J		220 J								60 J	
Butylbenzylphthalate														
Carbazole														
Chrysene	190 J	200 J	97 J		280 J						54 J		95 J	
Di-n-butylphthalate					540 J									
Dibenz(a,h)anthracene														
Dibenzofuran														
Diethylphthalate			170 J										530	
Dimethyl phthalate														
Fluoranthene	200 J	200 J	110 J		380 J						68 J		100 J	
Fluorene														
Indeno(1,2,3-cd)pyrene			51 J		150 J								49 J	
Naphthalene														
Phenanthrene			71 J		220 J								65 J	
Pyrene	160 J	170 J	84 J		230 J						61 J		90 J	
bis(2-Ethylhexyl)phthalate					17,000									

J - Estimated Value
K - Biased high
L - Biased low

Table 8-1
Detected Compounds in Site 25 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25SO01		IS25SO02	IS25SO03	IS25SO04	IS25SO05	IS25SO06	IS25SO07
Sample ID	IS25SS010001	IS25SS010001P	IS25SS020001	IS25SS030001	IS25SS040001	IS25SS050001	IS25SS060001	IS25SS070001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Total Metals (MG/KG)								
Aluminum	12,000	12,800	13,600	5,530	6,330	7,490	4,880	7,850
Antimony	2.1 L	1.5 L						
Arsenic	7.3	8.7	9	4.6	4.5	4.5	4.5	10.2
Barium	65.8	62.8 J	57.5 J	73.4	40.4 J	30.3 J	38 J	111
Cadmium	5.3	4.4	2.6	47.2	0.29 J	0.37 J	1.2 J	0.82 J
Calcium	3,410 J	3,000 J	1,520 J	2,370 J			1,910	2,140
Chromium	28.5	28.9	30.1	124	10.3	16.1	9.4	18.5
Cobalt	8.1 J	7.7 J	4.1 J	8 J	3.4 J	2.6 J	3 J	9.6 J
Copper	49	49	52.6	108		15.2	58	31.6
Cyanide								
Iron	20,100	22,200	24,400	20,000	9,340	16,500	12,500	15,600
Lead	73.9 K	74.2 K	75.9 K	174 K	19 K	18.5 K	35.2 K	60.2 K
Magnesium	2,090	1,760	793 J	830 J		477 J	549 J	608 J
Manganese	213	164	208	407	269	323	160	971
Mercury	0.31	0.35	0.39	0.34	0.084 J	0.087 J	0.12 J	0.27
Nickel	34	32.9	10.9 J	16.2	4.5 J	5.6 J	5.8 J	11.9
Potassium	748 J	735 J	730 J	358 J	294 J	677 J	508 J	639 J
Selenium			1.6			1.2 J		
Silver	8.8	9.8	20.6	2.4 J				13.7
Thallium								
Vanadium	58.3	72.8	42	27.8	19.9	27.5	24.8	34.8
Zinc	117 J	108 J	101 J	529 J				101 J
Wet Chemistry (MG/KG)								
% Moisture	37.6	40.4	34	27.7	23.8	25	25.7	31.3
% Solids	58.3	69.3	70.7	80.4	75.6	73.1	75.9	70.4
Total organic carbon (TOC)	120,000	103,000	124,000	37,400	34,100	29,000	90,000	78,400
pH	6.2	6.3	5	6.6	4.6	6	4.9	5.8

J - Estimated Value
K - Biased high
L - Biased low

Table 8-1
Detected Compounds in Site 25 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25SO08		IS25SO09		IS25SO10		IS25SO11		IS25SO12		IS25SO13		IS25SO14			
Sample ID	IS25SS080001		IS25SS090001		IS25SS100001		IS25SS110001		IS25SS120001		IS25SS130001		IS25SS140001		IS25SS140001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
Acetone																
Methyl acetate																
Methylene chloride																
Toluene																
Semi-volatile Organic Compounds (UG/KG)																
2-Methylnaphthalene																
Acenaphthene																
Acenaphthylene	90	J														
Acetophenone	45	J									100	J	49	J	59	J
Anthracene	54	J														
Benzaldehyde																
Benzo(a)anthracene	410	J			100	J							47	J	56	J
Benzo(a)pyrene	400	J			110	J			45	J			51	J	56	J
Benzo(b)fluoranthene	530				110	J			50	J			57	J	66	J
Benzo(g,h,i)perylene	210	J			120	J			51	J			69	J	79	J
Benzo(k)fluoranthene	380	J			120	J			47	J			60	J	72	J
Butylbenzylphthalate																
Carbazole																
Chrysene	580				160	J			65	J			79	J	93	J
Di-n-butylphthalate																
Dibenz(a,h)anthracene	81	J														
Dibenzofuran																
Diethylphthalate																
Dimethyl phthalate																
Fluoranthene	550				200	J			64	J	61	J	82	J	98	J
Fluorene																
Indeno(1,2,3-cd)pyrene	260	J			120	J			46	J			65	J	77	J
Naphthalene																
Phenanthrene	210	J			130	J							46	J	53	J
Pyrene	470				210	J			88	J	67	J	110	J	120	J
bis(2-Ethylhexyl)phthalate	610				570											

J - Estimated Value
K - Biased high
L - Biased low

Table 8-1
Detected Compounds in Site 25 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25SO08		IS25SO09		IS25SO10		IS25SO11		IS25SO12		IS25SO13		IS25SO14			
Sample ID	IS25SS080001		IS25SS090001		IS25SS100001		IS25SS110001		IS25SS120001		IS25SS130001		IS25SS140001		IS25SS140001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Total Metals (MG/KG)																
Aluminum	9,980		6,670		5,420		4,290		3,710		4,630		4,600		5,280	
Antimony																
Arsenic	8.8		6.5		6.8		4.6		4.4		4.3		5.7		6.1	
Barium	70		42.3	J	37.2	J	43.5	J	27.4	J	92.7		46.7	J	49.9	J
Cadmium	1.2	J	0.5	J	0.94	J	0.49	J	0.31	J	0.36	J	0.95	J	0.82	J
Calcium	1,250	J			1,130	J	1,740				2,550		1,100		1,310	J
Chromium	23.4		14		20.3		10.4		9.9		8.5		12.5		15.2	
Cobalt	4.1	J	4.8	J	3.4	J	3.1	J	3.3	J	5.1	J	4.7	J	4.9	J
Copper	20.6		7.6		19.6		9.6		6.1		8.1	J	11.1		14.8	
Cyanide																
Iron	21,200		17,200		12,600		9,260		9,470		8,880		12,400		13,100	
Lead	23.1	K	15	K	24.2	K	14	K	10.5	K	17.5	K	19.9	K	20	K
Magnesium	988	J	531	J	640	J	585	J			654	J	537	J	601	J
Manganese	340		807		228		400		293		461		636	J	556	
Mercury	0.1	J			0.064	J	0.081	J			0.12	J	0.073	J	0.091	J
Nickel	6.9	J	3.9	J	6.5	J	4.3	J	3.1	J	4.6	J	4.8	J	5.7	J
Potassium	474	J	442	J	414	J	318	J	247	J	376	J	303	J	387	J
Selenium			1.1	L												
Silver					2	J									1	J
Thallium																
Vanadium	31.7		24.3		20.2		15.1		13.7		17.9		17.6		19.8	
Zinc	141	J			95.1	J							92.4	J		
Wet Chemistry (MG/KG)																
% Moisture	23.6		16.8		18.1		23.7		17.9		43.2		22		27	
% Solids	79.6		79.8		79.1		83.8		81.5		57.7		78.5		78.3	
Total organic carbon (TOC)	23,400		6,180		23,200		7,840		13,900		78,200		16,800		24,300	
pH	6.8		6		6.5		6.8		6.6		5		6.2		6.3	

J - Estimated Value
K - Biased high
L - Biased low

Table 8-1
Detected Compounds in Site 25 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25SO15		IS25SO16		IS25SO17		IS25SO18		IS25SO19		IS25SO20		IS25SO21		IS25SO22	
Sample ID	IS25SS150001		IS25SS160001		IS25SS170001		IS25SS180001		IS25SS190001		IS25SS200001		IS25SS1800012		IS25SS1900012	
Sample Date	07/19/00		07/19/00		07/19/00		07/31/00		07/31/00		10/11/00		10/11/00		10/11/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
Acetone					2.6	J										
Methyl acetate					2.1	J										
Methylene chloride																
Toluene	1.5	J														
Semi-volatile Organic Compounds (UG/KG)																
2-Methylnaphthalene													44	J		
Acenaphthene													370	J		
Acenaphthylene																
Acetophenone	68	J			68	J			46	J						
Anthracene													440			
Benzaldehyde									59	J	2,400					
Benzo(a)anthracene					52	J							1,300			
Benzo(a)pyrene					54	J							160	J		
Benzo(b)fluoranthene					60	J							1,200		81	J
Benzo(g,h,i)perylene					65	J										
Benzo(k)fluoranthene					66	J							710			
Butylbenzylphthalate													70	J		
Carbazole													200	J		
Chrysene					90	J							1,200		66	J
Di-n-butylphthalate													86	J		
Dibenz(a,h)anthracene													220	J		
Dibenzofuran													180	J		
Diethylphthalate																
Dimethyl phthalate													96	J		
Fluoranthene	51	J			95	J					39	J	2,300		87	J
Fluorene													290	J		
Indeno(1,2,3-cd)pyrene					68	J							210	J		
Naphthalene													92	J		
Phenanthrene					45	J							2,300		59	J
Pyrene	65	J			120	J							990		95	J
bis(2-Ethylhexyl)phthalate							51	J			450		340	J		

J - Estimated Value
K - Biased high
L - Biased low

Table 8-1
Detected Compounds in Site 25 Surface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25SO15		IS25SO16		IS25SO17		IS25SO18		IS25SO19		IS25SO20		IS25SO21		IS25SO22	
Sample ID	IS25SS150001		IS25SS160001		IS25SS170001		IS25SS180001		IS25SS190001		IS25SS200001		IS25SS1800012		IS25SS1900012	
Sample Date	07/19/00		07/19/00		07/19/00		07/31/00		07/31/00		10/11/00		10/11/00		10/11/00	
Chemical Name																
Total Metals (MG/KG)																
Aluminum	4,150		5,350		5,270		9,030		4,920		8,290		6,910		5,020	
Antimony													1.5	K		
Arsenic	7.2		3.7		5.1		6.5		4.4		21.4		23.8		5.9	
Barium	43.7	J	84.1		25.8	J	42.2	J	36.2	J	27.9	J	46	J	45.7	J
Cadmium	0.46	J	0.48	J	0.21	J			2.5		0.092	J	3.7		1.6	
Calcium	1,400	J	1,980	J			175	J	270	J			2,020		1,810	
Chromium	13.6		9.6		9.9		17.4		9.3		15		31.9		34.9	
Cobalt	4.2	J	10	J	4.6	J	5	J	5	J	3.6	J	6.8	J	13.2	J
Copper	8.4		10		6.1	J	6.8		5.4	J	10.2		53.7		11.6	
Cyanide													0.22	J		
Iron	10,600		10,600		10,400		15,900	J	9,610	J	12,900		13,100		9,850	
Lead	12.9	K	16	K	15.9	K	28.2	K	35	K	25.9	K	90.2	K	29.8	K
Magnesium	487	J	698	J			634	J	529	J	678	J	2,560		6,680	
Manganese	568	J	521		270		196	J	619	J	156		348		328	
Mercury					0.084	J			0.083		0.091	J	0.095	J	0.093	J
Nickel	4.2	J	8.8	J	3.8	J	5.1	J	5	J	9.5	K	39		120	
Potassium	347	J	452	J	388	J	420	J	190	J	379	J	389	J	353	J
Selenium													2.3		1.4	K
Silver											0.9	J	201		8.5	
Thallium			1.9	J												
Vanadium	15.9		17.7	J	19.5		29.5		22.7		28.2		27.2		19.5	
Zinc							26.8	J	21.3	J	44.2	J	196	J	56.4	J
Wet Chemistry (MG/KG)																
% Moisture	33.7		43.8		22		20		25.8		11.1		18.5		27.6	
% Solids	70.1		70.6		76.1		79.2		77.4							
Total organic carbon (TOC)	21,100		33,300		20,200		15,700		23,900							
pH	6.6		6.3		4.2		4.7		4.7							

J - Estimated Value
K - Biased high
L - Biased low

Table 8-2
Detected Compounds in Site 25 Subsurface Soil Samples
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25SO01		IS25SO04		IS25SO07		IS25SO20				IS25SO21		IS25SO22	
Sample ID	IS25SB010203		IS25SB040203		IS25SB070203		IS25SB200203		IS25SB200203P		IS25SB180203		IS25SB190203	
Sample Date	10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/2000		10/11/00	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
Tetrachloroethene							1.8	J						
Trichloroethene							3.1	J						
Semi-volatile Organic Compounds (UG/KG)														
Pyrene					130	J								
Total Metals (MG/KG)														
Aluminum	13,400		10,700		11,000		11,400		12,300		15,000		11,400	
Antimony			1.1	K	0.86	K	0.85	K	1.4	K	0.98	K	0.76	K
Arsenic	6.9		5.5		5.7		5.9		7.5		7.6		5.6	
Barium	34.8	J	23	J	24.5	J	24.8	J	26.8	J	37.2	J	35.6	J
Cadmium	0.18	J	0.092	J	0.12	J	0.14	J	0.075	J	0.17	J	0.32	J
Calcium											333	J		
Chromium	22.6		13.7		13.4		17.2		19		17.5		18.2	
Cobalt	2.8	J	2.7	J	3.2	J	2.7	J	2.9	J	3.1	J	3.1	J
Copper	13.6		10.8		12.5		11.5		12.7		11.7		9.1	
Iron	30,100		21,100		22,800		25,100		27,000		22,100		19,400	
Lead	11.1	K	10.3	K	10.4	K	10.3	K	10.7	K	10.7	K	11.9	K
Magnesium	380	J	349	J	434	J	354	J	405	J	531	J	496	J
Manganese	71.5		76		103		81.2		87.1		71.4		99.5	
Mercury							0.075	J	0.064	J	0.1	J		
Nickel	5.8	K	5.3	K	6.5	K	5.1	K	6.1	K	5.8	K	7.4	K
Potassium	592	J	677	J			529	J	551	J			399	J
Selenium	1.9	K	1.4	K	2.1		1.4	K	1.5	K	1.4	K	1.1	K
Silver											18.3		4.8	
Vanadium	43.3		30.1		30.9		36.8		39.5		35.5		32.7	
Zinc	26.6	J	23.2	J	26.9	J	23.8	J	26.5	J	34.4	J	27.4	J
Wet Chemistry (MG/KG)														
% Moisture	16.1		17.5		16.5		16.8		17		16.2		15.8	

J - Estimated Value
K - Biased high
L - Biased low

Table 8-3
Detected Compounds in Site 25 Monitoring Well Samples (Rounds 1 and 2)
NDWIH
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Maryland

Station ID	IS25MW01	IS25MW02
Sample ID	IS25MW011000	IS25MW021000
Sample Date	10/24/00	10/24/00
Chemical Name		
Volatile Organic Compounds (UG/L)		
1,1,2-Trichloro-1,2,2- trifluoroethane		3.6 J
Total Metals (UG/L)		
Aluminum	292	
Barium	352	98.8 J
Beryllium	2.4 J	
Calcium	11,300	9,460
Cobalt	64.7	28.5 J
Copper	4 J	
Iron	111	1,160
Magnesium	11,400	5,380
Manganese	2,040	343
Nickel	28.8 J	5 J
Potassium	3,160 J	5,540
Sodium	120,000	23,100
Vanadium		0.94 J
Zinc	77.7	
Dissolved Metals (UG/L)		
Aluminum	301	
Barium	369	95.3 J
Beryllium	2.5 J	
Calcium	11,700	9,200
Cobalt	68.2	40.5 J
Copper	4.4 J	
Iron		1,120
Magnesium	11,900	5,220
Manganese	2,110	332
Nickel	29 J	5.8 J
Potassium	3,290 J	5,350
Sodium	125,000	22,200
Vanadium		0.97 J
Zinc	81.5	

Station ID	IS25MW01	IS25MW02	
Sample ID	IS25MW010202	IS25MW020202P	IS25MW020202
Sample Date	02/26/02	02/26/02	02/26/02
Chemical Name			
Total Metals (UG/L)			
Barium	243	110 J	98.6 J
Beryllium	1.8 J		
Calcium	7,420	7,790	7,100
Cobalt	44.4 J	6.2 J	5.7 J
Iron	161	1,030	1,000
Magnesium	7,510	5,300	4,720 J
Manganese	1,470	262	239
Nickel	17 J		
Potassium	2,430 J	5,060	4,850 J
Sodium	84,900	20,800	19,000
Zinc	47.7	25.2	26.1
Dissolved Metals (UG/L)			
Barium	215	104 J	94.9 J
Beryllium	1.6 J		
Calcium	7,050	7,760	7,140
Cobalt	41 J	6 J	5.7 J
Iron	60.4 J	423	338
Magnesium	7,200	5,180	4,750 J
Manganese	1,410	268	242
Nickel	13.8 J		
Potassium	2,230 J	5,090	4,700 J
Sodium	81,400	20,700	19,200
Zinc	33.7		

J - Estimated Value
K - Biased high
L - Biased low

TABLE 8-4
Conceptual Site Model for Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Surface Soil:

- Transport of organic and inorganic contaminants via erosion and deposition as sediment in the drainage swale. Once deposited as sediment, limited desorption and dissolution into surface water during precipitation events.
- Limited leaching of organic and inorganic contaminants from the surface soil to the subsurface soil via the infiltration of precipitation.
- Transport of contaminants to the drainage swale and surface water as dissolved compounds in stormwater runoff.
- Some bioaccumulation of inorganic and organic compounds in ecological receptors.
- Very slow biodegradation of organic compounds.

Subsurface Soil:

- Limited leaching of inorganic contaminants to the groundwater via the infiltration of precipitation and direct contact with groundwater when the water table is high.

Groundwater:

- Movement of dissolved contaminants with the groundwater flow. Contaminant concentration will decrease with distance from the source area due to the dilution caused by advection and dispersion and due to the removal of inorganics from the aqueous phase via precipitation and transformation.

Table 8-5
Summary of Data Quantitatively Used in Risk Assessment - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Medium	Date of Sampling	Sample Locations	Parameters
Soil			
Subsurface Soil (Below 2 feet)	10/11/2000	IS25SB010203	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SB040203	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SB070203	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SB180203	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SB190203	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SB200203	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SB200203P	EXPLO, METAL, SVOA, VOA
Surface Soil (0 to 6 inches)	07/18/2000	IS25SS010001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS25SS010001P	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS25SS020001	EXPLO, METAL, SVOA, VOA
	07/18/2000	IS25SS030001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS060001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS050001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS040001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS070001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS080001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS090001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS100001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS110001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS120001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS130001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS140001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS140001P	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS150001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS160001	EXPLO, METAL, SVOA, VOA
	07/19/2000	IS25SS170001	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SS1800012	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SS1900012	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SS200001	EXPLO, METAL, SVOA, VOA
Background Soil			
Surface Soil (0 to 6 inches)	07/31/2000	IS25SS180001	EXPLO, METAL, SVOA, VOA
	07/31/2000	IS25SS190001	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SS180002	EXPLO, METAL, SVOA, VOA
	10/11/2000	IS25SS190002	EXPLO, METAL, SVOA, VOA
Groundwater			
	10/24/2000	IS25MW011000	VOA, SVOA, METALS, NITROGLYCERIN
	10/24/2000	IS25MS021000	VOA, SVOA, METALS, NITROGLYCERIN

Table 8-6
Summary of Chemicals of Potential Concern for the HHRA-Site 25 (based on comparison to RBCs)
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Groundwater	Soil	
	Surface Soil	Surface and Subsurface
Barium	Benzo(a)anthracene	Benzo(a)anthracene
Iron	Benzo(a)pyrene	Benzo(a)pyrene
Manganese	Benzo(b)fluoranthene	Benzo(b)fluoranthene
	Dibenz(a,h)anthracene	Dibenz(a,h)anthracene
	Aluminum	Aluminum
	Arsenic	Arsenic
	Cadmium	Cadmium
	Chromium	Chromium
	Iron	Iron
	Manganese	Manganese
	Silver	Silver
	Thallium	Thallium
	Vanadium	Vanadium

Table 8-7
Exposure Pathways-Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Exposure Route	Current			Future					
		Industrial Worker	Trespasser/ Visitor		Construction Worker	Industrial Worker	Trespasser/ Visitor		Resident	
			Adult	Adolescents			Adult	Adolescents	Adult	Child
Groundwater										
	Ingestion								X	X
	Dermal				X				X	X
	Inhalation				X				X	
Surface Soil										
	Ingestion	X	X	X						
	Dermal	X	X	X						
	Inhalation	NC	NC	NC						
Combined Surface and Subsurface Soil										
	Ingestion				X	X	X	X	X	X
	Dermal				X	X	X	X	X	X
	Inhalation				NC	NC	NC	NC	NC	NC

X Quantitative evaluation (if COPCs selected for pathway).

NC No COPCs retained for this pathway, therefore, not evaluated quantitatively.

Table 8-8
Summary of RME Cancer Risks and Hazard Indices-Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current Trespasser/Visitor Adolescent	Surface Soil	Ingestion	6.8E-07				0.052	
		Dermal Contact	1.9E-07				0.037	
		Inhalation	NA				NA	
		Total	8.7E-07				0.089	
	All Media	Total	8.7E-07				0.089	
Current Trespasser/Visitor Adult	Surface Soil	Ingestion	1.3E-06				0.038	
		Dermal Contact	5.2E-07				0.038	
		Inhalation	NA				NA	
		Total	1.9E-06			Arsenic	0.076	
	All Media	Total	1.9E-06				0.076	
Current Industrial Worker	Surface Soil	Ingestion	6.6E-06			Arsenic	0.18	
		Dermal Contact	6.1E-06			Benzo(a)Pyrene, Dibenz(a,h)anthracene, Arsenic	0.43	
		Inhalation	NA				NA	
		Total	1.3E-05			Benzo(a)Pyrene, Dibenz(a,h)anthracene, Arsenic	0.61	
	All Media	Total	1.3E-05				0.61	
Future Resident Adult	Groundwater	Ingestion	NA				3.0	Manganese
		Dermal Contact	NA				0.14	
		Inhalation	N/A				0.0	
		Total	N/A				3.2	Manganese
	Soil*	Ingestion	NA				0.26	
		Dermal Contact	NA				0.46	
		Inhalation	NA				NA	
		Total	NA				0.72	
	All Media	Total	NA				3.9	
Future Resident Child	Groundwater	Ingestion	NA				7.1	Manganese
		Dermal Contact	NA				0.42	
		Inhalation	NA				NA	
		Total	NA				7.5	Manganese
	Soil*	Ingestion	NA				2.4	
		Dermal Contact	NA				0.61	
		Inhalation	NA				NA	
		Total	NA				3.0	
	All Media	Total	NA				11	

Table 8-8
Summary of RME Cancer Risks and Hazard Indices-Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Resident Child/Adult	Groundwater	Ingestion	0.0E+00				NA	
		Dermal Contact	0.0E+00				NA	
		Inhalation	NA				NA	
		Total	0.0E+00				NA	
	Soil*	Ingestion	2.7E-05		Arsenic	Benzo(a)pyrene, Dibenz(a,h)anthracene	NA	
		Dermal Contact	7.7E-06			Benzo(a)anthracene, Dibenz(a,h)anthracene, Arsenic	NA	
		Inhalation	NA				NA	
		Total	3.5E-05		Arsenic	Benzo(a)pyrene, Dibenz(a,h)anthracene	NA	
	All Media	Total	3.5E-05				NA	
Future Construction Worker Adult	Groundwater	Ingestion	NA				NA	
		Dermal Contact	0.0E+00				0.18	
		Inhalation	NA				NA	
		Total	0.0E+00				0.18	
	Soil*	Ingestion	1.2E-06				0.85	
		Dermal Contact	1.7E-07				0.28	
		Inhalation	NA				NA	
		Total	1.3E-06				1.1	
	All Media	Total	1.3E-06				1.3	
Future Industrial Worker Adult	Soil*	Ingestion	6.0E-06			Arsenic	0.18	
		Dermal Contact	5.5E-06			Benzo(a)Pyrene, Dibenz(a,h)anthracene, Arsenic	0.42	
		Inhalation	NA				NA	
		Total	1.2E-05			Benzo(a)Pyrene, Dibenz(a,h)anthracene, Arsenic	0.61	
	All Media	Total	1.2E-05				0.61	
Future Trespasser/Visitor Adolescent	Soil*	Ingestion	6.2E-07				0.053	
		Dermal Contact	1.7E-07				0.036	
		Inhalation	NA				NA	
		Total	7.9E-07				0.089	
	All Media	Total	7.9E-07				0.089	
Future Trespasser/Visitor Adult	Soil*	Ingestion	1.2E-06				0.038	
		Dermal Contact	4.7E-07				0.038	
		Inhalation	NA				NA	
		Total	1.7E-06			Arsenic	0.076	
	All Media	Total	1.7E-06				0.076	

NA - Not applicable, pathway incomplete.

Table 8-9
Summary of CT Cancer Risks and Hazard Indices-Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future	Groundwater	Ingestion	NA				0.83	
Resident		Dermal Contact	NA				0.051	
Adult		Inhalation	NA				NA	
		Total	NA				0.88	
	All Media	Total	NA				0.88	
Future	Groundwater	Ingestion	NA				2.8	Manganese
Resident		Dermal Contact	NA				0.14	
Child		Inhalation	NA				NA	
		Total	NA				2.9	Manganese
	Soil*	Ingestion	NA				0.58	
		Dermal Contact	NA				0.23	
		Inhalation	NA				NA	
		Total	NA				0.81	
	All Media	Total	NA				3.7	
Future	Soil*	Ingestion	NA				0.54	
Construction Worker		Dermal Contact	NA				0.061	
Adult		Inhalation	NA				NA	
		Total	NA				0.60	
	All Media	Total	NA				0.60	

NA - Not applicable, pathway incomplete.

Table 8-10
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American robin	0.0635	USEPA 1993	0.01287	allometric equation	0.00735	Levey and Karasov 1989
Red-tailed hawk	0.957	USEPA 1993	0.06796	allometric equation	0.03952	Sample and Suter 1994
Mammals						
Gray fox	3.34	Silva and Downing 1995	0.44636	allometric equation	0.27185	allometric equation
Short-tailed shrew	0.01331	USEPA 1993	0.00475	USEPA 1993	0.00189	USEPA 1993
White-footed mouse	0.0141	Silva and Downing 1995	0.00915	Sample and Suter 1994	0.00073	Sample and Suter 1994

Table 8-10
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American robin	51.6	43.6	0	0	0	0	Martin et al. 1951	4.8	Sample and Suter 1994
Red-tailed hawk	0	0	100	0	0	0	USEPA 1993; Sample and Suter 1994	0	Sample and Suter 1994
Mammals									
Gray fox	32	6	59.2	0	0	0	NISC 1996	2.8	Beyer et al. 1994 (red fox)
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994
White-footed mouse	51	47	0	0	0	0	Martin et al. 1951; Sample and Suter 1994	2	Beyer et al. 1994

Table 8-11
Step 2 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Inorganics (MG/KG)						
Aluminum	4.5 - 6.7	20 / 20	13,600	IS25SS020001	50	272.00
Antimony	0.70 - 1.5	2 / 20	2.1	IS25SS010001	5	0.42
Arsenic	0.72 - 1.3	20 / 20	23.8	IS25SS1800012	10	2.38
Barium	0.034 - 0.14	20 / 20	111	IS25SS070001	500	0.22
Beryllium	0.018 - 0.071	0 / 20	--	--	10	0.01
Cadmium	0.056 - 0.14	20 / 20	47.2	IS25SS030001	4	11.80
Chromium	0.25 - 0.71	20 / 20	124	IS25SS030001	0.4	310.00
Cobalt	0.19 - 0.78	20 / 20	13.2	IS25SS1900012	20	0.66
Copper	0.29 - 0.68	19 / 20	108	IS25SS030001	50	2.16
Cyanide	0.56 - 0.89	1 / 20	0.22	IS25SS1800012	27.5	0.01
Iron	3.6 - 9.7	20 / 20	24,400	IS25SS020001	200	122.00
Lead	0.31 - 0.53	20 / 20	174	IS25SS030001	50	3.48
Manganese	0.034 - 0.14	20 / 20	971	IS25SS070001	500	1.94
Mercury	0.056 - 0.089	16 / 20	0.39	IS25SS020001	0.1	3.90
Nickel	0.45 - 0.68	20 / 20	120	IS25SS1900012	30	4.00
Selenium	0.90 - 1.5	5 / 19	2.3	IS25SS1800012	1	2.30
Silver	0.25 - 1.1	9 / 19	201	IS25SS1800012	2	100.50
Thallium	1.3 - 1.9	1 / 19	1.9	IS25SS160001	1	1.90
Vanadium	0.17 - 0.50	20 / 20	72.8	IS25SS010001	2	36.40
Zinc	0.14 - 0.33	10 / 20	529	IS25SS030001	50	10.58
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	370 - 1,700	0 / 20	--	--	NSV	NSV
2,2'-Oxybis(1-chloropropane)	370 - 1,700	0 / 20	--	--	NSV	NSV
2,4,5-Trichlorophenol	930 - 4,200	0 / 20	--	--	430	9.77
2,4,6-Trichlorophenol	370 - 1,700	0 / 20	--	--	580	2.93
2,4-Dichlorophenol	370 - 1,700	0 / 20	--	--	13,400	0.13
2,4-Dimethylphenol	370 - 1,700	0 / 20	--	--	100	17.00
2,4-Dinitrophenol	930 - 4,200	0 / 20	--	--	20,000	0.21
2,4-Dinitrotoluene	370 - 460	0 / 3	--	--	NSV	NSV
2,6-Dinitrotoluene	370 - 460	0 / 3	--	--	NSV	NSV
2-Chloronaphthalene	370 - 1,700	0 / 20	--	--	2,323	0.73
2-Chlorophenol	370 - 1,700	0 / 20	--	--	100	17.00
2-Methylnaphthalene	370 - 1,700	1 / 20	44.0	IS25SS1800012	1,730	0.03
2-Methylphenol	370 - 1,700	0 / 20	--	--	100	17.00
2-Nitroaniline	930 - 4,200	0 / 20	--	--	NSV	NSV
2-Nitrophenol	370 - 1,700	0 / 20	--	--	NSV	NSV
3,3'-Dichlorobenzidine	370 - 1,700	0 / 20	--	--	NSV	NSV
3-Nitroaniline	930 - 4,200	0 / 20	--	--	NSV	NSV
4,6-Dinitro-2-methylphenol	930 - 4,200	0 / 20	--	--	NSV	NSV
4-Bromophenyl-phenylether	370 - 1,700	0 / 20	--	--	NSV	NSV

NSV - No Screening Value

Table 8-11
Step 2 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
4-Chloro-3-methylphenol	370 - 1,700	0 / 20	--	--	100	17.00
4-Chloroaniline	370 - 1,700	0 / 20	--	--	NSV	NSV
4-Chlorophenyl-phenylether	370 - 1,700	0 / 20	--	--	NSV	NSV
4-Methylphenol	370 - 1,700	0 / 20	--	--	100	17.00
4-Nitroaniline	930 - 4,200	0 / 20	--	--	NSV	NSV
4-Nitrophenol	930 - 4,200	0 / 20	--	--	380	11.05
Acenaphthene	370 - 1,700	1 / 20	370	IS25SS1800012	2,500	0.15
Acenaphthylene	370 - 1,700	1 / 20	90.0	IS25SS080001	1,730	0.05
Acetophenone	370 - 1,700	6 / 20	100	IS25SS130001	NSV	NSV
Anthracene	370 - 1,700	2 / 20	440	IS25SS1800012	1,730	0.25
Atrazine	370 - 1,700	0 / 20	--	--	NSV	NSV
Benzaldehyde	370 - 1,700	3 / 20	2,400	IS25SS200001	NSV	NSV
Benzo(a)anthracene	370 - 1,700	7 / 20	1,300	IS25SS1800012	1,730	0.75
Benzo(a)pyrene	370 - 1,700	9 / 20	400	IS25SS080001	1,730	0.23
Benzo(b)fluoranthene	370 - 1,700	11 / 20	1,200	IS25SS1800012	1,730	0.69
Benzo(g,h,i)perylene	370 - 1,700	6 / 20	210	IS25SS080001	1,730	0.12
Benzo(k)fluoranthene	370 - 1,700	10 / 20	710	IS25SS1800012	1,730	0.41
Butylbenzylphthalate	370 - 1,700	1 / 20	70.0	IS25SS1800012	NSV	NSV
Caprolactam	370 - 1,700	0 / 20	--	--	NSV	NSV
Carbazole	370 - 1,700	1 / 20	200	IS25SS1800012	NSV	NSV
Chrysene	370 - 1,700	12 / 20	1,200	IS25SS1800012	1,730	0.69
Di-n-butylphthalate	370 - 1,700	2 / 20	540	IS25SS030001	200,000	0.00
Di-n-octylphthalate	370 - 1,700	0 / 20	--	--	NSV	NSV
Dibenz(a,h)anthracene	370 - 1,700	2 / 20	220	IS25SS1800012	1,730	0.13
Dibenzofuran	370 - 1,700	1 / 20	180	IS25SS1800012	NSV	NSV
Diethylphthalate	370 - 1,700	2 / 20	530	IS25SS070001	13,400	0.04
Dimethyl phthalate	370 - 1,700	1 / 20	96.0	IS25SS1800012	10,640	0.01
Fluoranthene	370 - 1,700	15 / 20	2,300	IS25SS1800012	1,730	1.33
Fluorene	370 - 1,700	1 / 20	290	IS25SS1800012	1,730	0.17
Hexachlorobenzene	370 - 1,700	0 / 20	--	--	100,000	0.02
Hexachlorobutadiene	370 - 1,700	0 / 20	--	--	NSV	NSV
Hexachlorocyclopentadiene	370 - 1,700	0 / 20	--	--	1,000	1.70
Hexachloroethane	370 - 1,700	0 / 20	--	--	NSV	NSV
Indeno(1,2,3-cd)pyrene	370 - 1,700	9 / 20	260	IS25SS080001	1,730	0.15
Isophorone	370 - 1,700	0 / 20	--	--	NSV	NSV
Naphthalene	370 - 1,700	1 / 20	92.0	IS25SS1800012	1,730	0.05
Nitrobenzene	370 - 460	0 / 3	--	--	2,260	0.20
Pentachlorophenol	900 - 4,000	0 / 20	--	--	3,000	1.33
Phenanthrene	370 - 1,700	9 / 20	2,300	IS25SS1800012	1,730	1.33
Phenol	370 - 1,700	0 / 20	--	--	1,880	0.90
Pyrene	370 - 1,700	14 / 20	990	IS25SS1800012	1,730	0.57

NSV - No Screening Value

Table 8-11
Step 2 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
bis(2-Chloroethoxy)methane	370 - 1,700	0 / 20	--	--	NSV	NSV
bis(2-Chloroethyl)ether	370 - 1,700	0 / 20	--	--	NSV	NSV
bis(2-Ethylhexyl)phthalate	370 - 2,300	5 / 20	17,000	IS25SS030001	13,514	1.26
n-Nitroso-di-n-propylamine	370 - 1,700	0 / 20	--	--	NSV	NSV
n-Nitrosodiphenylamine	370 - 1,700	0 / 20	--	--	1,090	1.56
Explosives (UG/KG)						
2,4-Dinitrotoluene	400 - 1,700	0 / 16	--	--	NSV	NSV
2,6-Dinitrotoluene	400 - 1,700	0 / 16	--	--	NSV	NSV
Nitrobenzene	400 - 1,700	0 / 16	--	--	2,260	0.75
Nitroglycerin	1,100 - 2,000	0 / 19	--	--	NSV	NSV
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	11.0 - 18.0	0 / 20	--	--	300	0.06
1,1,2,2-Tetrachloroethane	11.0 - 18.0	0 / 20	--	--	300	0.06
1,1,2-Trichloro-1,2,2- trifluoroethane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
1,1,2-Trichloroethane	11.0 - 18.0	0 / 20	--	--	300	0.06
1,1-Dichloroethane	11.0 - 18.0	0 / 20	--	--	300	0.06
1,1-Dichloroethene	11.0 - 18.0	0 / 20	--	--	NSV	NSV
1,2,4-Trichlorobenzene	11.0 - 18.0	0 / 20	--	--	1,270	0.01
1,2-Dibromo-3-chloropropane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
1,2-Dibromoethane	11.0 - 18.0	0 / 20	--	--	5,000	0.00
1,2-Dichlorobenzene	11.0 - 18.0	0 / 20	--	--	100	0.18
1,2-Dichloroethane	11.0 - 18.0	0 / 20	--	--	902	0.02
1,2-Dichloroethene (total)	13.0 - 13.0	0 / 1	--	--	300	0.04
1,2-Dichloropropane	11.0 - 18.0	0 / 20	--	--	38,800	0.00
1,3-Dichlorobenzene	11.0 - 18.0	0 / 20	--	--	100	0.18
1,4-Dichlorobenzene	11.0 - 18.0	0 / 20	--	--	1,280	0.01
2-Butanone	11.0 - 18.0	0 / 20	--	--	NSV	NSV
2-Hexanone	11.0 - 18.0	0 / 20	--	--	NSV	NSV
4-Methyl-2-pentanone	11.0 - 18.0	0 / 20	--	--	10,000	0.00
Acetone	11.0 - 18.0	3 / 20	8.9	IS25SS010001	NSV	NSV
Benzene	11.0 - 18.0	0 / 20	--	--	236	0.08
Bromodichloromethane	11.0 - 18.0	0 / 20	--	--	45,000	0.00
Bromoform	11.0 - 18.0	0 / 20	--	--	114,700	0.00
Bromomethane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Carbon disulfide	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Carbon tetrachloride	11.0 - 18.0	0 / 20	--	--	1,000,000	0.00
Chlorobenzene	11.0 - 18.0	0 / 20	--	--	2,400	0.01
Chloroethane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Chloroform	11.0 - 18.0	0 / 20	--	--	2,249	0.01
Chloromethane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Cumene	11.0 - 18.0	0 / 20	--	--	NSV	NSV

NSV - No Screening Value

Table 8-11
Step 2 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Maximum Hazard Quotient
Cyclohexane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Dibromochloromethane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Dichlorodifluoromethane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Ethylbenzene	11.0 - 18.0	0 / 20	--	--	11,254	0.00
Methyl acetate	11.0 - 18.0	1 / 20	2.1	IS25SS170001	NSV	NSV
Methyl-tert-butyl ether (MTBE)	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Methylcyclohexane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Methylene chloride	11.0 - 18.0	2 / 20	1.9	IS25SS040001	2,251	0.00
Styrene	11.0 - 18.0	0 / 20	--	--	22,508	0.00
Tetrachloroethene	11.0 - 18.0	0 / 20	--	--	902	0.02
Toluene	11.0 - 18.0	1 / 20	1.5	IS25SS150001	29,243	0.00
Trichloroethene	11.0 - 18.0	0 / 20	--	--	13,492	0.00
Trichlorofluoromethane	11.0 - 18.0	0 / 20	--	--	NSV	NSV
Vinyl chloride	11.0 - 18.0	0 / 20	--	--	300	0.06
Xylene, total	11.0 - 18.0	0 / 20	--	--	5,633	0.00
cis-1,2-Dichloroethene	11.0 - 18.0	0 / 20	--	--	300	0.06
cis-1,3-Dichloropropene	11.0 - 18.0	0 / 20	--	--	300	0.06
trans-1,2-Dichloroethene	11.0 - 18.0	0 / 20	--	--	300	0.06
trans-1,3-Dichloropropene	11.0 - 18.0	0 / 20	--	--	300	0.06

NSV - No Screening Value

Table 8-12
Summary of Hazard Quotients for Food Web Exposures, Step 2 - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		White-footed mouse		Gray fox		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	9.21	0.92	1.57	0.16	0.89	0.09	0.20	0.07	<0.01	<0.01
Cadmium	43.19	4.32	9.51	0.95	5.85	0.59	13.77	1.00	0.19	0.01
Chromium	0.53	0.05	0.09	<0.01	0.09	<0.01	2.75	0.55	0.56	0.11
Copper	0.68	0.53	0.15	0.11	0.18	0.14	0.08	0.06	0.01	<0.01
Lead	1.18	0.12	0.21	0.02	0.19	0.02	3.59	0.36	0.09	<0.01
Mercury	1.94	0.39	0.48	0.10	0.05	0.03	0.07	0.04	<0.01	<0.01
Nickel	0.64	0.32	0.13	0.06	0.08	0.04	0.14	0.10	0.02	0.01
Selenium	1.57	0.95	0.46	0.28	0.35	0.21	0.47	0.14	0.03	<0.01
Silver	1.53	0.15	0.40	0.04	0.32	0.03	0.09	<0.01	<0.01	<0.01
Zinc	1.03	0.51	0.23	0.12	1.28	0.13	5.55	0.61	0.60	0.07
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.07	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.08	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.12	0.01	0.02	<0.01	0.01	<0.01	0.04	0.01	<0.01	<0.01
Hexachlorobenzene	0.23	0.02	0.05	<0.01	0.03	<0.01	1.95	0.20	0.07	<0.01
Hexachlorocyclopentadiene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.83	0.08	0.17	0.02	0.09	<0.01	0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

Table 8-13
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 25
Sites 11 ,13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American robin	0.0452	USEPA 1993	0.00741	allometric equation	0.00162	Levey and Karasov 1989
Red-tailed hawk	1.126	Sample and Suter 1994	0.06388	allometric equation	0.03603	Sample and Suter 1994
Mammals						
Gray fox	4.21	Silva and Downing 1995	0.36098	allometric equation	0.22393	allometric equation
Short-tailed shrew	0.01687	USEPA 1993	0.00376	USEPA 1993	0.00149	USEPA 1993
White-footed mouse	0.0208	Silva and Downing 1995	0.00624	Sample and Suter 1994	0.00050	Sample and Suter 1994

Table 8-13
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors - Site 25
Sites 11 ,13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American robin	0	95	0	0	0	0	Martin et al. 1951	5	Sample and Suter 1994
Red-tailed hawk	0	0	100	0	0	0	USEPA 1993; Sample and Suter 1994	0	Sample and Suter 1994
Mammals									
Gray fox	32	6	59.2	0	0	0	NISC 1996	2.8	Beyer et al. 1994 (red fox)
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994
White-footed mouse	51	47	0	0	0	0	Martin et al. 1951; Sample and Suter 1994	2	Beyer et al. 1994

Table 8-14
Step 3 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Inorganics (MG/KG)							
Aluminum	4.5 - 6.7	20 / 20	13,600	IS25SS020001	6,673	50	133.45
Antimony	0.70 - 1.5	2 / 20	2.1	IS25SS010001	0.71	5	0.14
Arsenic	0.72 - 1.3	20 / 20	23.8	IS25SS1800012	7.73	10	0.77
Barium	0.034 - 0.14	20 / 20	111	IS25SS070001	52.6	500	0.11
Beryllium	0.018 - 0.071	0 / 20	--	--	0.089	10	0.01
Cadmium	0.056 - 0.14	20 / 20	47.2	IS25SS030001	3.45	4	0.86
Chromium	0.25 - 0.71	20 / 20	124	IS25SS030001	22.7	0.4	56.74
Cobalt	0.19 - 0.78	20 / 20	13.2	IS25SS1900012	5.50	20	0.27
Copper	0.29 - 0.68	19 / 20	108	IS25SS030001	25.2	50	0.50
Cyanide	0.56 - 0.89	1 / 20	0.22	IS25SS1800012	0.19	27.5	0.01
Iron	3.6 - 9.7	20 / 20	24,400	IS25SS020001	13,985	200	69.93
Lead	0.31 - 0.53	20 / 20	174	IS25SS030001	38.6	50	0.77
Manganese	0.034 - 0.14	20 / 20	971	IS25SS070001	395	500	0.79
Mercury	0.056 - 0.089	16 / 20	0.39	IS25SS020001	0.13	0.1	1.30
Nickel	0.45 - 0.68	20 / 20	120	IS25SS1900012	15.5	30	0.52
Selenium	0.90 - 1.5	5 / 19	2.3	IS25SS1800012	0.85	1	0.85
Silver	0.25 - 1.1	9 / 19	201	IS25SS1800012	13.9	2	6.95
Thallium	1.3 - 1.9	1 / 19	1.9	IS25SS160001	0.82	1	0.82
Vanadium	0.17 - 0.50	20 / 20	72.8	IS25SS010001	26.0	2	13.01
Zinc	0.14 - 0.33	10 / 20	529	IS25SS030001	82.9	50	1.66
Semivolatile Organic Compounds (UG/KG)							
1,1-Biphenyl	370 - 1,700	0 / 20	--	--	268	NSV	NSV
2,2'-Oxybis(1-chloropropane)	370 - 1,700	0 / 20	--	--	268	NSV	NSV
2,4,5-Trichlorophenol	930 - 4,200	0 / 20	--	--	676	430	1.57
2,4,6-Trichlorophenol	370 - 1,700	0 / 20	--	--	268	580	0.46
2,4-Dichlorophenol	370 - 1,700	0 / 20	--	--	268	13,400	0.02
2,4-Dimethylphenol	370 - 1,700	0 / 20	--	--	268	100	2.68
2,4-Dinitrophenol	930 - 4,200	0 / 20	--	--	676	20,000	0.03
2,4-Dinitrotoluene	370 - 460	0 / 3	--	--	205	NSV	NSV
2,6-Dinitrotoluene	370 - 460	0 / 3	--	--	205	NSV	NSV
2-Chloronaphthalene	370 - 1,700	0 / 20	--	--	268	2,323	0.12
2-Chlorophenol	370 - 1,700	0 / 20	--	--	268	100	2.68
2-Methylnaphthalene	370 - 1,700	1 / 20	44.0	IS25SS1800012	260	1,730	0.15
2-Methylphenol	370 - 1,700	0 / 20	--	--	268	100	2.68
2-Nitroaniline	930 - 4,200	0 / 20	--	--	676	NSV	NSV
2-Nitrophenol	370 - 1,700	0 / 20	--	--	268	NSV	NSV
3,3'-Dichlorobenzidine	370 - 1,700	0 / 20	--	--	268	NSV	NSV
3-Nitroaniline	930 - 4,200	0 / 20	--	--	676	NSV	NSV
4,6-Dinitro-2-methylphenol	930 - 4,200	0 / 20	--	--	676	NSV	NSV
4-Bromophenyl-phenylether	370 - 1,700	0 / 20	--	--	268	NSV	NSV
4-Chloro-3-methylphenol	370 - 1,700	0 / 20	--	--	268	100	2.68
4-Chloroaniline	370 - 1,700	0 / 20	--	--	268	NSV	NSV
4-Chlorophenyl-phenylether	370 - 1,700	0 / 20	--	--	268	NSV	NSV
4-Methylphenol	370 - 1,700	0 / 20	--	--	268	100	2.68
4-Nitroaniline	930 - 4,200	0 / 20	--	--	676	NSV	NSV
4-Nitrophenol	930 - 4,200	0 / 20	--	--	676	380	1.78

NSV - No Screening Value

Table 8-14
Step 3 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
Acenaphthene	370 - 1,700	1 / 20	370	IS25SS1800012	277	2,500	0.11
Acenaphthylene	370 - 1,700	1 / 20	90.0	IS25SS080001	262	1,730	0.15
Acetophenone	370 - 1,700	6 / 20	100	IS25SS130001	203	NSV	NSV
Anthracene	370 - 1,700	2 / 20	440	IS25SS1800012	272	1,730	0.16
Atrazine	370 - 1,700	0 / 20	--	--	268	NSV	NSV
Benzaldehyde	370 - 1,700	3 / 20	2,400	IS25SS200001	377	NSV	NSV
Benzo(a)anthracene	370 - 1,700	7 / 20	1,300	IS25SS1800012	289	1,730	0.17
Benzo(a)pyrene	370 - 1,700	9 / 20	400	IS25SS080001	215	1,730	0.12
Benzo(b)fluoranthene	370 - 1,700	11 / 20	1,200	IS25SS1800012	240	1,730	0.14
Benzo(g,h,i)perylene	370 - 1,700	6 / 20	210	IS25SS080001	226	1,730	0.13
Benzo(k)fluoranthene	370 - 1,700	10 / 20	710	IS25SS1800012	214	1,730	0.12
Butylbenzylphthalate	370 - 1,700	1 / 20	70.0	IS25SS1800012	262	NSV	NSV
Caprolactam	370 - 1,700	0 / 20	--	--	268	NSV	NSV
Carbazole	370 - 1,700	1 / 20	200	IS25SS1800012	268	NSV	NSV
Chrysene	370 - 1,700	12 / 20	1,200	IS25SS1800012	243	1,730	0.14
Di-n-butylphthalate	370 - 1,700	2 / 20	540	IS25SS030001	267	200,000	0.00
Di-n-octylphthalate	370 - 1,700	0 / 20	--	--	268	NSV	NSV
Dibenz(a,h)anthracene	370 - 1,700	2 / 20	220	IS25SS1800012	263	1,730	0.15
Dibenzofuran	370 - 1,700	1 / 20	180	IS25SS1800012	267	NSV	NSV
Diethylphthalate	370 - 1,700	2 / 20	530	IS25SS070001	271	13,400	0.02
Dimethyl phthalate	370 - 1,700	1 / 20	96.0	IS25SS1800012	263	10,640	0.02
Fluoranthene	370 - 1,700	15 / 20	2,300	IS25SS1800012	277	1,730	0.16
Fluorene	370 - 1,700	1 / 20	290	IS25SS1800012	273	1,730	0.16
Hexachlorobenzene	370 - 1,700	0 / 20	--	--	268	100,000	0.00
Hexachlorobutadiene	370 - 1,700	0 / 20	--	--	268	NSV	NSV
Hexachlorocyclopentadiene	370 - 1,700	0 / 20	--	--	268	1,000	0.27
Hexachloroethane	370 - 1,700	0 / 20	--	--	268	NSV	NSV
Indeno(1,2,3-cd)pyrene	370 - 1,700	9 / 20	260	IS25SS080001	210	1,730	0.12
Isophorone	370 - 1,700	0 / 20	--	--	268	NSV	NSV
Naphthalene	370 - 1,700	1 / 20	92.0	IS25SS1800012	263	1,730	0.15
Nitrobenzene	370 - 460	0 / 3	--	--	205	2,260	0.09
Pentachlorophenol	900 - 4,000	0 / 20	--	--	645	3,000	0.21
Phenanthrene	370 - 1,700	9 / 20	2,300	IS25SS1800012	315	1,730	0.18
Phenol	370 - 1,700	0 / 20	--	--	268	1,880	0.14
Pyrene	370 - 1,700	14 / 20	990	IS25SS1800012	210	1,730	0.12
bis(2-Chloroethoxy)methane	370 - 1,700	0 / 20	--	--	268	NSV	NSV
bis(2-Chloroethyl)ether	370 - 1,700	0 / 20	--	--	268	NSV	NSV
bis(2-Ethylhexyl)phthalate	370 - 2,300	5 / 20	17,000	IS25SS030001	1,014	13,514	0.07
n-Nitroso-di-n-propylamine	370 - 1,700	0 / 20	--	--	268	NSV	NSV
n-Nitrosodiphenylamine	370 - 1,700	0 / 20	--	--	268	1,090	0.25
Explosives (UG/KG)							
2,4-Dinitrotoluene	400 - 1,700	0 / 16	--	--	283	NSV	NSV
2,6-Dinitrotoluene	400 - 1,700	0 / 16	--	--	283	NSV	NSV
Nitrobenzene	400 - 1,700	0 / 16	--	--	283	2,260	0.13
Nitroglycerin	1,100 - 2,000	0 / 19	--	--	689	NSV	NSV
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02

NSV - No Screening Value

Table 8-14
Step 3 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
1,1,2,2-Tetrachloroethane	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02
1,1,2-Trichloro-1,2,2- trifluoroethane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
1,1,2-Trichloroethane	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02
1,1-Dichloroethane	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02
1,1-Dichloroethene	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
1,2,4-Trichlorobenzene	11.0 - 18.0	0 / 20	--	--	6.93	1,270	0.01
1,2-Dibromo-3-chloropropane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
1,2-Dibromoethane	11.0 - 18.0	0 / 20	--	--	6.93	5,000	0.00
1,2-Dichlorobenzene	11.0 - 18.0	0 / 20	--	--	6.93	100	0.07
1,2-Dichloroethane	11.0 - 18.0	0 / 20	--	--	6.93	902	0.01
1,2-Dichloroethene (total)	13.0 - 13.0	0 / 1	--	--	6.5	300	0.02
1,2-Dichloropropane	11.0 - 18.0	0 / 20	--	--	6.93	38,800	0.00
1,3-Dichlorobenzene	11.0 - 18.0	0 / 20	--	--	6.93	100	0.07
1,4-Dichlorobenzene	11.0 - 18.0	0 / 20	--	--	6.93	1,280	0.01
2-Butanone	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
2-Hexanone	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
4-Methyl-2-pentanone	11.0 - 18.0	0 / 20	--	--	6.93	10,000	0.00
Acetone	11.0 - 18.0	3 / 20	8.9	IS25SS010001	5.63	NSV	NSV
Benzene	11.0 - 18.0	0 / 20	--	--	6.93	236	0.03
Bromodichloromethane	11.0 - 18.0	0 / 20	--	--	6.93	45,000	0.00
Bromoform	11.0 - 18.0	0 / 20	--	--	6.93	114,700	0.00
Bromomethane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Carbon disulfide	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Carbon tetrachloride	11.0 - 18.0	0 / 20	--	--	6.93	1,000,000	0.00
Chlorobenzene	11.0 - 18.0	0 / 20	--	--	6.93	2,400	0.00
Chloroethane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Chloroform	11.0 - 18.0	0 / 20	--	--	6.93	2,249	0.00
Chloromethane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Cumene	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Cyclohexane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Dibromochloromethane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Dichlorodifluoromethane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Ethylbenzene	11.0 - 18.0	0 / 20	--	--	6.93	11,254	0.00
Methyl acetate	11.0 - 18.0	1 / 20	2.1	IS25SS170001	6.71	NSV	NSV
Methyl-tert-butyl ether (MTBE)	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Methylcyclohexane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Methylene chloride	11.0 - 18.0	2 / 20	1.9	IS25SS040001	5.96	2,251	0.00
Styrene	11.0 - 18.0	0 / 20	--	--	6.93	22,508	0.00
Tetrachloroethene	11.0 - 18.0	0 / 20	--	--	6.93	902	0.01
Toluene	11.0 - 18.0	1 / 20	1.5	IS25SS150001	6.63	29,243	0.00
Trichloroethene	11.0 - 18.0	0 / 20	--	--	6.93	13,492	0.00
Trichlorofluoromethane	11.0 - 18.0	0 / 20	--	--	6.93	NSV	NSV
Vinyl chloride	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02
Xylene, total	11.0 - 18.0	0 / 20	--	--	6.93	5,633	0.00
cis-1,2-Dichloroethene	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02
cis-1,3-Dichloropropene	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02
trans-1,2-Dichloroethene	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02

NSV - No Screening Value

Table 8-14
Step 3 Soil Screening - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Mean Hazard Quotient
trans-1,3-Dichloropropene	11.0 - 18.0	0 / 20	--	--	6.93	300	0.02

NSV - No Screening Value

Table 8-15
Summary of Hazard Quotients for Food Web Exposures, Step 3A - Site 25
Sites 11, 13, 17, 21, an 25 RI Report
NDWIH
Indian Head, Maryland

Chemical	Short-tailed shrew		White-footed mouse		Gray fox		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	1.87	0.19	0.24	0.02	0.19	0.02	0.03	0.01	<0.01	<0.01
Cadmium	1.97	0.20	0.32	0.03	0.28	0.03	0.63	0.05	0.01	<0.01
Chromium	0.06	<0.01	<0.01	<0.01	0.01	<0.01	0.29	0.06	0.08	0.02
Copper	0.10	0.08	0.02	0.01	0.03	0.02	<0.01	<0.01	<0.01	<0.01
Lead	0.16	0.02	0.02	<0.01	0.03	<0.01	0.42	0.04	0.02	<0.01
Mercury	0.40	0.08	0.07	0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01
Nickel	0.05	0.03	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Selenium	0.36	0.22	0.08	0.05	0.09	0.05	0.07	0.02	<0.01	<0.01
Silver	0.07	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.10	0.05	0.02	<0.01	0.13	0.01	0.49	0.05	0.07	<0.01
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.20	0.02	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.08	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NA = No ingestion screening value available or compound was not analyzed for.
Note: Shading indicates value exceeds 1.

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LEGEND

- Storm Sewer Outfall
- Approximate Location of Discharge Points
- Buildings
- Demolished Buildings
- IR Site Boundary
- Wooded Area
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)
- Road
- Railroads

Figure 8-1
Site 25 Topography
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

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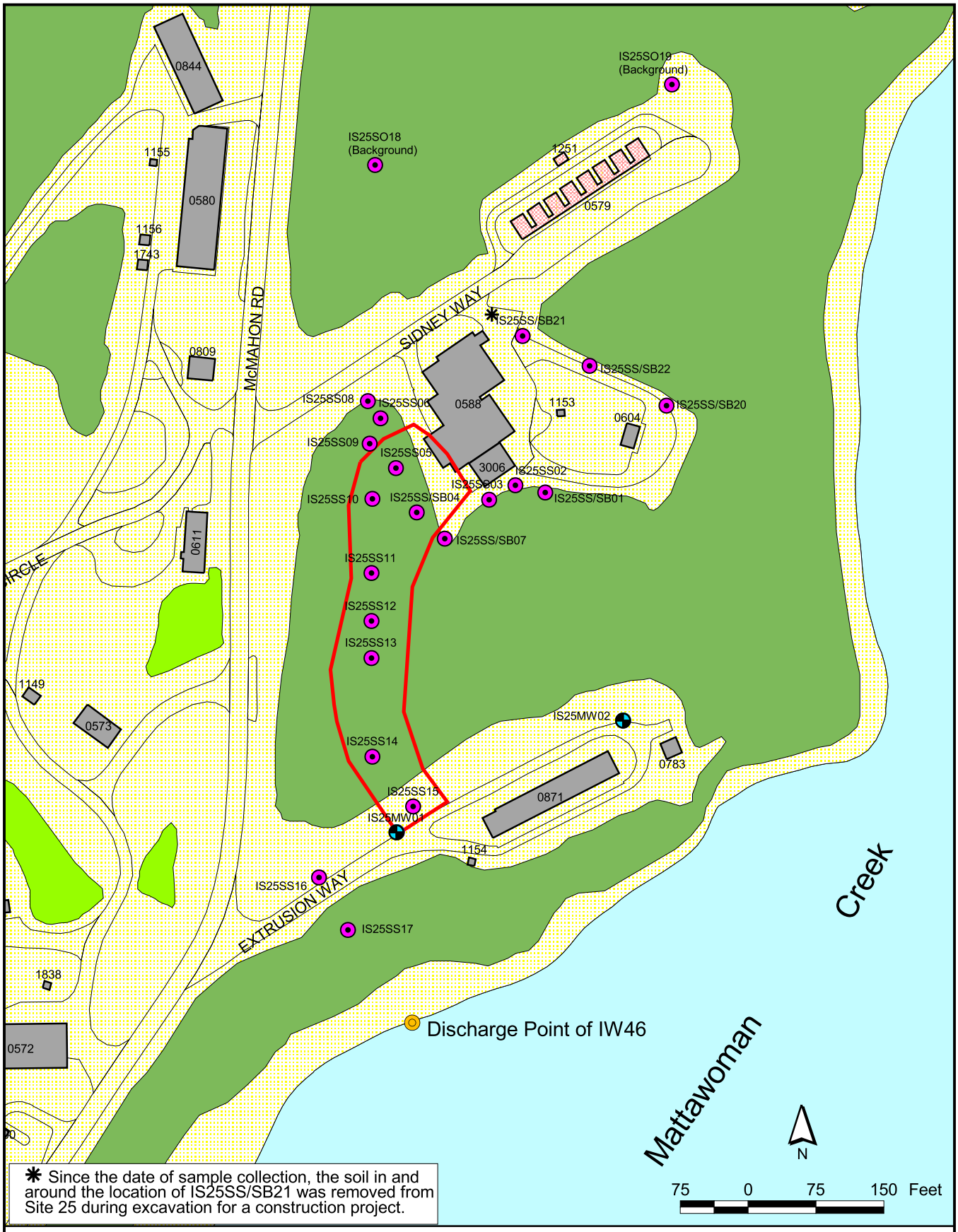

✱ Since the date of sample collection, the soil in and around the location of IS25SS/SB21 was removed from Site 25 during excavation for a construction project.

LEGEND

- Soil Sample
- Monitoring Wells
- Approximate Location of IW46 Discharge
- Road
- Railroads
- IR Site Boundary
- Buildings
- Demolished Buildings
- Wooded Area

Figure 8-2
Site 25 Sample Locations
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

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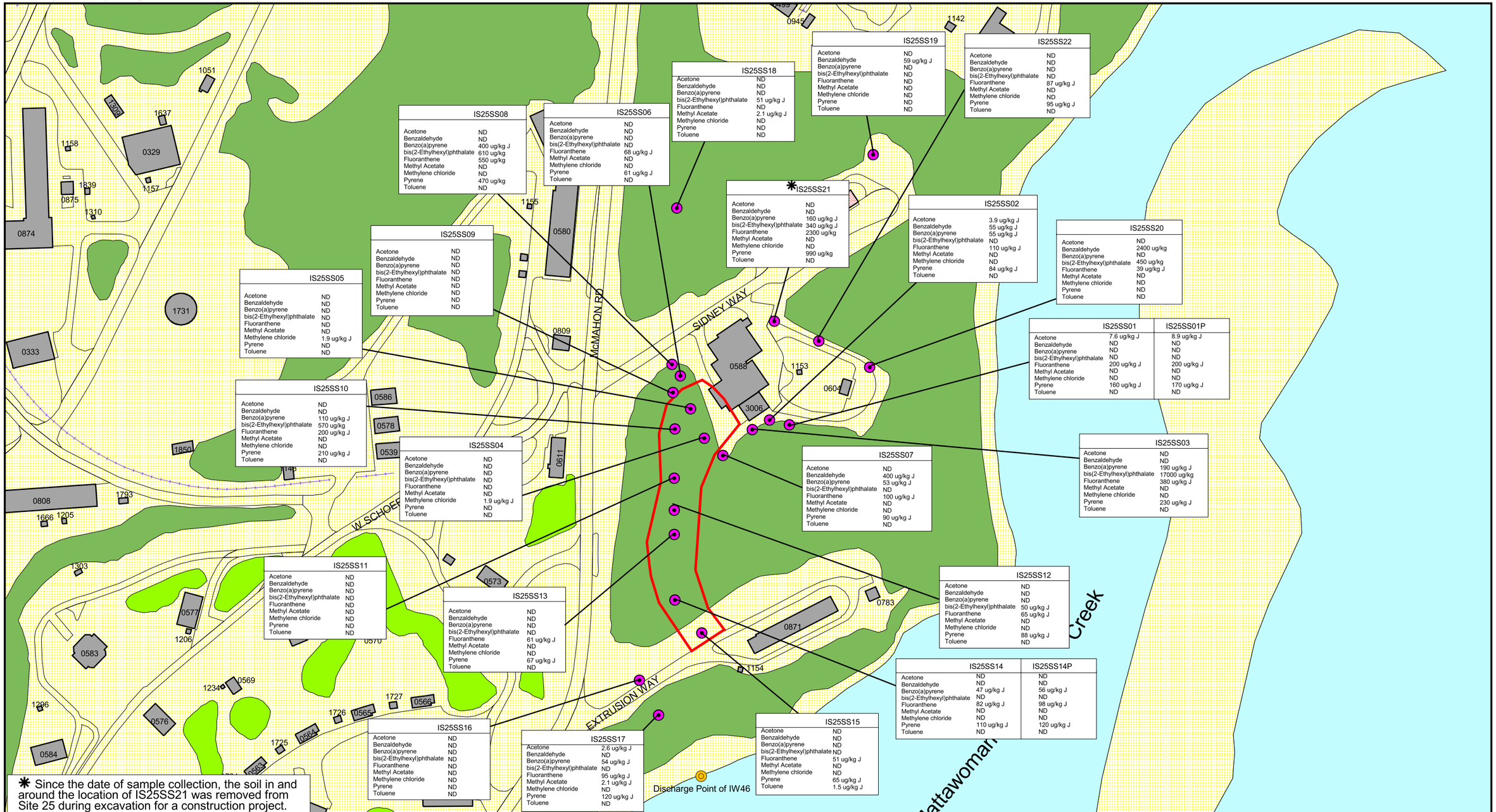


✱ Since the date of sample collection, the soil in and around the location of IS25SS21 was removed from Site 25 during excavation for a construction project.

LEGEND

- Soil Sample
- Approximate Location of IW46 Discharge
- Buildings
- Demolished Buildings
- IR Site Boundary
- Wooded Area
- Road
- Railroads

ND = Non Detect

J = Estimated Value Below the Detection Limit

ug/kg = Micrograms per kilogram

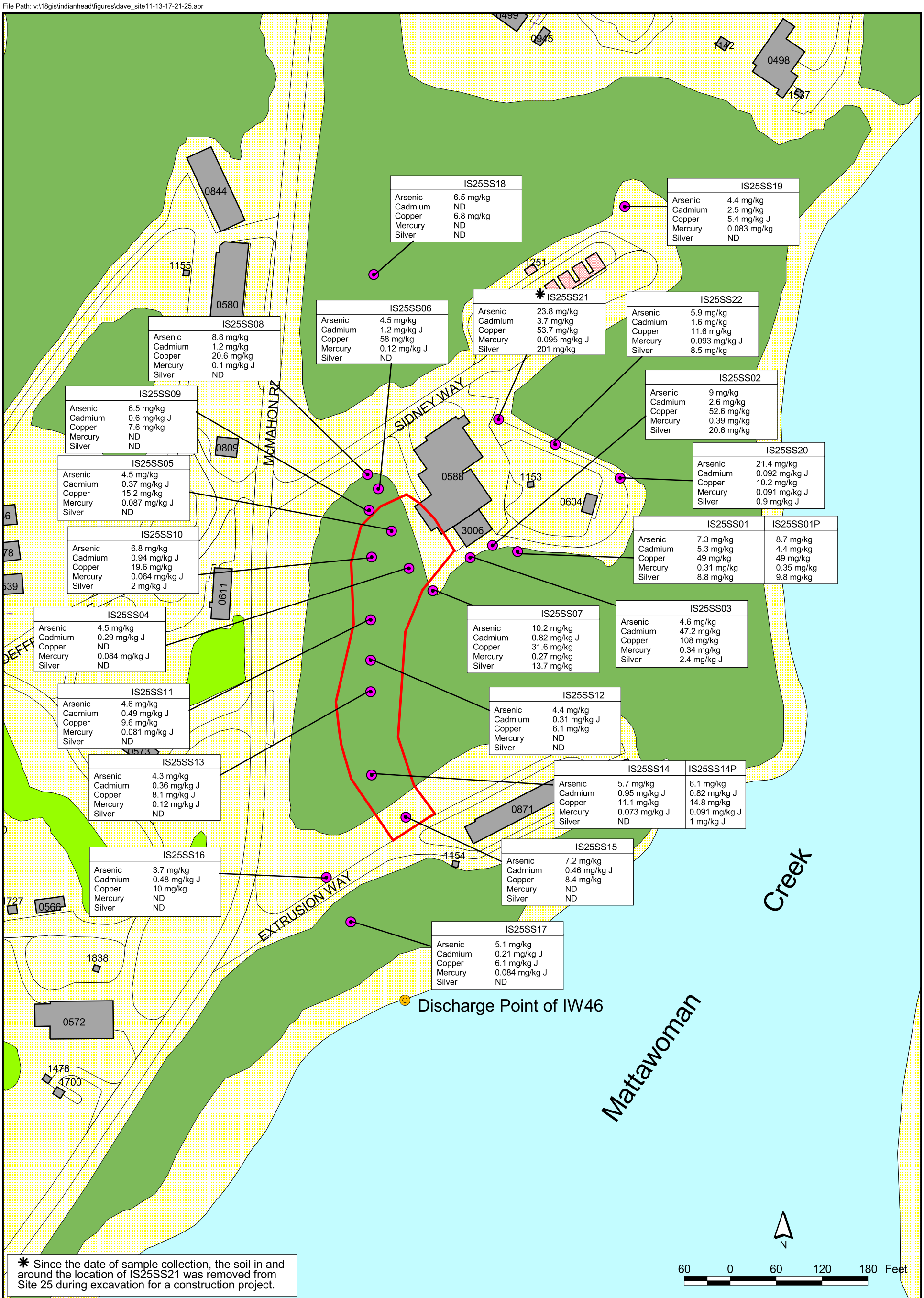
N

80 0 80 160 240 Feet

Figure 8-3
Site 25 - VOCs and SVOCs
In Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr



LEGEND

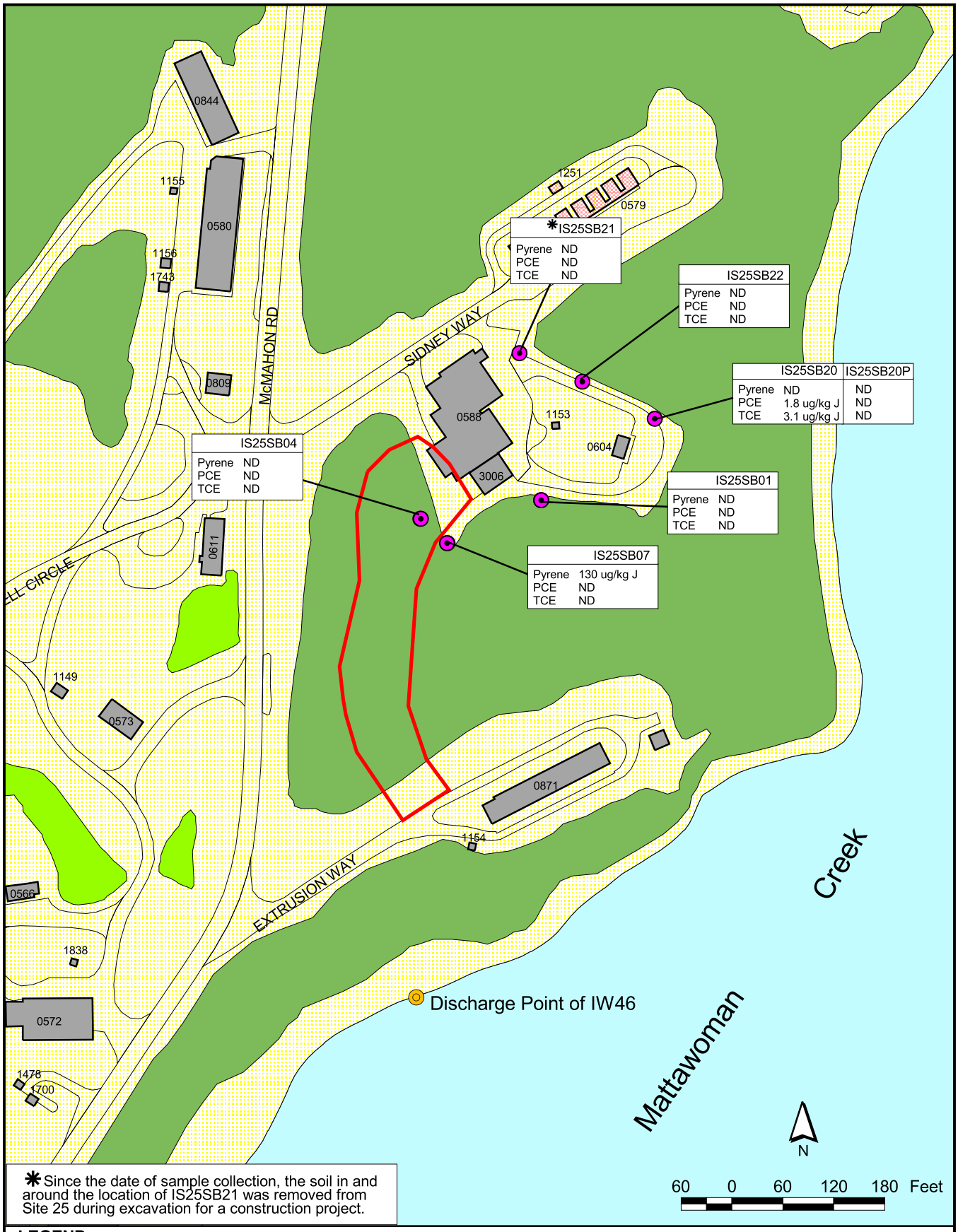
- Soil
- Approximate Location of IW46 Discharge
- Buildings
- Demolished Buildings
- Road
- IR Site Boundary
- Wooded Area
- Railroads

ND = Non Detect
J = Estimated Value Below the Detection Limit
mg/kg = Milligrams per kilogram

Figure 8-4
Site 25 - Selected Metals in Surface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr



*Since the date of sample collection, the soil in and around the location of IS25SB21 was removed from Site 25 during excavation for a construction project.

LEGEND

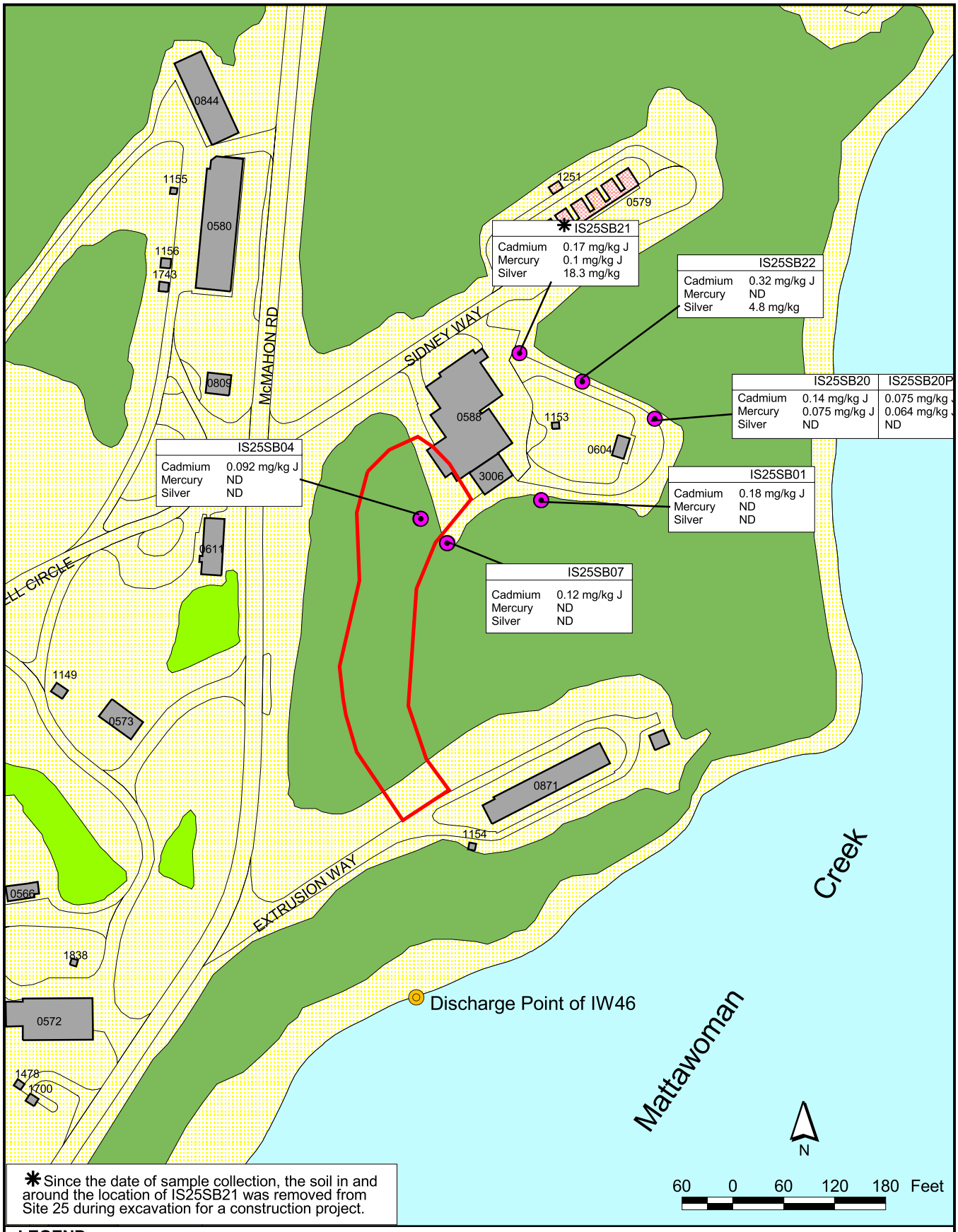
- Soil Sample
- Approximate Location of IW46 Discharge
- Buildings
- Demolished Buildings
- Road
- Railroads
- IR Site Boundary
- Wooded Area

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/kg = Micrograms per kilogram

Figure 8-5
Site 25 - VOCs and SVOCs
In Subsurface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr



✱ Since the date of sample collection, the soil in and around the location of IS25SB21 was removed from Site 25 during excavation for a construction project.

LEGEND

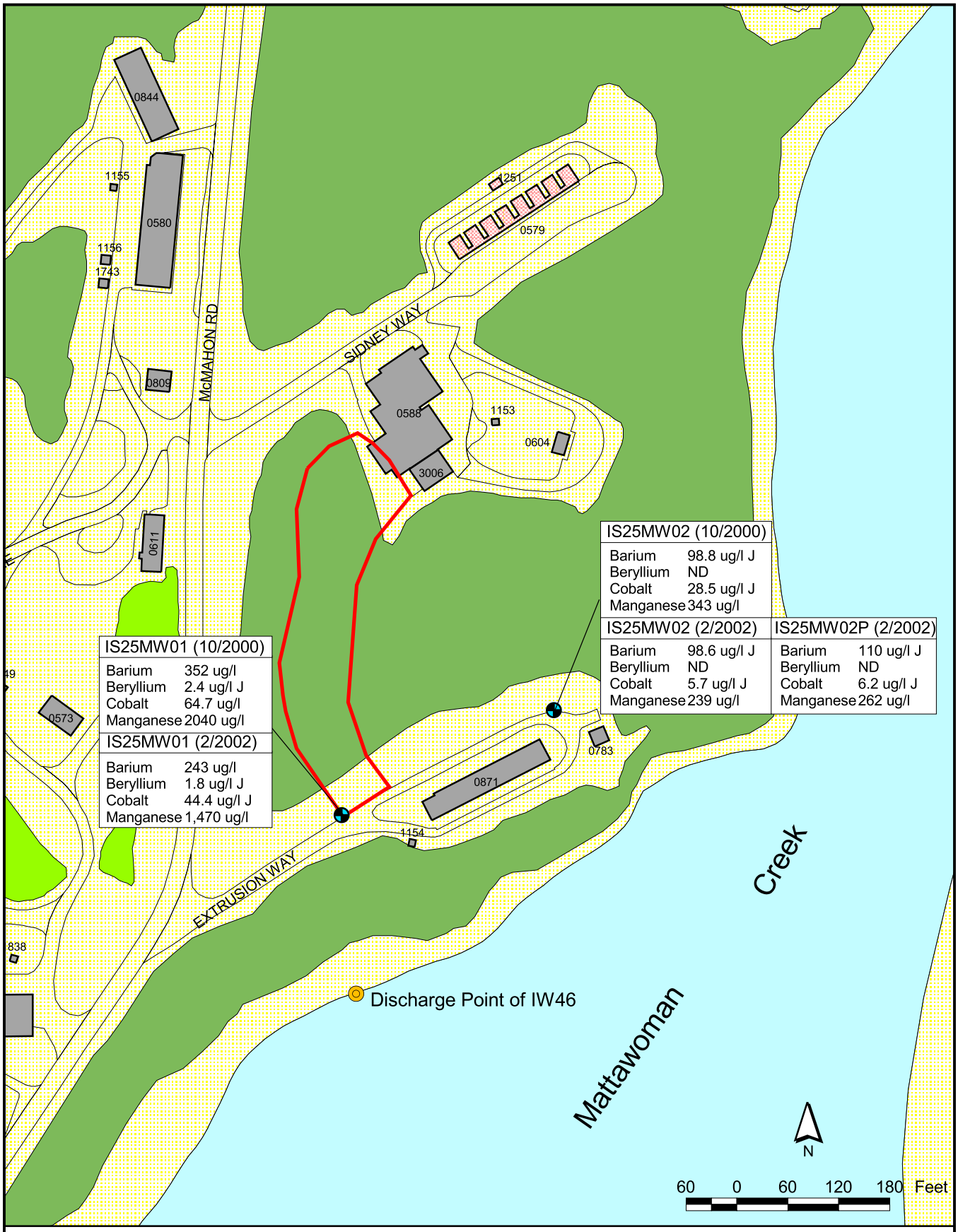
- Soil Sample
- Approximate Location of IW46 Discharge
- Buildings
- Demolished Buildings
- Road
- Railroads
- IR Site Boundary
- Wooded Area

ND = Non Detect
J = Estimated Value Below the Detection Limit
mg/kg = Milligrams per kilogram

Figure 8-6
Site 25 - Selected Metals in Subsurface Soil
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\dave_site11-13-17-21-25.apr



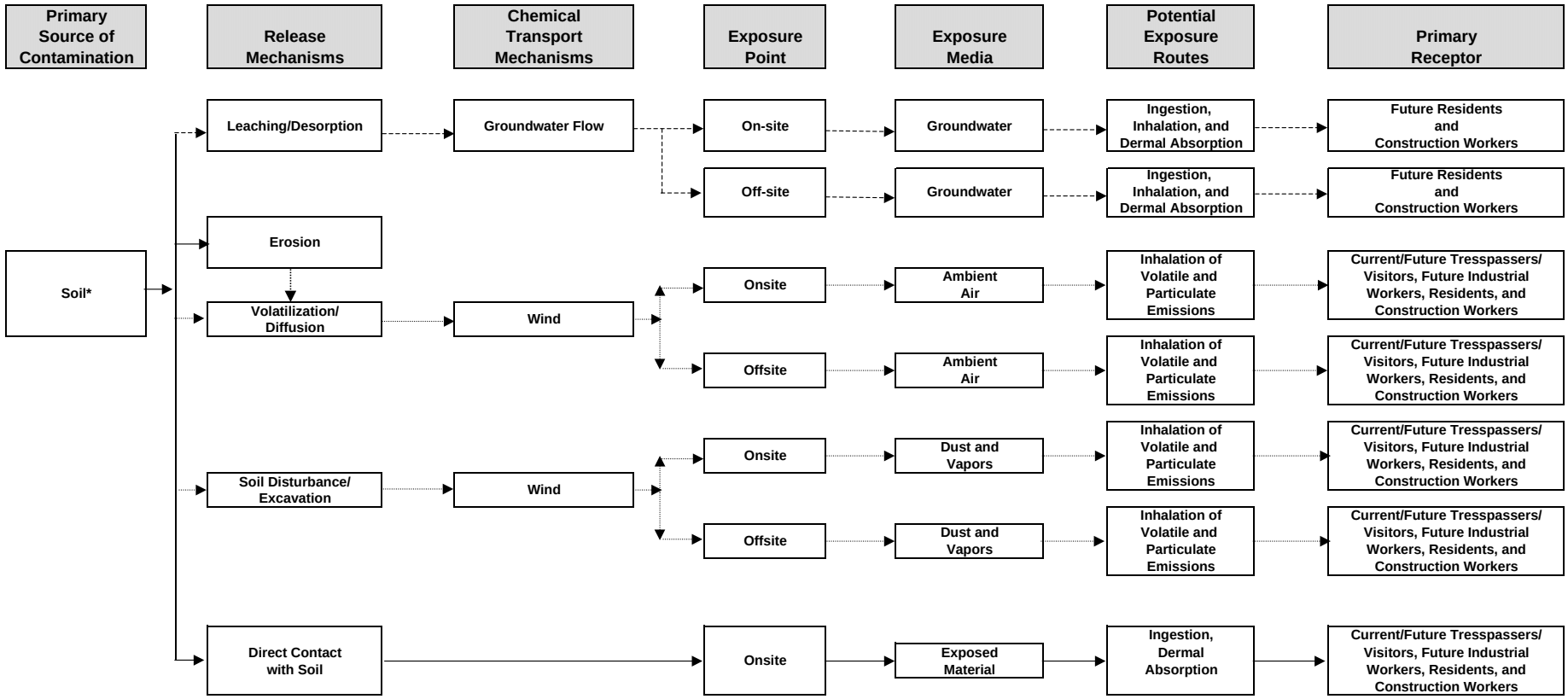
LEGEND

- Monitoring Wells
- Buildings
- Wooded Area
- Road
- Railroads
- IR Site Boundary

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/l = Micrograms per liter

Figure 8-7
Site 25 - Selected Total Metals in Groundwater
Sites 11, 13, 17, 21, and 25 Remedial Investigation
NDWIH, Indian Head, Maryland

CH2MHILL



* Current scenario is for surface soil and future scenarios are for surface and subsurface soil combined.

Complete Pathway
Incomplete Pathway
Pathway not evaluated because no CPOCs identified

Figure 8-8
Conceptual Exposure Model for Potential Human Exposures-Site 25
Sites 11,13,17,21, and 25 RI Report
NDWIH
Indian Head, Maryland

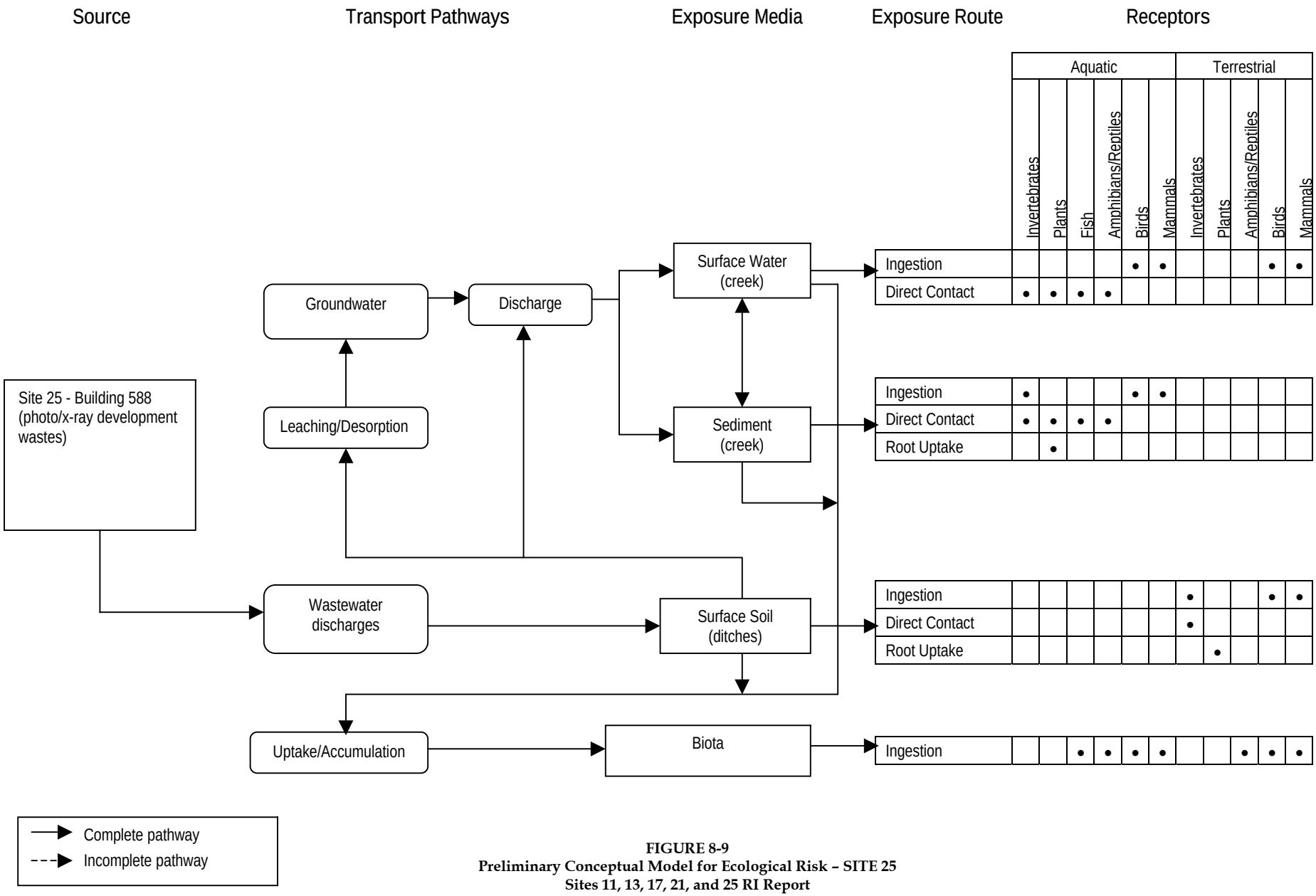


FIGURE 8-9
Preliminary Conceptual Model for Ecological Risk – SITE 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 11 along Mattawoman Creek

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 3.5' START : 8/9/00 END : 8/9/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1.5/2	SS01	4-4-11-12 (15)	Grass and organic matter with Silts @0.5' **FILL** - brick and black Clayey Sand w/ Silt, glass fragments	Wet at surface, moist by 0.5' bgs.
		1/2	SS02	6-7-10-5 (17)		@2' OVM=0ppm @3.5' First encountered water. @4' OVM=0ppm
5		0/2	SS03	50/4		@5' push aside solid obstruction @6' OVM=0ppm
		0/2	SS04	2-2-2-2 (4)	@7' based on auger cuttings, **Silty Sand (SM)**, gray, fine to medium sand, loose, wet, appears native	@8' OVM=0ppm
10					Boring terminated at 8' bgs. Monitoring well installed.	First encountered water at 3.5'bgs; monitoring well screened from 3-8' bgs (as shallow as possible with an adequate seal). See Monitoring Well Completion Diagrams for additional details.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 11 along Mattawoman Creek

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 4' — START : 8/8/00 — END : 8/8/00 — LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1/2	SS01	2-6-6-8 (12)	Grass, 2" organic matter with garbage @0.5' **FILL - Sandy Gravel w/ Clay (GC)**, yellowish brown, also quartz/glass/brick/wood fragments	@0' OVM=0 ppm
		1/2	SS02	10-9-6-5- (15)	@3' color to black, charred wood fragments associated with burn area @4' wet	**@2' OVM= 72 ppm**
5		0/2	SS03	5-6-4-2 (10)		**@4' OVM=16 ppm**; First encountered water.
		0/2	SS04	2-3-7-8 (10)	@6' No Recovery, possible that we encountered loose, silty native material	
					Boring terminated at 8' bgs. Monitoring well installed.	First encountered water at 4' bgs; monitoring well screened from 3-8' bgs. See Monitoring Well Completion Diagrams for additional details.
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 11 along Mattawoman Creek

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 14' START : 8/8/00 END : 8/8/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		0.5/2	SS01	2-8-8-2 (16)	Grass, 4" organic matter @0.5' **FILL - Clayey Sand w/ Gravel (SC)**, dark grayish brown (10YR 4/2)	@0' OVM=0 ppm
					@2' wet, fills augers	@2' OVM=0ppm; First encountered water.
		0/2	SS02	WOH*		Where no recovery, log based on auger cuttings and log for IS11SB02.
5		0/2	SS03	WOH*		
						@6' OVM=0ppm
		1.5/2	SS04	WOH*/1.5-2	@7' **Silt (ML)**, dark gray (10YR 4/1), wet, soft, 10-20% fine sand, assumed native	@8' OVM=0ppm
10				*WOH=weight of hammer	Boring terminated at 8' bgs. Monitoring well installed.	First encountered water at 14' bgs; monitoring well screened from 3-8' bgs (as shallow as possible with an adequate seal). See Monitoring Well Completion Diagrams for additional details.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 11 along entry road inside gate

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 14' START : 8/8/00 END : 8/8/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT) / RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	2/2	SS01	2-3-5-6 (8)	0-4" organic matter @0.5' **Silt (ML)**, yellowish brown (10YR 5/6), not plastic, firm, trace roots, trace clay and fine gravel	@0' OVM=0 ppm @2' OVM=0ppm; First encountered water.
	1.5/2	SS02	11-13-15-15 (28)	@2' **Clayey Silt (ML)**, light gray (10YR 7/2), iron oxide stained fractures, very slightly plastic, moist	Where no recovery, log based on auger cuttings and log for IS11SB02.
5	2/2	SS03	7-9-9-10 (18)	@4' **Silt (ML)**, light gray (10YR 7/2), iron oxide stained fractures, trace fine sand, trace clay, non-plastic, moist	@6' OVM=0ppm
	1.5/2	SS04	12-11-13-13 (24)		@8' OVM=0ppm
	2/2	SS05	5-6-7-9 (13)		
10	2/2	SS06	2-5-5-8 (10)	@10' trace iron staining, moist	@10' OVM=0ppm
	1.5/2	SS07	9-8-9-11 (17)	@11.8' **Clayey Silt (ML)**, light gray (10YR 7/2), slightly plastic, moist @12.5' **Silt (ML)**, light gray (10YR 7/2), non-plastic, moist	@12' OVM=0ppm @14' OVM=0ppm; First encountered water.
15	2/2	SS08	2-3-6-7 (9)	@14' **Sandy Silt (ML)**, light gray (10YR 7/2), with iron staining, 20% very fine sand, 80% non-plastic fines, wet, soft	@16' OVM=0ppm
	1.5/2	SS09	6-5-6-6 (11)	@16' sand to 5%, trace clay @16.5' **Sandy Silt (ML)**, light gray (10YR 7/2), with iron staining, 20% very fine sand, 80% non-plastic fines, wet, soft	@18' OVM=0ppm
20				Boring terminated at 18' bgs. Monitoring well installed.	First encountered water at 14' bgs; monitoring well screened from 13-18' bgs. See Monitoring Well Completion Diagrams for additional details.
25					

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW05	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 11 background near Bld 1650/1651

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS: First encountered at 20-24 START : 8/7/00 — END : 8/7/00 — LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
					2" grass and organics	@0' OVM=0ppm
		1.5/2	SS01	3-3-3-3 (6)	**Gravelly Silt (ML)**, yellowish brown (10YR 5/6), trace fine sand, 10% fine gravel, moist	
					(7.5YR 4/4), moist, firm, slightly plastic	@2' OVM=0ppm
		1.5/2	SS02	2-2-4-4 (6)	@2' **Clayey Silt (ML)**, light brownish gray (10YR 6/2), very slightly plastic, firm, iron oxide staining	
					@3' **Silt (ML)**, as above, non-plastic, to 10% fine sand	@4' OVM=0ppm
5		2/2	SS03	4-4-5-5 (9)		
					@5.5' **Clayey Silt (ML)**, light brownish gray (10YR 6/2), very slightly plastic, firm, iron oxide staining	@6' OVM=0ppm
		2/2	SS04	6-7-7-8 (14)	@7' **Silt (ML)**, as above, non-plastic, to 10% fine sand, soft	@8' OVM=0ppm
		2/2	SS05	3-4-5-5 (9)	@8' moist to wet, 2" thick seams of 10-20% very fine sand	
10						@10' OVM=0ppm
		2/2	SS06	3-4-3-3 (7)	@11-11.5' increased clay content, moist	
						@12' OVM=0ppm
		2/2	SS07	5-4-6-5 (10)		@13' wet perched zone
					@13' **Sandy Silt (ML)**, light brownish gray (2.5Y 6/2), 30% very fine sand, 70% non-plastic fines, wet	@14' OVM=0ppm
15		2/2	SS08	2-3-3-2 (6)	@14' wood fragments	
					@15' **Lean Clay (CL)**, light brownish gray (2.5Y 6/2), very stiff, slightly plastic, iron staining, moist	@16' OVM=0ppm
		1.5/2	SS09	4-6-12-9 (18)		
					@17' **Clayey Silt (ML)**, light brownish gray (2.5Y 6/2), stiff, very slightly plastic, moist	@18' OVM=0ppm
		0/2	SS10	5-5-6-7 (11)		
20						@20' OVM=0ppm
		2/2	SS11	5-5-5-5 (10)	@20' **Silt (ML)**, light brownish gray (2.5Y 6/2), firm, moist to wet, to 20% very fine sand	
						@22' OVM=0ppm
		2/2	SS12	7-6-6-7 (12)	@22' moist to wet, increased iron staining	
						@24' OVM=0ppm
					@24' wet	
25		2/2	SS13	2-2-2-2		

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW05	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 background near Bld 1650/1651
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling
WATER LEVELS: First encountered at 20-24 START : 8/7/00 END : 8/7/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1.5/2	SS16	3-3-4-3 (7)	@30' **Lean Clay (CL)** as above	@32' OVM=0ppm
					Boring terminated at 32' bgs. Monitoring well installed.	Monitoring well screened from 22-27' bgs based on lithology (clay from 27-32') and water levels (first encountered at 20-24'). The wet zone at 13' bgs is assumed to be perched. See Monitoring Well Completion Diagrams for additional details.
35						
40						
45						
50						
55						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS21MW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21 along Bronson Road

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 14' START : 8/3/00 END : 8/3/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		0/2	SS01	7-11-11-4 (22)	2" Organic Topsoil **Sandy Gravel w/ Silt (GM)** orange, moist	@0' OVM=0ppm
		0/2	SS02	5-5-3-2 (8)	@2' **Sandy Silt w/ Gravel (ML)** , yellowish - red (5YR 4/6), fine sand with well-rounded gravel to 1/2"	@2-4' log based on slough from SS03
5		2/2	SS03	3-3-6-11 (10)	@4' **Silty Sand (SM)**, light brownish gray (2.5Y 6/2), 20-30% fines, 70-80% fine sand, 5-10%fine gravel, loose moist	@4' OVM=0ppm
		1/2	SS04	6-5-6-9 (11)		@6' OVM=0ppm
		2/2	SS05	7-10-21-15 (31)	@8.5' **Clayey Silt (ML)**, light gray (10YR 7/2), moist, very stiff	@8' OVM=0ppm
10		1.5/2	SS06	6-11-11-8 (22)	@9.5' **Silty Sand (SM)**, light brownish gray (2.5Y 6/2), 40% low plasticity fines, 60% fine sand, iron oxide staining, loose @11' **Lean Clay (CL)**, light gray (10YR 7/1), slightly plastic, very stiff, trace very fine sand, iron oxide staining	@10' OVM=0ppm @12' OVM=0ppm
		2/2	SS07	12-12-16-13 (28)		@14' OVM=0ppm; First encountered water.
15		1.5/2	SS08	2-3-5-5 (8)	@14' **Poorly Graded Sand (SP)**, light gray (10YR 7/1), loose, wet, fine sand, 5-10% fines	
		2/2	SS09	14-15-18-14 (32)	@15.5' **Well Graded Sand (SW)**, as above except fine-coarse sand, trace fine gravel	@16' OVM=0ppm @18' OVM=0ppm
20					Boring terminated at 18' bgs. Monitoring well installed.	First encountered water at 14'bgs; monitoring well screened from 13-18' bgs. See Monitoring Well Completion Diagrams for additional details.
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS21MW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21 along Bronson Road

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 16' START : 8/3/00 END : 8/4/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1.5/2	SS01	3-3-4-4 (7)	2" Organic Topsoil **Sandy Silt w/ Gravel (ML)** , yellowish - red (5YR 4/6), fine sand with well-rounded coarse gravel (10%)	Large subsurface cobbles in this area as large as 2' in diameter based on IS21TP06
						@2' OVM=0ppm
		1.5/2	SS02	10-13-12-15 (25)	@3' **Silty Gravel w/ Sand (GM)**, as above with 75% angular quartz gravel to 1" diameter	
					@3.5-3.8' green quartz sandstone,	@4' OVM=0ppm
5		1.5/2	SS03	11-17-18-21 (35)	probably cobble cored w/ split spoon	
						@6' OVM=0ppm
		1.5/2	SS04	22-18-22-11 (40)	@6' **Sandy Gravel w/ Silt (GM),** yellowish-red (5YR 4/6), well graded sand with angular quartz gravel	
						@8' OVM=0ppm
		1.5/2	SS05	8-9-40-26 (49)		
10						@10' OVM=0ppm
		1.5/2	SS06	8-11-26-16 (37)	@10' color to dark brown/black @10.5' color back to yellowish-red (5YR 4/6)	
						@12' OVM=0ppm
		1.5/2	SS07	19-30-25-19 (55)		
						@14' OVM=0ppm
15		1/2	SS08	21-29-24-11 (53)	@15' **Silty Sand (SM)**, strong brown (7.5Y 5/6), moist to wet, loose, fine-coarse sand	
						@16' OVM=0ppm; First encountered water.
		1/2	SS09	21-22-31-40 (54)	@15.5' **Sandy Gravel w/ Silt (GM),** yellowish-red (5YR 4/6), well graded sand with angular quartz gravel	
						@18' OVM=0ppm
		1/2	SS10	10-10-11-10 (21)		
20					Boring terminated at 20' bgs. Monitoring well installed.	First encountered water at 16'bgs; monitoring well screened from 15-20' bgs. See Monitoring Well Completion Diagrams for additional details.
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS21MW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : SW corner of Site 21

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 14' START : 8/4/00 END : 8/4/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1/2	SS01	5-5-4-4 (9)	2" Organic Topsoil **Silt (ML)**, dark yellowish brown (10YR 4/4), moist, roots, trace fine sand	@0' OVM=0ppm
		1.5/2	SS02	5-7-6-9 (13)	@2' **Clayey Silt (ML)**, light olive brown (2.5Y 5/4), slightly plastic, firm, iron staining, trace fine gravel	@2' OVM=0ppm
5		2/2	SS03	8-9-11-13 (20)	@4' color to light gray (2.5Y 7/2), ancient roots	@4' OVM=0ppm
		2/2	SS04	12-12-17-40 (29)	@7' **Silty Sand w/ Gravel (SM)**, light gray (2.5Y 7/2), 20% fines, 70% fine-medium sand, 10% quartz gravel	@6' OVM=0ppm
		1.5/2	SS05	11-26-50-50 (76)	@7.5' **Sandy Gravel w/ Silt (GM)**, yellowish red (5YR 4/6), angular quartz gravel > 1" diameter (75%), fine-medium sand (15%), fines (10%)	@8' OVM=0ppm
10		2/2	SS06	22-30-50/4		@10' OVM=0ppm
		1.5/2	SS07	12-30-50/4		@12' OVM=0ppm
15		1/2	SS08	18-24-12-6 (36)	@13.5' a 3" thick band of silty sand @14' wet	@14' OVM=0ppm; First encountered water, could be as high as 13.5 bgs.
		1/2	SS09	7-8-10-8 (18)	@15.5' **Silty Sand (SM)**, pinkish gray (7.5YR 7/2), 30% low plasticity fines, 65% fine-medium sand, 5% quartz gravel	@16' OVM=0ppm @18' OVM=0ppm
20					Boring terminated at 18' bgs. Monitoring well installed.	First encountered water at 14'bgs; monitoring well screened from 13-18' bgs. See Monitoring Well Completion Diagrams for additional details.
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS21MW04	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21 near Bld 554

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 44' START : 8/2/00 END : 8/3/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT) / RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	2/2	SS01	2-3-3-4 (6)	0-1' Organic Topsoil with gravel **@1' Gravelly Silt w/ Sand (ML)**, brown (7.5YR 4/4), moist, firm, slightly plastic	Although some of the soils are indistinguishable from fill, entire boring appears to be native materials transported via fluvial processes. @2' OVM=0ppm
	2/2	SS02	4-4-5-6 (9)		@4' OVM=0ppm
5	2/2	SS03	5-12-11-11 (23)	@5' **Sandy Silt w/ Gravel (ML)**, yellowish-red (5YR 4/6), quartz sandstone angular gravel to 1", moist, firm, 10% fine sand	@6' OVM=0ppm
	2/2	SS04	8-8-10-11 (18)	@6' **Sandy Silt (ML)**, yellowish-red (5YR 4/6), medium to coarse sand, not plastic, moist	@8' OVM=0ppm
	2/2	SS05	4-4-5-5 (9)		
10					@10' OVM=0ppm
	1.5/2	SS06	5-5-8-10 (13)	@10' as above, color to brown (7.5YR 4/4)	
	1/2	SS07	10-12-11-9 (23)	@12' sand content increases to 20%	@12' OVM=0ppm; possible cobble preventing recovery
				@14' sand content increases to 40%	@14' OVM=0ppm
15	2/2	SS08	4-4-6-6 (10)		
					@16' OVM=0ppm
	2/2	SS09	6-8-8-7 (16)		
					@18' OVM=0ppm
	2/2	SS10	4-5-5-7 (10)	@18' **Silty Sand (SM)**, yellowish red (5YR 4/6), 20% low plasticity fines, 80% fine sand, loose, moist	
20					@20' OVM=0ppm
	1/2	SS11	4-5-5-5 (10)	@21' seams 1-2" thick of fine to medium sand	
					@22' OVM=0ppm
	2/2	SS12	6-9-7-6 (16)	@22.5' **Sandy Silt (ML)**, brown (7.5YR 4/4) medium to coarse sand, not plastic, moist @23' **Silty Sand (SM)**, yellowish red (5YR 4/6), 20% low plasticity fines, 80% fine sand, loose, moist	@24' OVM=0ppm
25	1/2	SS13	11-25-50/4	@24' **Sandy Gravel (GW)**, tan to orange	

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS21MW04	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21 near Bld 554

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 44' START : 8/2/00 END : 8/3/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1/2	SS16	20-29-30-37 (59)	@30' as above	
		1/2	SS17	40-50/3		@32' OVM=0ppm
						@34' OVM=0ppm
35		0.5/2	SS18	32-32-34-38 (66)		
		1.5/2	SS19	20-22-27-25 (49)	@36' end of reddish sandstone gravel, moist	@36' OVM=0ppm
						@38' OVM=0ppm
		1/2	SS20	25-31-20-16 (51)		
40						@40' OVM=0ppm
		2/2	SS21	5-5-9-8 (14)	@40' **Lean Clay (CL)**, yellowish brown (10YR 5/6) slightly plastic, trace fine sand, firm, moist	
		2/2	SS22	6-5-6-7 (11)	@42' fine laminations of **Silty Sand (SM)** to **Sandy Silt (ML)**, color as above, moist to wet	@42' OVM=0ppm Water level is 42.5' with augers at 48'
						@44' OVM=0ppm; First encountered water.
45		1/2	SS23	10-10-22-10 (32)	@44' **Sand (SP)**, fine to medium, iron oxide stained white quartz sand, wet	
						@46' OVM=0ppm
		1/2	SS24	10-11-15-16 (26)		
						@48' OVM=0ppm
50					Boring terminated at 48' bgs. Monitoring well installed.	Appears to be confined conditions below 42' (the gravels above 40' appeared moist not wet). Monitoring well screened from 42-47' bgs. See Monitoring Well Completion Diagrams for additional details.
55						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 20' START : 7/27/00 END : 7/27/00 LOGGER : Chip Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
					Grass/Gravel	
			SS01	5-5-6-4 (11)	@0.5' **Sandy Clay (CL)**, light brown	@0' OVM=0 ppm
						@2' OVM=0ppm
			SS02	7-5-5-4 (10)	@2' color to gray, soft	
						@4' OVM=0ppm
5			SS03	4-4-6-4 (10)	@4' moist	
						@6' OVM=0ppm
			SS04	4-4-6-5 (10)	@6' **Clayey Sand w/ Gravel (SP)**, light brown	
						@8' OVM=0ppm
			SS05	2-3-2-2 (5)		
10						@10' OVM=0ppm
			SS06	5-6-12-12 (18)	@10' **Silty Sand and Gravel (SM-GM)**, orange, coarse sand, moist	
						@12' OVM=0ppm
			SS07	17-15-17-18 (32)		
						@14' OVM=0ppm
15			SS08	8-13-15-13 (28)		
					@15.5' silt content increases	@16' OVM=0ppm
			SS09	40-40-12-15 (52)	@16' **Lean Clay (CL)** laminations with silt and sand, damp	
						@18' OVM=0ppm
			SS10	14-18-20-15 (38)	@18' **Sand (SP)** with clay laminations, light gray, moist, medium sand	
20						@20' OVM=0ppm
			SS11	4-8-8-12 (16)	@20' **Sand (SP)**, white, medium sand, wet	
					Boring terminated at 22' bgs. Monitoring well installed.	First encountered water at 20' bgs. Backfilled with cuttings. It was difficult to determine whether the gravelly soils to 15' were native or fill, they appeared native.
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB02	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 40' START : 7/28/00 END : 7/28/00 LOGGER : Ben Francisco (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT) / RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	1.75/2	SS01	4-6-6 (12)	**FILL - Gravelly Silt w/ Sand (ML)**, brown moist, firm, coal and wood fragments	@2' OVM=0ppm
	1.75/2	SS02	4-6-8 (14)	@2.5' **FILL - Gravelly Clay (CL)**, orange-brown, trace sand, moist, firm	@4' OVM=0ppm
5	2/2	SS03	3-4-5 (9)	@4' **FILL - Sandy Silt w/ Gravel (ML)**, tan, rounded quartz gravel, moist, firm	@6' OVM=0ppm
	1/2	SS04	3-3-4 (7)	@6' black staining, coal fragment, probable fill	@8' OVM=0ppm
	1/2	SS05	1-3-5 (8)	@9' organic material	
10	1.75/2	SS06	2-2-2 (4)	@10' **FILL - Sandy Silt w/ Gravel (ML)**, dark brown, rounded quartz gravel, moist, soft, organic staining	@10' OVM=0ppm @12' OVM=0ppm
	2/2	SS07	3-3-3 (6)		@14' OVM=0ppm
15	1/2	SS08	Weight of Hammer	@15' **FILL - Gravelly Sand w/ Silt (SM)**, black, damp, tight, wood fragments	@16' OVM=0ppm
	1/2	SS09	3-6-6 (12)		@18' OVM=0ppm
	1.25/2	SS10	4-6-6 (12)		
20	1/2	SS11	2-2-2 (4)	@ 20' glass, wood, and paper fragments @21' **Silt (ML)**, pink, trace sand, moist, firm, appears native (probable contact)	@20' OVM=0ppm @21' probably contact fill/native @22' OVM=0ppm
	1/2	SS12	2-50/4	@22' **Gravelly Sand (SW)**, tan, fine to coarse grained sand, fine gravel, trace silt, moist, tight	@24' OVM=0ppm
25	1.25/2	SS13	31-50/3	@24' **Sandy Gravel (GP)**, tan to orange, trace silt, fine to coarse sand, rounded	

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB02	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : NDWIH | LOCATION : Site 21

ELEVATION : See survey report | DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 40' START : 7/28/00 END : 7/28/00 LOGGER : Ben Francisco (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS16	16-17-16 (33)	as above, **Sandy Gravel (GP)**	
						@32' OVM=0ppm
			SS17	21-19-11 (30)		
						@34' OVM=0ppm
35			SS18	15-26-17 (43)	@35' very moist	
						@36' OVM=0ppm
			SS19	17-23-29 (52)	@36' **Sandy Clay (CL)**, tan, fine grained sand, moist, soft	
						@38' OVM=0ppm
			SS20	3-2-4 (6)		
40						@40' OVM=0ppm; First encountered water.
			SS21	44-26-18 (44)	@40' **Clayey Sand (SC)**, tan to orange, loose, wet	
						@42' OVM=0ppm
			SS22	15-10-10 (20)	@42' **Sandy Gravel w/ Silt (GM)**, orange, loose, wet	
						@44' OVM=0ppm
45			SS23	7-12-15 (27)	@45' **Sand (SP)**, mottled white and tan, medium to coarse sand, trace silt, wet, tight	
						@46' OVM=0ppm
					Boring terminated at 46' bgs.	First encountered water at 40' bgs. Backfilled with cuttings.
50						
55						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB03	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 40' START : 7/30/00 END : 7/31/00 LOGGER : Ben Francisco (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT) / RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	1.5/2	SS01	4-3-5 (8)	**FILL - Silty Clay w/ Sand & Gravel (CL),** orange-brown, coal fragments, firm	
					@2' OVM=0ppm
	1.5/2	SS02	5-4-3 (7)		
					@4' OVM=0ppm
				@4' wood and coal fragments	
5	1.5/2	SS03	4-4-3 (7)	@5' birck and coal fragments	
					@6' OVM=0ppm
	1/2	SS04	3-3-5 (8)	@6' **FILL - Clayey Silt w/ Sand (SC)**, brown, trace gravel, moist, soft, coal and wood fragments	
					@8' OVM=0ppm
	1/2	SS05	1-1-1 (2)		@9' probably contact fill/native
10				@9' **Sandy Silt (ML)**, black, moist, soft, appears native (probable contact), wood fragments (peat?)	@10' OVM=0ppm; chlorinated odor? possibly organic odor
	1/2	SS06	1-2-2 (4)		
					@12' OVM=0ppm
	1/2	SS07	2-3-3 (6)	@12' **Clayey Silt (ML)**, brown, with trace sand, moist, soft	
					@14' OVM=0ppm
15	1.5/2	SS08	2-2-2 (4)		
				@15' **Silty Sand (SM)**, black, fine sand, damp, tight	@16' OVM=0ppm
	1/2	SS09	1-1-1 (2)	@16' **Sand (SP)**, pink, trace clay, damp, tight	
					@18' OVM=0ppm
	1/2	SS10	1-1-1 (2)		
20					@20' OVM=0ppm
	1/2	SS11	2-2-2 (4)	@20' **Clayey Sand (SC)**, pink, moist, tight, clay nodules, trace gravel	
					@22' OVM=0ppm
	0.75/2	SS12	1-3-4 (7)	@22.5' **Sandy Silt (ML)**, brown, moist, trace gravel, moist, soft	
				@23.5' **Gravelly Sand w/ Silt (SM)**, yellow-brown, fine sand, damp, tight	@24' OVM=0ppm
25	1.5/2	SS13	25-28-37		

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB03	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 40' START : 7/30/00 END : 7/31/00 LOGGER : Ben Francisco (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT) / RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	1.5/2	SS16	44-10-9 (19)	as above, **Sandy Gravel w/ Silt (GM)** @31' **Sandy Silt (ML)**, brown, moist, firm	@32' OVM=0ppm
	1.75/2	SS17	12-10-11 (21)	@32.2' a 2" thick layer of quartz gravel @32.5' **Clayey Sand (SC)**, brown, fine to medium grained sand, moist, tight, clay content increases w/ depth	@34' OVM=0ppm
35	1/2	SS18	50/3	@34' **Sandy Gravel (GP)**, brown to orange, trace silt, rounded quart gravel to 1.5" in diameter, fine to medium grained sand, moist, tight	@36' OVM=0ppm
	1.25/2	SS19	22-50/5		@38' OVM=0ppm
	1/2	SS20	36-50/5		
40					@40' OVM=0ppm
	1.25/2	SS21	18-12-26 (38)		@42' OVM=0ppm
	1/2	SS22	23-24-24 (48)		@44' OVM=0ppm
45	1.75/2	SS23	23-39-50/1		@46' OVM=0ppm
	1.25/2	SS24	20-15-10 (25)	@47' wet	@47' First encountered water. @48' OVM=0ppm
		SS25	48-50/2		
50				Boring terminated at 49' bgs.	First encountered water at 47' bgs. Backfilled with cuttings.
55					

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB04	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 30' START : 8/1/00 END : 8/1/00 LOGGER : Ben Francisco (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT) / RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	1/2	SS01	2-3-4 (7)	**FILL - Sandy Silty w/ Gravel (ML),** brown, moist firm, coal fragments	The contact between fill and native soil is estimated to be at 25' bgs, however, the native soil are difficult to distinguish from the clean fill (or re-worked) deposits.
	1.25/2	SS02	4-3-6 (9)	@3' **FILL - Sandy Silt (ML)**, black, moist, soft	@2' OVM=0ppm @3' unusual odor, organic?; OVM=0ppm @4' OVM=0ppm
5	1.75/2	SS03	4-4-4 (8)	@4' **FILL - Clayey Sand w/ Gravel (SC)**, grey brown, fine to medium grained sands, moist, firm	@6' OVM=0ppm
	1.25/2	SS04	4-5-5 (10)	@7' black staining	@8' OVM=0ppm
	2/2	SS05	2-1-2 (3)	@9' coal fragments	
10					@10' OVM=0ppm
	1.75/2	SS06	4-6-7 (13)	@10.5' **FILL - Sandy Silt w/ Gravel (ML)**, grey brown, moist, firm, wood fragments	@12' OVM=0ppm
	1.5/2	SS07	4-6-6 (12)		@14' OVM=0ppm
15	1.75/2	SS08	6-7-6 (13)	@15' **FILL - Silty Sand w/ Gravel (SM)**, pink, moist, firm	@16' OVM=0ppm @16.4' split spoon refusal
	0.4/2	SS09	50/4		@18' OVM=0ppm
	1/2	SS10	7-7-7 (14)	@18' **FILL - Gravelly Sand w/ Silt (SM)**, brown, angular gravel, moist, tight	
20					@20' OVM=0ppm
	1.5/2	SS11	2-3-2 (5)	@21' organic material	@22' OVM=0ppm
	1/2	SS12	2-3-5 (8)	@23' **FILL - Sandy Gravel w/ Silt (GM)**, moist, loose, gravel is 0.5-1" in diameter, wood fragments	@24' OVM=0ppm
25	2/2	SS13	12-23-20		@25' probably contact fill/native

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB04	SHEET 2 OF 2

SOIL BORING LOG

PROJECT : NDWIH | LOCATION : Site 21

ELEVATION : See survey report | DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 30' START : 8/1/00 END : 8/1/00 LOGGER : Ben Francisco (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1.75/2	SS16	21-23-11 (34)	@30' wet	
						@32' OVM=0ppm
		2/2	SS17	30-33-39 (69)	@32' **Gravelly Sand (SP)**, tan, medium to coarse sand, trace silt, wet, tight	
						@34' OVM=0ppm
35					Boring terminated at 34' bgs.	First encountered water at 30' bgs. Backfilled with cuttings.
40						
45						
50						
55						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS21SB05	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 21

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 22' START : 7/27/00 END : 7/28/00 LOGGER : Francisco/Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	6-5-5-4 (10)	**FILL - Clayey Sand and Gravel (GC),** orange-red	The contact between fill and native soil is estimated to be at 12' bgs, however, the native soil are difficult to distinguish from the clean fill (or re-worked) deposits. Contact possibly at 22' bgs)
			SS02	2-3-2-3 (5)		@4' OVM=0ppm
5			SS03	Weight of Hammer	@4' **FILL - Sandy Clay (CL),** dark brown, moist, soft, leaves	@6' OVM=0ppm
			SS04	3-5-7-8 (12)	@6' **FILL - Sandy Clay (CL),** dark brown, damp, soft, some debris	@8' OVM=0ppm
			SS05	20-25-30-27 (55)	@8' **FILL - Sandy Clay (CL),** dark brown, fine sand, wood and metal debris	
10		0/2	SS06	16-30-46-35 (76)	@10' **FILL - trash and metal debris**	@10' OVM=0ppm
			SS07	38-30-37-50/3 (67)	@12' **Gravelly Sand (SP),** light orange, medium sand	@12' OVM=0ppm; probably contact fill/native
15			SS08	14-17-18-14 (33)	@14' color to orange	@14' OVM=0ppm
		2/2	SS09	11-17-18-11 (35)	@16' **Gravelly Sand w/ Silt (SM),** orange-brown, moist, loose	@16' OVM=0ppm
		1/2	SS10	10-10-21-32 (21)		@18' OVM=0ppm
20		1/2	SS11	44-32-30-34 (62)	@19' **Sandy Gravel w/ Silt (GM),** orange-brown, very moist, loose	@20' OVM=0ppm
		1/2	SS12	13-15-12-10 (27)	@22' **Sand (SP),** mottled white and tan, medium to coarse sand, trace silt, saturated, tight, bedding of sand layers visible	@22' OVM=0ppm; first encountered water @24' OVM=0ppm
25					Boring terminated at 24' bgs.	First encountered water at 22' bgs. Backfilled

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid L10)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 6' START : 7/24/00 END : 7/24/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT) / RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	2/2	SS01	2-3-4-5 (7)	**FILL - Sandy Clay w/ Gravel (CL),** brown, medium sand	
					@2' OVM=0ppm
	2/2	SS02	4-5-4-4 (9)	@2' **FILL - Sandy Clay (CL),** gray, medium sand	
					@4' OVM=0ppm
				@4' wood	
5	0.5/2	SS03	4-6-3-2 (9)		
					@6' OVM=0ppm; first encountered water.
	2/2	SS04	Weight of hammer	@7' **Sandy Clay (CL)**, gray, medium sand, presumed native	@7' fill/native contact
		SS05			
10				Boring terminated at 10' bgs.	First encountered water at 6' bgs. Grab groundwater sample GW-1 collected. Backfilled with cuttings.
15					
20					
25					

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid J9)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 5.5' START : 7/24/00 END : 7/24/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		0.5/2	SS01	3-5-11-5 (16)	**Fill - Clayey Sand w/ Gravel (SC),** brown	
					@2' gravel and wood	@2' OVM=0ppm
			SS02	32-57-refusal		
					@4' wood fragments	@4' OVM=0ppm
5			SS03	11-5-3-2 (8)		@5.5' First encountered water.
						@6' OVM=0ppm
			SS04			
					@7.5' **Sandy Clay (CL)**, gray, marine clay, presumed native	@7.5' fill/native contact
			SS05			
10					Boring terminated at 10' bgs.	First encountered water at 5.5' bgs. Grab groundwater sample GW-2 collected. Backfilled with cuttings.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid G10)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 4' START : 7/25/00 END : 7/25/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1/2	SS01	2-10-6-10 (16)	**Fill - Clayey Sand w/ Gravel (SC),** brown, with concrete chunks	
						@2' OVM=0ppm
		1.5/2	SS02	21-21-15-10 (36)	@2' **Fill - Clayey Sand (SC)**, dark gray to black stained	
						@4' OVM=0ppm; First encountered water.
5		1/2	SS03	2-2-6-4 (8)		
						@6' OVM=0ppm
					@6' wood fragments	
		0.5/2	SS04	10-7-2-3 (9)	@7' **Sandy Clay (CL)**, gray, marine clay, presumed native	@7' fill/native contact
			SS05			
10					Boring terminated at 10' bgs.	First encountered water at 5.5' bgs. Grab groundwater sample GW-3 collected. Backfilled with cuttings.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid E10)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 10' START : 7/25/00 END : 7/25/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1/2	SS01	3-3-9-11 (12)	**Fill - Clay (CL)**, brown	
					@2' moist	@2' OVM=0ppm
		0.5/2	SS02	10-50/4		
					@4' rubble chunks	@4' OVM=0ppm
5		1/2	SS03	10-10-50/2		
						@6' OVM=0ppm @6.5' fill/native contact
		1.5/2	SS04	2-4-8-11 (12)	@ 6.5' **Clay (CL)**, mottled green to dark gray, stiff	
					@8' **Clayey Sand (SC)**, brown, moist	
		0.5/2	SS05	2-3-5-7 (8)		
10						@10' First encountered water.
					Boring terminated at 10' bgs.	First encountered water at 10' bgs. Grab groundwater sample GW-4 collected. Backfilled with cuttings.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid C9)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 2' START : 7/25/00 END : 7/25/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		0.5/2	SS01	3-3-4-5 (7)	**Fill - Sandy Clay (CL),** brown	
						@2' OVM=0ppm; First encountered water.
		0/2	SS02	6-40-43-30 (83)	@2' trash, roots, cyprus stump, tire, metal	
						@4' OVM=0ppm; fill/native contact
5			SS03	2-3-3-2 (6)	@ 4' **Sandy Clay (CL)**, brown	
						@6' OVM=0ppm
		0/2	SS04	Weight of hammer, 11-2		
					Boring terminated at 8' bgs.	First encountered water at 2' bgs. Grab groundwater sample GW-5 collected. Backfilled with cuttings.
10						
15						
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25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid C8)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 2' START : 7/25/00 END : 7/25/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		0.4/2	SS01	Weight of hammer, 3-4-4	**Fill - Organic Clay (OH),** black, wood	
						@2' OVM=0ppm; First encountered water.
			SS02	2-3-7-9 (10)	@2' metal	
						@4' OVM=0ppm
5			SS03		@ 4' wood	
						@6' OVM=0ppm; fill/native contact
			SS04	5-4-3-2 (7)	@6' **Sand with Gravel and Clay (SP),** dark gray, coarse sand, natural fluvial deposits	
					Boring terminated at 8' bgs.	First encountered water at 2' bgs. Grab groundwater sample GW-6 collected. Backfilled with cuttings.
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid K8)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 6' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	6-5-5-5 (10)	**Fill - Clayey Sand (SC),** dark gray	
						@2' OVM=0ppm
					@2' wood	
			SS02	5-4-4-4 (8)		
						@4' OVM=0ppm
5			SS03	3-3-6-3 (9)		
						@6' OVM=0ppm; First encountered water.
			SS04	2-2-2-2 (4)		@7' fill/native contact
					@7' **Clay (CL)**, native	
					Boring terminated at 8' bgs.	First encountered water at 6' bgs. Backfilled with cuttings.
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB08	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 4' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	4-4-4-4 (8)	**Fill - Sandy Clay (CL)**,brown, with wood	
					@2' **Clay (CL)**, native	@2' OVM=0ppm; fill/native contact
			SS02	7-5-5-4 (10)		
						@4' OVM=0ppm; First encountered water.
5			SS03	4-4-3-2 (7)		
						@6' OVM=0ppm
						First encountered water at 4' bgs. Backfilled with cuttings.
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB09	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS :
START : 7/26/00
END : 7/26/00
LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	2-4-4-5 (8)	6" of surficial metal and debris **Clayey Sand (SC),** tan, fine sand, native	
						@2' OVM=0ppm
			SS02	4-5-5-10 (10)		
						@4' OVM=0ppm
						Backfilled with cuttings.
5						
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB10	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 11 (grid I8)

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 4' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	WOH-12-3-4	**Fill - Clayey Sand (SC),** brown, moist	
						@2' **OVM = 1336 ppm**
			SS02	3-4-8-4 (12)		
						@4' First encountered water.
5			SS03	2-1-1-1 (2)		
					@6' wood	
			SS04	2-2-2-2 (4)		
					@8' **Sand (SP)**, brown, wood	
			SS05	4-3-1-1 (4)		
10					@10' **Clay (CL)**, brown, organics	@10' fill/native contact
			SS06	Weight of hammer		
					Boring terminated at 12' bgs.	First encountered water at 4' bgs. Backfilled with cuttings.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB11	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid H6)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 5' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	6-8-8-5 (16)	**Fill - Clayey Sand w/ Gravel (SC),** tan, slag material	
						@2' OVM=0ppm
			SS02	4-3-3-4 (6)	@2' **Sand (SP)**, dark brown, medium to coarse	
						@4' OVM=0ppm
5			SS03	1-2-1-1 (3)	@5' **Clay (CL)**, dark gray, native	@5' First encountered water. Fill/native contact.
						@6' OVM=0ppm
			SS04			
						@8' OVM=0ppm
			SS05			
10						@10' OVM=0ppm
					Boring terminated at 10' bgs.	First encountered water at 5' bgs. Backfilled with cuttings.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB12	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid G4)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS :
START : 7/26/00
END : 7/26/00
LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	WOH-4-6-12 (10)	0-6" Plant debris and leaves	
						@2' OVM=0ppm
			SS02	10-12-14-16 (26)	@2' **Sand (SP)**, tan, stiff, dry, native	
						@4' OVM=0ppm
5					Boring terminated at 4' bgs.	Backfilled with cuttings.
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB13	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid G8)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 6' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	6-6-4-31 (10)	**Fill -** Metallic debris and black fill	
						@2' OVM=0ppm
			SS02	6-8-14-14 (22)	@2' **Fill - Sandy Clay w/ Gravel (SC)**, tan, medium sand, stained soil	
						@4' OVM=0ppm
5			SS03	11-7-6-4 (13)	@4' **Fill - Sand (SP) and industrial debris,** black and tan stained coarse sand	
						@6' OVM=0ppm; First encountered water. Auger refusal, continue w/ spoons only.
			SS04	1-2-2-2 (4)		
						@8' OVM=0ppm
			SS05	1-2-1-1 (3)	@8' **Organic Clay (OH)**, brown, native (no recovery; depth of contact estimated)	
10						@10' OVM=0ppm
			SS06	2-2-2-3 (4)		
						@12' OVM=0ppm
					Boring terminated at 12' bgs.	First encountered water at 6' bgs. Backfilled with cuttings.
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB14	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid F6)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 4' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	6-18-20-12 (38)	**Fill - Clayey Sand (SC),** brown, wood particles	
						@2' OVM=0ppm
			SS02	10-7-2-2 (9)	@2' No recovery.	
						@4' OVM=0ppm; First encountered water. Fill/native contact.
5			SS03	WOH-1-1-2 (2)	@4' **Clayey Sand (SC)**, dark gray, medium sand @5.5' **Clay (CL)**, gray	
						@6' OVM=0ppm
					Boring terminated at 6' bgs.	First encountered water at 4' bgs. Backfilled with cuttings.
10						
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB15	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH — LOCATION : Site 11

ELEVATION : See survey report — DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling

WATER LEVELS : First encountered at 4' — START : 7/26/00 — END : 7/26/00 — LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	40-19-10-4 (29)	**Fill -Metalic debris w/ Gravelly Sand (SW),** dark	
						@2' OVM=0ppm
			SS02	12-30-25-10 (55)		
						@4' OVM=0ppm; First encountered water.
					@4' wet	
5			SS03	6-15-10-12 (3)		
						@6' OVM=0ppm
			SS04	2-2-2-2 (4)	@6' **Fill - Sandy Clay (CL)**, tan to dark tan to black, treated wood fragments	
						@8' OVM=0ppm
			SS05	5-11-12-15 (23)		
10						@10' OVM=0ppm
			SS06	2-1-1-2 (2)		
						@12' OVM=0ppm
					@12' wood fragments	
			SS07	2-3-3-2 (6)		
						@14' OVM=0ppm
15			SS08	3-3-2-3 (5)		@15' Fill/native contact.
					@15' **Clayey Sand (SC)**, gray, medium sand, native	
						@16' OVM=0ppm
					Boring terminated at 16' bgs.	First encountered water at 4' bgs. Backfilled with cuttings.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB16	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid D6)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 1' START : 7/27/00 END : 7/27/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	4-7-21-20 (28)	**Fill - Clayey Sand (SC),** brown, treated wood debris	@1' First encountered water.
					@2' large metallic debris interferring w/augers	@2' OVM=0ppm
			SS02	21-47-50/4		
						@4' OVM=0ppm
5			SS03	3-2-1-2 (3)	@4' **Fill - Sandy Clay (CL)**, dark brown, wood particles	@5.5' Fill/native contact.
					@5.5 **Sandy Clay (CL)**, dark brown, native	@6' OVM=0ppm
			SS04	2-1-3-2 (4)	@6' **Sandy Clay w/ Gravel (CL)**, dark brown	
						@8' OVM=0ppm
					Boring terminated at 8' bgs.	First encountered water at 1' bgs. Backfilled with cuttings.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB17	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid C4)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 2' START : 7/27/00 END : 7/27/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	1-1-3-5 (4)	**Fill - Clay (CL) and Wood**	
						@2' OVM=0ppm; First encountered water.
			SS02	3-2-2-2 (4)	No recovery.	
						@4' OVM=0ppm; Fill/native contact.
5			SS03	1-1-1-1 (2)	@4' **Clayey Sand (SC)**, gray, native	
						@6' OVM=0ppm
					Boring terminated at 6' bgs.	First encountered water at 2' bgs. Backfilled with cuttings.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB18	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid B6)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 1' START : 7/27/00 END : 7/27/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	WOH-WOH-4-4	**Fill - Clayey Sand (SC),** light brown, medium sand	@1' First encountered water
						@2' OVM=0ppm
					@2' **Fill - Sand (SP)**, dark, concrete chunks	
			SS02	4-4-4-4 (8)		
						@4' OVM=0ppm; Fill/native contact.
					@4' **Clayey Sand (SC)**, gray, native	
5			SS03	1-2-2-2 (4)		
						@6' OVM=0ppm
					Boring terminated at 6' bgs.	First encountered water at 1' bgs. Backfilled with cuttings.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB19	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid A4)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS :
START : 7/27/00
END : 7/27/00
LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	1-1-1-1 (2)	**Clayey Sand (SC), native**	@2' OVM=0ppm
					Boring terminated at 2' bgs.	Backfilled with cuttings.
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10						
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB20	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid B1)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 2' START : 7/27/00 END : 7/27/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	WOH-5-5-5 (10)	**Fill - Sandy Clay (CL),** gray, concrete chunks, glass, dark industrial sand	
					@2' **Fill - Wood**	@2' OVM=0ppm; First encountered water.
			SS02	30-7-3-3 (10)		
						@4' OVM=0ppm
5			SS03	5-3-2-2 (5)	@5' **Clay (CL)**, dark gray, marine origin, native	@5' Fill/native contact.
						@6' OVM=0ppm
					Boring terminated at 6' bgs.	First encountered water at 2' bgs. Backfilled with cuttings.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB21	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid F10)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 4' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	3-4-4-10 (8)	**Fill - Silty Sand and Gravel (SM)**	
						@2' OVM=0ppm
			SS02	7-11-5-7 (16)	@2' **Fill - Clayey Sand (SC)**, dark brown, dark industrial sand	
						@4' OVM=0ppm; First encountered water.
5			SS03	7-10-11-9 (21)	@4' **Fill - Clayey Sand w/ Gravel (SC)**, dark tan	
						@6' OVM=0ppm
			SS04	4-5-4-3 (9)	@6' As above with organics	
						@8' OVM=0ppm
			SS05	1-3-2-1 (5)	@8' As above with slag fragments	
10						@10' OVM=0ppm
			SS06	2-3-3-2 (6)		
						@12' OVM=0ppm
			SS07	3-3-3-3 (6)	@13' **Clay (CL)**, gray, marine, native	@13' Fill/native contact.
						@14' OVM=0ppm
15					Boring terminated at 14' bgs.	First encountered water at 4' bgs. Backfilled with cuttings.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB22	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid H10)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 2' START : 7/26/00 END : 7/26/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	5-5-8-4 (13)	**Fill - Clayey Sand w/ Gravel (SC),** tan	
					@2' **Fill - Clayey Sand (SC)**, dark gray	@2' OVM=0ppm; Diesel odor; First encountered water.
			SS02	7-2-6-7 (8)		
						@4' OVM=0ppm
5			SS03	2-2-5-7 (7)		
						@6' OVM=0ppm
					@6' **Fill - Sandy Clay (SC)**, dark tan, organic	
			SS04	1-5-2-3 (7)		
						@8' OVM=0ppm
			SS05	7-3-5-2 (8)	@9' **Clay (CL)**, gray, native	@9' OVM=0ppm; strong petroleum odor; Fill/native contact.
10						@10' OVM=0ppm
			SS06	2-3-3-2 (6)		
						@12' OVM=0ppm
					Boring terminated at 12' bgs.	First encountered water at 2' bgs. Backfilled with cuttings.
15						
20						

PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB27	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (grid M8)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 2' START : 7/27/00 END : 7/27/00 LOGGER : Cates (edits by DK)

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			SS01	7-8-5-3 (13)	**Fill - Clayey Sand w/ Gravel (SC),** dark brown, medium sand	
					@2' Fill - **Clayey Sand (SC)**, dark gray, wet, wood particles	@2' OVM=0ppm; First encountered water.
			SS02	3-7-3-3 (10)		
					@4' **Sandy Clay (CL)**, gray, native	@4' OVM=0ppm; Fill/native contact.
5			SS03	1-WOH		
						@6' OVM=0ppm
					Boring terminated at 6' bgs.	First encountered water at 2' bgs. Backfilled with cuttings.
10						
15						
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB28	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (50' East of SB27)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2' split spoon sampling (augers not advanced)
WATER LEVELS : First encountered at 3' START : 8/9/00 END : 8/9/00 LOGGER : Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1.5/2	SS01	4-5-5-5 (10)	0-2" Grass and Topsoil **Fill - Clayey Sand w/ Gravel (SC),** dark brown, moist, angular gravel to 1"	
					@2' **Silt (ML)**, dark gray, peaty material	@2' OVM=0ppm; Fill/native contact.
		2/2	SS02	4-3-3-3 (6)	@2.5' **Sandy Silt (ML)**, dark gray @3' wet	@3' First encountered water. @4' OVM=0ppm; Fill/native contact.
5					Boring terminated at 4' bgs.	First encountered water at 3' bgs. Backfilled with cuttings.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11SB29	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 (50' East of SB28)
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2' split spoon sampling (augers not advanced)
WATER LEVELS : First encountered at 3' START : 8/9/00 END : 8/9/00 LOGGER : Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
					0-2" Grass and Topsoil	
		2/2	SS01	2-5-6-7 (11)	**Fill - Clayey Sand w/ Gravel (SC),** yellowish brown	
					@1.8' porcelain fragments and angular gravel to 1"	@2' OVM=0ppm
		1/2	SS02	7-5-5-6 (10)	@2.5' **Fill - Clayey Sand w/ Gravel (SC)**, dark brown, plastic	@3' First encountered water.
						@4' OVM=0ppm, large quartz cobble
5		1.5/2	SS03	30-15-20 (35)	@4.5' **Fill - Sandy Gravel (GP)**, wet, wood	
						@6' OVM=0ppm
		0/2	SS04	8-8-8-6 (16)	No Recovery	
						@8' OVM=0ppm
					Boring terminated at 8' bgs.	First encountered water at 3' bgs. Backfilled with cuttings. Based on surface topography and surrounding structures, likely that fill extends another 100' east of this location.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 along Mattawoman Creek
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 3.5' START : 8/9/00 END : 8/9/00 LOGGER : David Kinney

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1.5/2	SS01	4-4-11-12 (15)	Grass and organic matter with Silts @0.5' **FILL** - brick and black Clayey Sand w/ Silt, glass fragments	Wet at surface, moist by 0.5' bgs.
		1/2	SS02	6-7-10-5 (17)		@2' OVM=0ppm @3.5' First encountered water. @4' OVM=0ppm
5		0/2	SS03	50/4		@5' push aside solid obstruction @6' OVM=0ppm
		0/2	SS04	2-2-2-2 (4)	@7' based on auger cuttings, **Silty Sand (SM)**, gray, fine to medium sand, loose, wet, appears native	@8' OVM=0ppm
10					Boring terminated at 8' bgs. Monitoring well installed.	First encountered water at 3.5'bgs; monitoring well screened from 3-8' bgs (as shallow as possible with an adequate seal). See Monitoring Well Completion Diagrams for additional details.
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PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 along Mattawoman Creek
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 3' START : 2/26/02 END : 2/26/02 LOGGER : Stephen Brand

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1/4	SS01		Sandy Clay (CL) 0'-0.3' - Organic Loam 5YR3/2 grayish brown. 0.3'-0.6' - Moist very soft clay with a moderate plasticity. Some gravel is present. Yellowish brown in color 10YR5/4.	@ 0.6' OVM = 1.2
		1/6	SS02		Little recovery. The spoon hit refusal in wood. Saturated very soft clay with a moderate plasticity. Some gravel is present. Yellowish brown in color 10YR5/4.	Bottom of screen set at the bottom 10'. @ 3' OVM = 9.4
5		Cuttings				Logging stopped at 3' bgs due to refusal.
		Cuttings				
10						
15						
20						
25						

PROJECT NUMBER	BORING NUMBER	
156175.FI.FI	IS11MW07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11 along Mattawoman Creek
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers, 2' split spoon sampling
WATER LEVELS : @ 3' bgs
START : 2/26/02
END : 2/26/02
LOGGER : Stephen Brand

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		1/2	SS01		Silty Sand (SM)- Fine medium sand, moist, poorly sorted. Dark yellowish brown in color 10YR4/2. Grades to medium dense sand with wood and gravel present.	@0' OVM=1.5 ppm @2' OVM=0ppm; First encountered water.
		1/4	SS02		Raw, not rotted wood, saturated, some plastic pieces, no soil recovery.	No recovery. Hit the water table somewhere between 2 and 4 feet.
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10						
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PROJECT NUMBER	BORING NUMBER	
156175.FI.SS	IS11MW08	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NDWIH
LOCATION : Site 11
ELEVATION : See survey report
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 2 3/4" hollow stem augers, 2' split spoon sampling
WATER LEVELS : First encountered at 20' START : 2/27/02 END : 2/27/02 LOGGER : Stephen Brand

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
		3/4	SS01		0-0.2' Organic loam (SM) with roots, moist. 0.2-0.9' Silty sandy clay (CL) stiff, moist, some roots 0.9-1.3' Brick.	dark yellowish brown 10YR4/2 moderate yellowish brown 10YR5/4 OVM=1.8 ppm
		1/2	SS02		Silty sandy clay (CL) moderate yellowish brown in color 10YR5/4, stiff, moist. Bottom 0.1' is saturated	OVM=1.9 ppm 3' First encountered groundwater.
5		3/4	SS03		4-4.8' Silty sand (SM) Dark yellowish brown, fine, grained, soft, saturated, 10YR4/2. 4.8-5.6' Silty clay (CL) medium stiff, saturated, with some fine grained sand yellowish brown 10YR5/4	OVM=1.5 ppm
			SS04			
			SS05			
10			SS06			
15						
20						
25						

Borehole ID: IS13SB01

Project No: CHM003-03DB
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335593.9818

Date: 7/17/00 1550
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261945.127

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
1		***Silty Clay*** Top 2" dark brown silty clay, moist, 2" - 1' is yellowish tan silty clay moist, very soft	-1					
2, 3		***Silty Clay*** Yellowish tan silty clay, mottled with orange brown silty clay, dry, medium stiff	-4					
4		***Clay*** Light gray mottled with red clay, dry, medium stiff	-6				322	
5							114	BZ = 0.0ppm Verified blank after this sample reading
6		***Clay*** Red clay, decreasing gray mottling, medium stiff, dry	-8				392	
7							328	
8							264	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB01

Project No: CHM003-03DB
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335593.9818

Date: 7/17/00 1550
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261945.127

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Silty Clay with Sand Red silty clay with sand, soft, slightly moist						
9							147	
10							154	
11			-12				167	
12		***Sandy Clay*** Brownish orange sandy clay, soft, slightly moist	-13				201	
13		***Clayey Sand*** Brownish orange clayey sand (fine to medium grained), soft, slightly moist	-14				94	
14		***Sandy Clay*** Grayish brown fine sandy clay, soft, slightly moist	-15				82	
15		***Sandy Clay*** Brownish orange clay with fine sand, soft, slightly moist	-16				83	
16			-16					

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB01

Project No: CHM003-03DB
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335593.9818

Date: 7/17/00 1550
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261945.127

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Sandy Clay Grayish brown fine sandy clay, soft, slightly moist						
17		***Sandy Clay*** Grayish brown fine sandy clay mottled with yellowish brown and red clay, medium stiff, dry	-17				114	
18		***Sandy Clay*** Reddish orange brown clay with fine sand, soft, slightly moist	-18				96	
19		***Sandy Clay*** Grayish brown fine sandy clay, soft, slightly moist, layer of pebbles and black staining	-19				453	Collect Sample from 19' - 20' IS13SB011920, highest PID at 1700
20		***Sandy Clay*** Orangish brown fine sandy clay, soft, slightly moist					89	
21		***Sandy Clay*** Grayish brown fine sandy clay, soft, slightly moist	-21				136	
22		***Sandy Clay with Pebbles*** Poorly sorted fine sandy clay mixed with medium coarse sand and rounded to subrounded pebbles (up to ½" diameter), black staining at 23.5'	-22				147	
23		***Sand and Clay*** Fine sand and clay, moist, soft	-24				160	
24			-24				265	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB01

Project No: CHM003-03DB
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335593.9818

Date: 7/17/00 1550
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261945.127

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Sand and Gravel Poorly sorted medium to coarse grained sand and gravel (up to 1"), subround to subangular, at 25' a 2" quartz layer	-25					
25		***Sandy Clay with Pebbles*** Poorly sorted fine sandy clay with medium to coarse grained sand and pebbles	-26				127	
26		***Sandy Clay*** Orangish brown fine sandy clay, moist, soft, with 5% subangular pebbles	-28				156	
27							331	
28		***Sand with Pebbles*** Poorly sorted, medium to coarse grained sand with subrounded to subangular pebbles (up to 1" diameter) black staining at 29'	-29				73	
29		***Sandy Clay*** Orangish brown fine sandy clay, soft, moist, with 5% pebbles	-30				83	
30								End boring at 30 ft bgs
31								
32								

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
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(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB02

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335565.2192

Date: 7/31/00 0952
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261951.54

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Silty Clay Dark brown silty CLAY	-1					
1		***Silty Clay*** Mottled light gray/reddish orange, silty CLAY						
2							0	0' - 2.5' moist 2.5 - 4' dry
3							0	
4			-4				0	
		Silty Clay with Sand Reddish orange silty CLAY with fine sand, medium stiff, damp						
5							0	
6			-7				0	
		Silty Clay Yellowish brown silty CLAY, stiff, damp						
7							24	
8			-8				0	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB02

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335565.2192

Date: 7/31/00 0952
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261951.54

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Silty Clay with Sand Mottled, reddish orange/medium brown silty CLAY with fine sand, medium stiff, damp, from 11' feet down, soft and friable, slightly moist						
9							0	
10							0	
11							0	
			-12					
12		***Silty Clay with fine Sand*** Mottled, reddish orange/medium brown silty CLAY with fine sand, slightly moist, friable					0	
13							0	
			-14					
14		***Silty Clay with fine Sand*** Same as above					0	
15							36	
			-16					
16					80%		41	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
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(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB02

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335565.2192

Date: 7/31/00 0952
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261951.54

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Silty Clay Medium brown silty CLAY	-17					
17		***Sand*** Reddish orange, fine to medium SAND					51	
18			-19				80	
19		***Sand with Silty Clay*** Medium brown fine grained SAND with silty clay	-20				73	
20		***Sand*** Reddish orange fine to medium grained SAND with 5% small gravel	-20				26	
21		***Sand with Silty Clay*** Orangish brown medium to fine SAND with silty clay; at 20.5' a 1" piece of quartz	-22				0	
22		***Silty Clay*** Medium brown silty CLAY, moist, pliable	-23				0	
23		***Sand and Gravel*** Yellowish brown, poorly sorted SAND and gravel; gravel up to 1" in diameter, medium to coarse grained sand	-24				0	
24							0	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB02

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335565.2192

Date: 7/31/00 0952
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261951.54

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
25		***Sand with Silty Clay and Gravel*** Yellowish orange, poorly sorted SAND with silty clay and gravel, color change at 25.5' to medium brown	-26				0	
26		***Gravel*** Black staining in the silty clay at 26'; GRAVEL percentage increasing o 75%; bottom inch is red silty clay	-28				7	
27							6	
28		***Sand with Silty Clay and Gravel*** Poorly sorted yellowish brown SAND with silty clay and gravel, bottom inch is reddish orange silty clay, damp	-30				0	
29								
30								
31								
32								

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB03

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335525.201

Date: 7/31/00 1030
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261949.483

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
1		***Silty Clay*** Dark brown silty CLAY top 2", moist, medium stiff; 2" - 1' medium brown sitly clay, moist, soft	-1					
2		***Silty Clay*** Reddish orange mottled with medium brown silty CLAY, medium stiff, dry					0	
3							5	
4			-4				10	
5		***Silty Clay with Sand*** Reddish orange silty CLAY with fine sand, damp, medium stiff					11	
6							11	
7							10	
8			-8				12	
9		***Silty Clay*** Reddish orange mottled with medium brown silty CLAY, damp, medium stiff, with some fine sand (about 5%)					3	
10							16	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
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Hole Size: 2"
Total Depth Drilled: 28'
Sheet: 1 of 3

Borehole ID: IS13SB03

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335525.201

Date: 7/31/00 1030
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261949.483

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
11							18	
			-12					
12		***Silty Clay*** Mottled reddish orange/medium brown silty CLAY, slightly moist, medium stiff					11	
			-13					
13		***Sand and Gravel with Silty Clay*** Reddish orange fine to medium grained SAND with gravel and silty clay, gravel up to 1.5" diameter, 15% gravel					16	
14							18	
15							16	
			-16					
16		***Silty Clay*** Reddish orange silty CLAY, medium stiff, damp	-17				12	
17		***Sand*** Yellowish orange SAND, fine to medium grained, well sorted, damp					14	
18							15	
19							8	
			-20					
20							14	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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Hole Size: 2"
Total Depth Drilled: 28'

Borehole ID: IS13SB03

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335525.201

Date: 7/31/00 1030
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261949.483

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Sand with Silty Clay Light brown fine to medium grained SAND with silty clay, medium soft, and damp	-21					
21							16	
		Sand with Silty Clay and Gravel Yellowish brown poorly sorted SAND with silty clay and gravel, fine to coarse grained sand, 15% gravel, quartz layer at 23' - 23.5'						
22							18	
23							18	
			-24					
		Sand with Silty Clay and Gravel Yellowish brown SAND with silty clay and gravel, fine to medium grained sand	-24					
24							8	
		Sand with Silty Clay Reddish orange fine to medium grained SAND with silty clay	-25					
25							16	
		Sand and Gravel Yellowish brown, poorly sorted SAND with gravel, damp						
26							18	
			-27					
27		***Bedrock*** Refusal at 28'					16	
28							0	
29								
			-30					
30								

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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Hole Size: 2"
Total Depth Drilled: 28'
Sheet: 3 of 3

Borehole ID: IS13SB04

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335542.2763

Date: 7/31/00 1135
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261979.31

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Silty Clay Dark to medium brown, silty CLAY, slightly moist, medium soft	-1					
1		***Silty Clay*** Mottled, reddish orange/medium brown, silty CLAY, dry, medium stiff			75%			
2							9	
3							11	
			-4					
4		***Silty Clay with Sand*** Reddish orange silty CLAY, with fine sand, damp, medium stiff					10	
5							13	
6							0	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB04

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335542.2763

Date: 7/31/00 1135
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261979.31

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
7							14	
			-8					
8		***Silty Clay with Sand*** Reddish orange, silty CLAY with fine sand, 15% iron staining, dry, medium stiff, bottom inch, yellowish brown, fine to medium sand					9	1155 - PID recalibrated, does no function, readings suspect, decided to take bottom 1'
9							11	
10							0	
11							0	
			-12					
12							0	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB04

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335542.2763

Date: 7/31/00 1135
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261979.31

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
		Sand Yellowish brown, fine to medium grained SAND	-13					
13		***Sand*** Medium to coarse SAND	-13				0	
		Sandy Clay Reddish orange sandy CLAY, fine sand, slightly moist, friable						
14							0	
15			-16				0	
		Sand with Silty Clay and Gravel Poorly sorted SAND with silty clay and gravel, fine to coarse sand, gravel <= 1", damp	-16					
16							0	
		Sand and Gravel with Silty Clay Reddish orange, poorly sorted SAND and gravel with silty clay, damp, 15% gravel up to 1" in diameter						
17							0	
18							0	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
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Hole Size: 2"
Total Depth Drilled: 30'
Sheet: 3 of 5

Borehole ID: IS13SB04

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335542.2763

Date: 7/31/00 1135
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261979.31

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
19							0	
20							0	
21			-21				0	
		Sand Yellowish brown fine to medium SAND, moist						
22							0	
23			-23				0	PID stuck at 131', but at others read at 0, took deepest foot
		Clay Tan silty CLAY with black staining (1" thick)						
		Sand Reddish orange, fine to medium SAND	-24					
24							0	

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB04

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335542.2763

Date: 7/31/00 1135
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1261979.31

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
25		***Sand with Silty Clay*** Reddish brown, fine to medium SAND with silty clay and 5% gravel,moist	-26				131	
26		***Sand with Gravel and Clay*** Poorly sorted SAND with gravel and clay; clay is a greenish brown; sand varies from reddish brown to tan, 20% gravel <= 1" in diameter, moist; 1" layer of black staining at 26', no odor	-26					
27		***Sand with Silty Clay and Gravel*** Reddish brown SAND with silty clay and gravel <= 1.5" in diameter, 15% gravel, 1" layer of white medium sand between black staining and sand with silty clay and gravel	-28					
28		***Sand with Silty Clay and Gravel*** Reddish brown, poorly sorted, fine to medium SAND with silty clay and gravel <= 1' diameter, 15% gravel, damp, quartz layer at 29'	-29					Sample 28' - 30'
29		***Sand with Gravel*** Tan, poorly sorted, fine to medium grained SAND with gravel (30%), up to 1" in diameter, damp, black staining 2" from the bottom	-30					
30								

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB05

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335541.8106

Date: 7/31/00 1315
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1262010.422

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
1 2		***Silty Clay*** Medium brown silty CLAY, moist, with black substance with manure like odor, chunks of asphalt present	-3					
3 4		***Silty Clay*** Yellowish orange silty CLAY, damp from 2.5' - 3.5', soft; from 3.5' - 4', dry and stiff	-4					
5 6 7		***Silty Clay*** Mottled reddish orange/medium brown silty clay; 4' - 6', damp and medium stiff; 6' - 7', dry and stiff	-7					
8		***Silty Clay with Sand*** Reddish orange silty CLAY with sand, dry and stiff, black staining at 4'	-8					
9 10		***Silty Clay with Sand*** Reddish orange silty CLAY with sand, slightly moist, friable, black staining with a chemical odor (saved for possible sampling) at 10' - 11'						

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB05

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335541.8106

Date: 7/31/00 1315
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1262010.422

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
11			-12		50%			
12		***Silty Clay with Sand*** Same as above, but has black staining, compost odor, moist, pliable	-14					
13								
14		***Silty Clay with Sand*** Reddish orange silty CLAY with increasing sand, moist, friable, bottom 2" reddish orange fine to medium sand with silty clay	-16					
15								
16		***Silty Clay with Sand*** Reddish orange silty CLAY with fine sand, moist, friable	-18					
17								
18		***Sand*** Reddish orange and yellowish brown, fine to medium grained SAND, 15% gravel in bottom 2", up to 1" in diameter, damp	-20					
19								
20								

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

HydroGeoLogic, Inc.
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Herndon, VA 20170
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Hole Size: 2"
Total Depth Drilled: 30'

Borehole ID: IS13SB05

Project No: CHM003-03
Project:
Client: Navy
Location: Indian Head, MD
Northing: 335541.8106

Date: 7/31/00 1315
Geologist: Margaret Johnston
Ground Surface Elevation:
Easting: 1262010.422

SUBSURFACE PROFILE					SAMPLE			
Depth	Symbol	Description	Elevation	ASTM	Recovery	Moisture	PID (ppm)	Remarks
21 22		***Sand and Gravel*** Poorly sorted SAND with gravel, reddish brown gravel up to 1.5" in diameter, about 30% gravel, damp	-23					
23 24		***Sand*** Yellowish brown SAND, medium to coarse grained, moist	-24					
25		***Sand with Silty Clay*** Reddish orange fine to medium grained SAND with silty clay, slightly moist, sweet odor at 24'	-25					Odor at 24' very different from odor at 8' - 12'
26 27 28		***Sand*** Yellowish brown SAND, well sorted, medium grained, moist, does not have odor	-28					
29 30		***Sand and Gravel*** Yellowish brown, fine to coarse SAND with gravel, 20% up to 1" in diameter, moist, poorly sorted, at 29.5' color change to reddish brown (2" band) then back to yellowish brown	-30					

Drilled By: Tidewater
Drill Method: DPT
Drilling Equipment: Geoprobe

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(703) 478-5186 FAX (703) 471-4180

Hole Size: 2"
Total Depth Drilled: 30'

Project No: 156175
Project: NSWC-IH
Client: Navy
Location: Indian Head, MD
Northing:

Borehole ID: IS25MW01

Date: 10/10/00
Geologist: Kelly Gragg
Ground Surface Elevation:
Easting:

SUBSURFACE PROFILE				SAMPLE			
Depth	Symbol	Description	Elevation	Percent Oxygen	LEL	PID (ppm)	Remarks
		Sandy Silty Clay Brown/ dark brown clay, fine to very coarse grained sand and silt intermixed, mostly surface materials with some organic debris and asphalt fragments, a few large pebbled (up to 1"), damp	-2			0.0	35% recovery
2		***Sandy Clay*** Silver gray mottled with light orange brown gummy clay, dense, at base, grading to medium to coarse grained clayey sand at top of section, slightly damp	-4		0.0	0.0	90% recovery BZ = 0.0ppm
4		***Sandy Clay*** Light gray with orange streaked dense clay with increasing minor sand grains (medium to coarse grained) toward top of section, slightly damp, a few gravel fragments	-6			0.0	100% recovery
6		***Sandy Clay*** Light gray dense clay with some mottled orange sections, a few scattered sand grains throughout, sharp contact 4" from base, change in lithology to wet medium to coarse grained sand, light brown/ light orange	-8		0.0	0.0	95% recovery BZ = 0.0ppm
8		***No Recovery***	-10				0% recovery
10		***Sand*** Light brown fine grained sand, clean, well sorted, grading downward to a gray medium to coarse grained sand with trace of clay, wet throughout section, trace of gravel	-12			0.0	30% recovery
12		Auger down to 13'	-13				Total depth 13'
14							

Drilled By: Parratt-Wolff, Inc.
Drill Method: HSA
Drilling Equipment: Auger Rig

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 8.5"
Total Depth Drilled: 13'
Sheet: 1 of 1

Project No: 156175
Project: NSWC-IH
Client: NAVY
Location: Indian Head, MD
Northing:

Borehole ID: IS25MW02

Date: 10/10/00
Geologist: Kelly Gragg
Ground Surface Elevation:
Easting:

SUBSURFACE PROFILE				SAMPLE			
Depth	Symbol	Description	Elevation	Percent Oxygen	LEL	PID (ppm)	Remarks
		Silty Clay Dark brown surface clayey soils with organic debris (0-4") grading to brown/ light brown, very fine grained silty clay, then to light brown dense clay with trace very fine silt, 2" calcite pebble found 5" from base, damp	-2				60% recovery
2		***Silty Clay*** Light brown/ light greenish brown dense clay with very fine grained silt, lense of gummy light gray clay in middle 3", dry	-4			0.0	100% recovery
4		***Silty Clay*** Light greenish gray clay, dense, with trace very fine grained silt, top 2" contain a layer of small (<¼") pebbles, orange mottled spots in center of section, dry/ slightly damp	-6			0.0	100% recovery
6		***Silty Clay*** Light greenish gummy clay with trace silt, grading to orange/ light orange brown silty clay, more brittle, then back to gummy light greenish gray clay at base, damp	-8	20.8		0.0	100% recovery BZ = 0.0ppm
8		***Silty Clay*** Very light brown/ tan silty clay, gummy to gritty, grading to orange clay with trace very fine silt throughout, layer of very dense brittle light greenish gray clay approximately 5" from the base (3" thick), very slightly damp	-10			0.0	95% recovery
10							

Drilled By: Parratt-Wolff, Inc.
Drill Method: HSA
Drilling Equipment: Auger Rig

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 8.5"
Total Depth Drilled: 24'

Project No: 156175
Project: NSWC-IH
Client: NAVY
Location: Indian Head, MD
Northing:

Borehole ID: IS25MW02

Date: 10/10/00
Geologist: Kelly Gragg
Ground Surface Elevation:
Easting:

SUBSURFACE PROFILE				SAMPLE			
Depth	Symbol	Description	Elevation	Percent Oxygen	LEL	PID (ppm)	Remarks
		Silty Clay Light brownish orange silty clay with few coarse grained light gray sand lenses near the top, one 6" thick wet zone with few pebbles (<¼") 8" from base, damp throughout rest of section	-12			0.0	100% recovery
12		***Silty Clay*** Light orange silty clay with few greenish gray streaks, slightly damp	-14	20.8		324.0	100% recovery BZ = 0.0ppm
14		***Silty Clay*** Light brownish orange silty clay, gummy at top grading to light greenish brown silty clay at bottem, with lenses of sucrosic gray clayey sand, slightly damp	-16			90.0 300.0	100% recovery
16		***Sandy Clay*** Light brownish orange sandy silty clay to 4", grading to fine to medium grained gray sand with clay in mid section, then mottled orange/ light gray caly with medium to coarse grained sand lenses at base, damp	-18			5.0 15.0	100% recovery BZ = 0.0ppm
18		***Sandy Silty Clay*** Orange silty clay at top 4" grading to gray clear medium to coarse grained fairly clean sand with trace clay, wet at 19'	-20	20.8		<3.0 5.9	100% recovery BZ = 0.0ppm
20				20.8	0.0	16.9	

Drilled By: Parratt-Wolff, Inc.
Drill Method: HSA
Drilling Equipment: Auger Rig

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 8.5"
Total Depth Drilled: 24'

Project No: 156175
Project: NSWC-IH
Client: NAVY
Location: Indian Head, MD
Northing:

Borehole ID: IS25MW02

Date: 10/10/00
Geologist: Kelly Gragg
Ground Surface Elevation:
Easting:

SUBSURFACE PROFILE				SAMPLE			
Depth	Symbol	Description	Elevation	Percent Oxygen	LEL	PID (ppm)	Remarks
		Auger to 24'					
22							
			-24				
24							Total depth 24'
26							
28							
30							

Drilled By: Parratt-Wolff, Inc.
Drill Method: HSA
Drilling Equipment: Auger Rig

HydroGeoLogic, Inc.
1155 Herndon Pkwy, Suite 900
Herndon, VA 20170
(703) 478-5186 FAX (703) 471-4180

Hole Size: 8.5"
Total Depth Drilled: 24'
Sheet: 3 of 3

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS11MW01	SHEET 1 OF 1

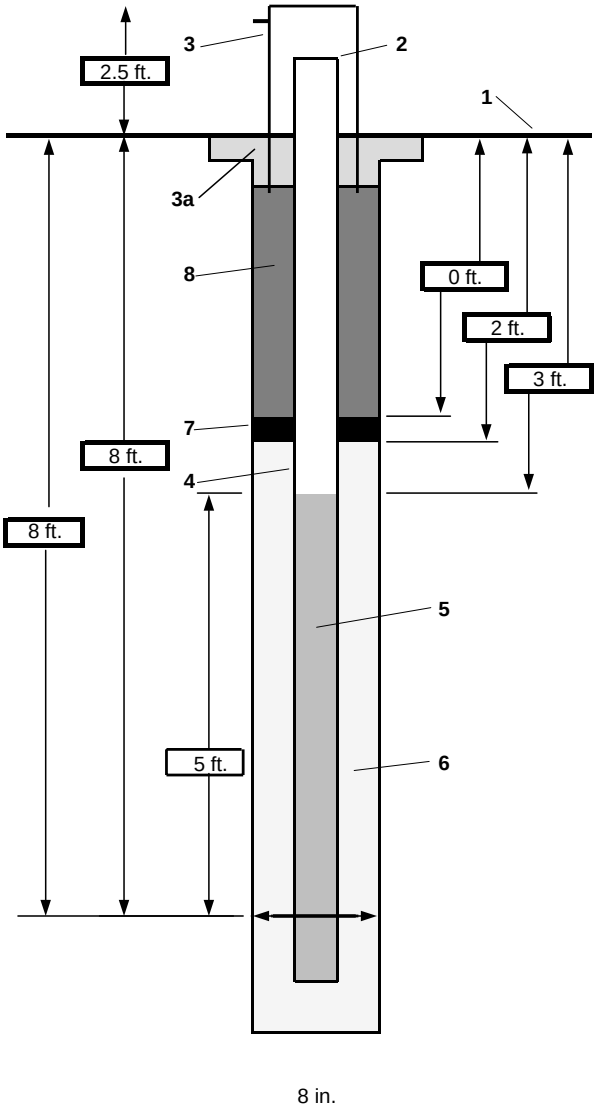
WELL COMPLETION DIAGRAM

PROJECT : NDWIH — LOCATION : Site 11 along Mattowoman Creek

DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers

WATER LEVELS : First encountered at 3.5' bgs. START : 8/9/00 END : 8/9/00 LOGGER : David Kinney



1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	25 lbs
8- Grout	
a) Grout mix used	None -- too shallow
b) Method of placement	
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

Note we had to cut off the 4" iron wellhead cover to less than 1 foot below grade, so as not to interfere with the shallow seal.

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS11MW02	SHEET 1 OF 1

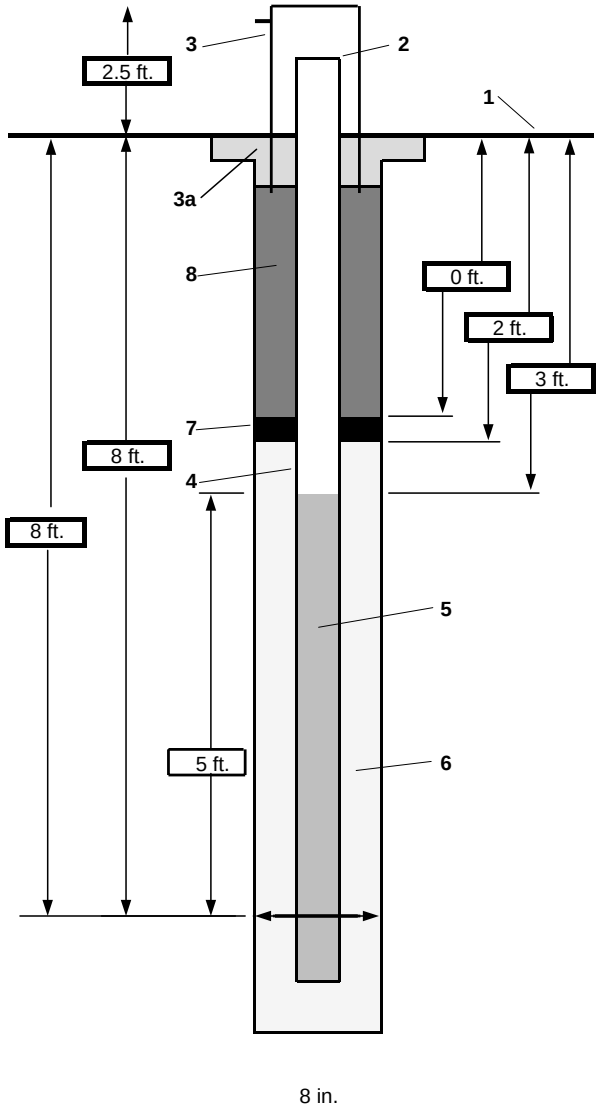
WELL COMPLETION DIAGRAM

PROJECT : NDWIH — LOCATION : Site 11 along Mattowoman Creek

DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers

WATER LEVELS : First encountered at 4' bgs. START : 8/8/00 END : 8/8/00 LOGGER : David Kinney



1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	25 lbs
8- Grout	
a) Grout mix used	None -- too shallow
b) Method of placement	
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

Note we had to cut off the 4" iron wellhead cover to less than 1 foot below grade, so as not to interfere with the shallow seal.

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS11MW03	SHEET 1 OF 1

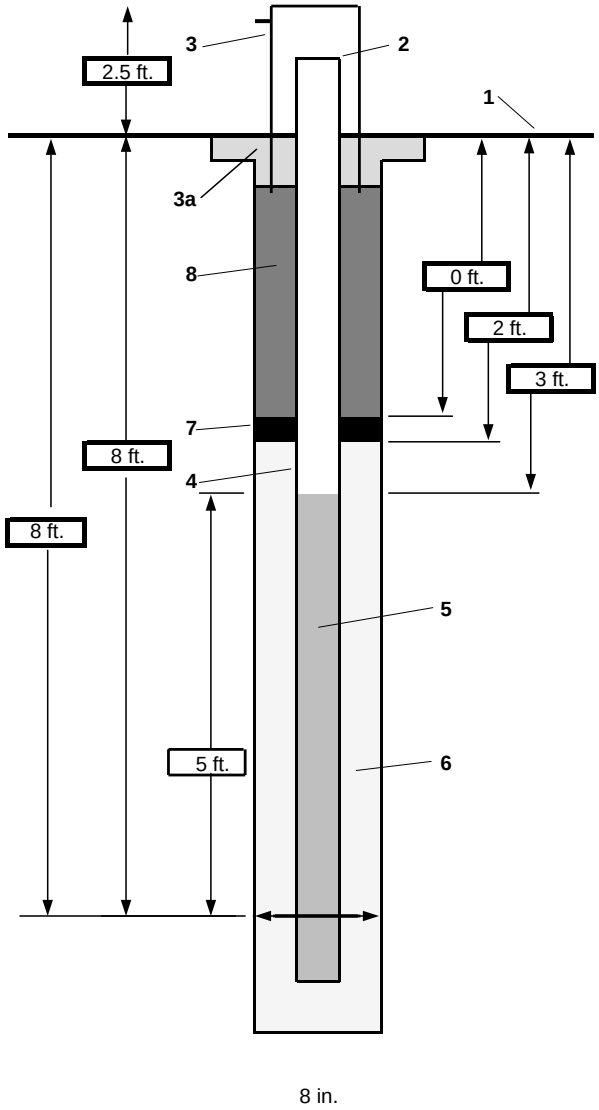
WELL COMPLETION DIAGRAM

PROJECT : NDWIH — LOCATION : Site 11 along Mattowoman Creek

DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers

WATER LEVELS : First encountered at 2' bgs. START : 8/8/00 END : 8/8/00 LOGGER : David Kinney



1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	35 lbs
8- Grout	
a) Grout mix used	None -- too shallow
b) Method of placement	
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

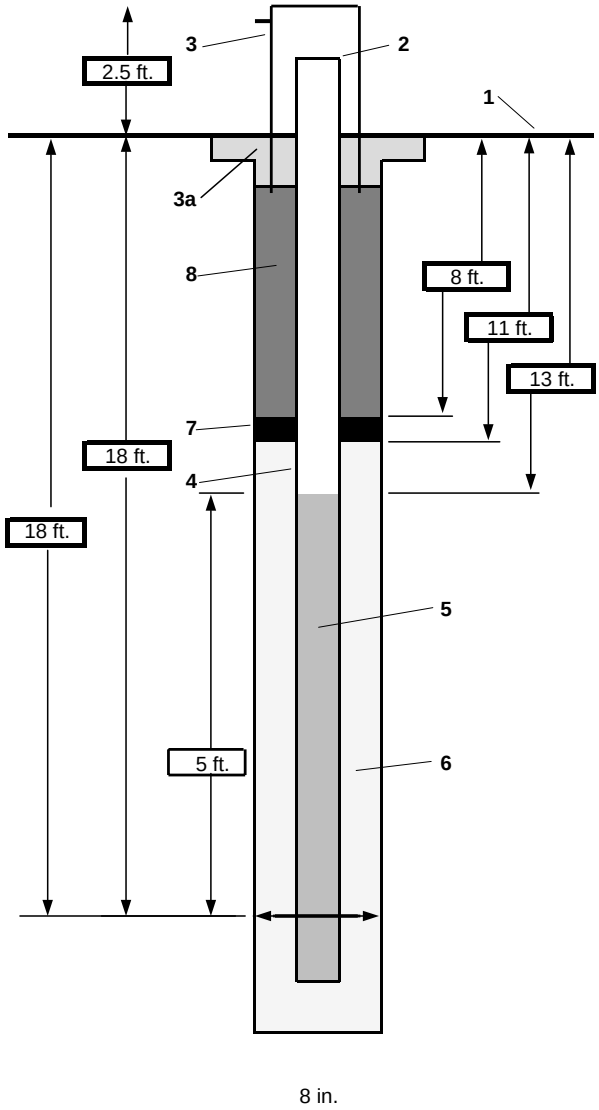
Comments Driller Service Inc. (DSI) 704-322-1100

Note we had to cut off the 4" iron wellhead cover to less than 1 foot below grade, so as not to interfere with the shallow seal.

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS11MW04	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : NDWIH
LOCATION : Site 11 along entry road
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers
WATER LEVELS : First encountered at 14' bgs. START : 8/8/00 END : 8/8/00 LOGGER : David Kinney



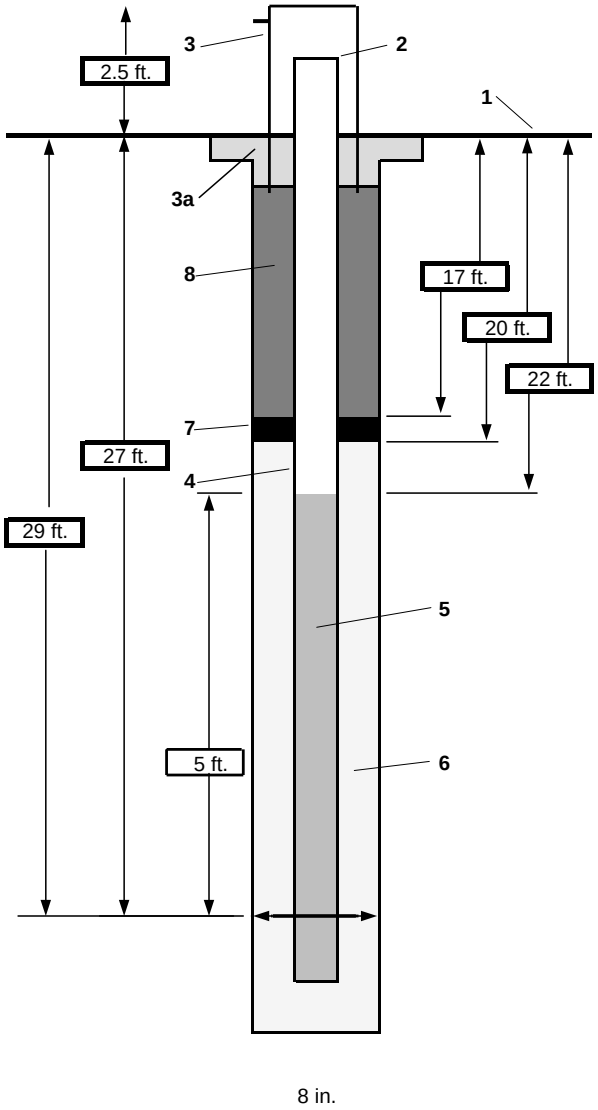
1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	50 lbs
8- Grout	
a) Grout mix used	Portland Type I/II Cement w/ bentonite
b) Method of placement	Poured
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS11MW05	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : NDWIH
LOCATION : Site 11, background well near Bld 1650
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers
WATER LEVELS : First encountered at 20-24' bgs. START : 8/7/00 END : 8/8/00 LOGGER : David Kinney



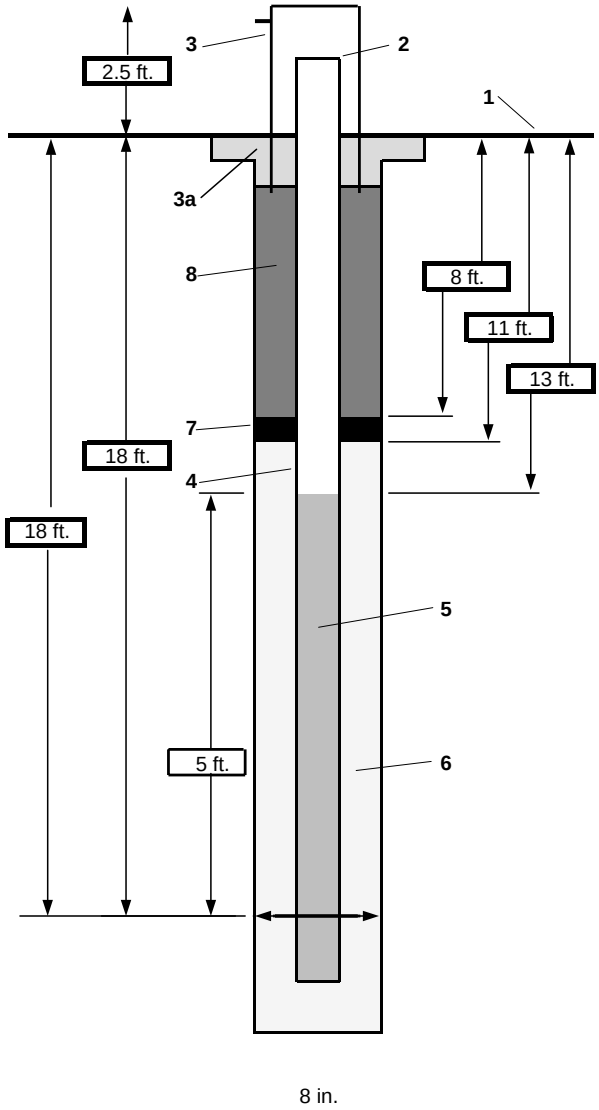
1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	250 lbs.
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	50 lbs
8- Grout	
a) Grout mix used	Portland Type I/II Cement w/ bentonite
b) Method of placement	Tremied
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS21MW01	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : NDWIH
LOCATION : Site 21 along Bronson Road
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers
WATER LEVELS : First encountered at 14' bgs. START : 8/3/00 END : 8/3/00 LOGGER : David Kinney



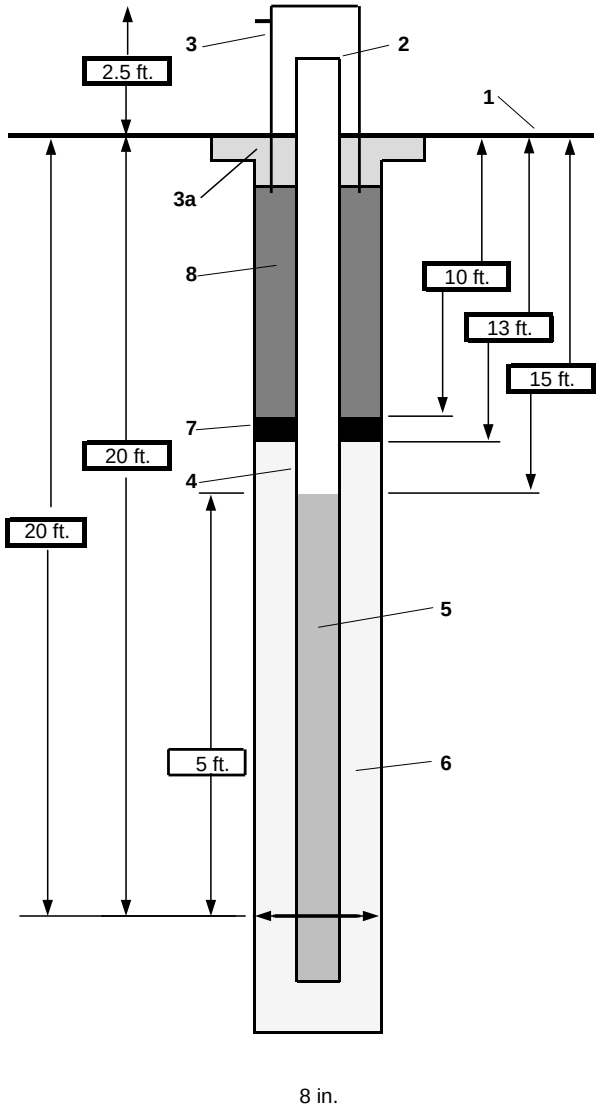
1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	50 lbs
8- Grout	
a) Grout mix used	Portland Type I/II Cement w/ bentonite
b) Method of placement	Poured
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS21MW02	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : NDWIH
LOCATION : Site 21 along Bronson Road
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers
WATER LEVELS : First encountered at 16' bgs. START : 8/4/00 END : 8/4/00 LOGGER : David Kinney



1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	50 lbs
8- Grout	
a) Grout mix used	Portland Type I/II Cement w/ bentonite
b) Method of placement	Poured
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS21MW03	SHEET 1 OF 1

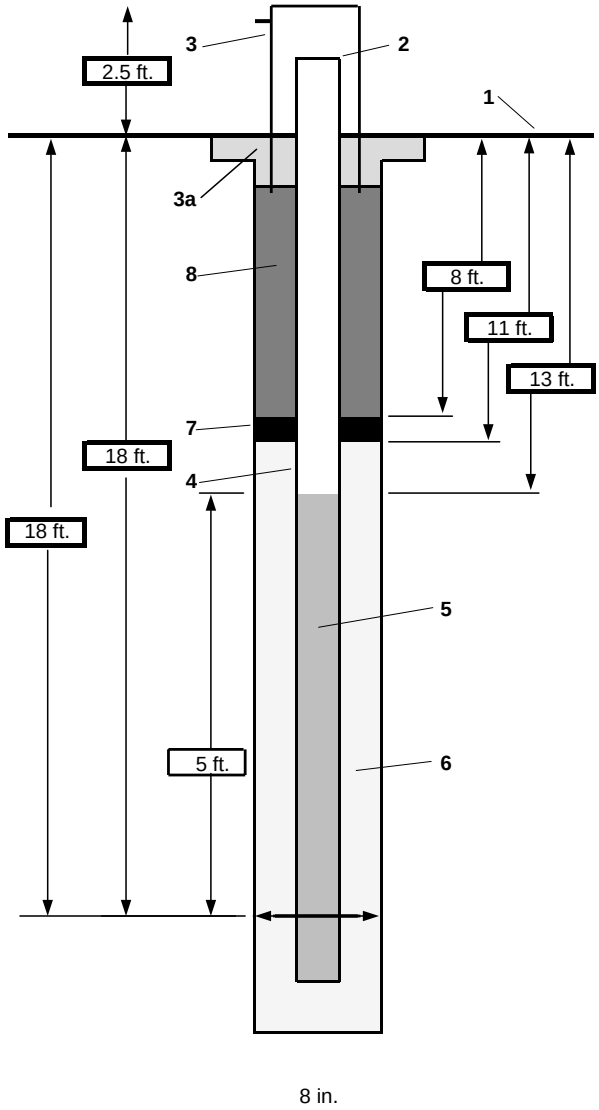
WELL COMPLETION DIAGRAM

PROJECT : NDWIH — LOCATION : Site 21 along Bronson Road, SW corner

DRILLING CONTRACTOR : Parratt-Wolff Inc.

DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers

WATER LEVELS : First encountered at 14' bgs. START : 8/4/00 END : 8/4/00 LOGGER : David Kinney



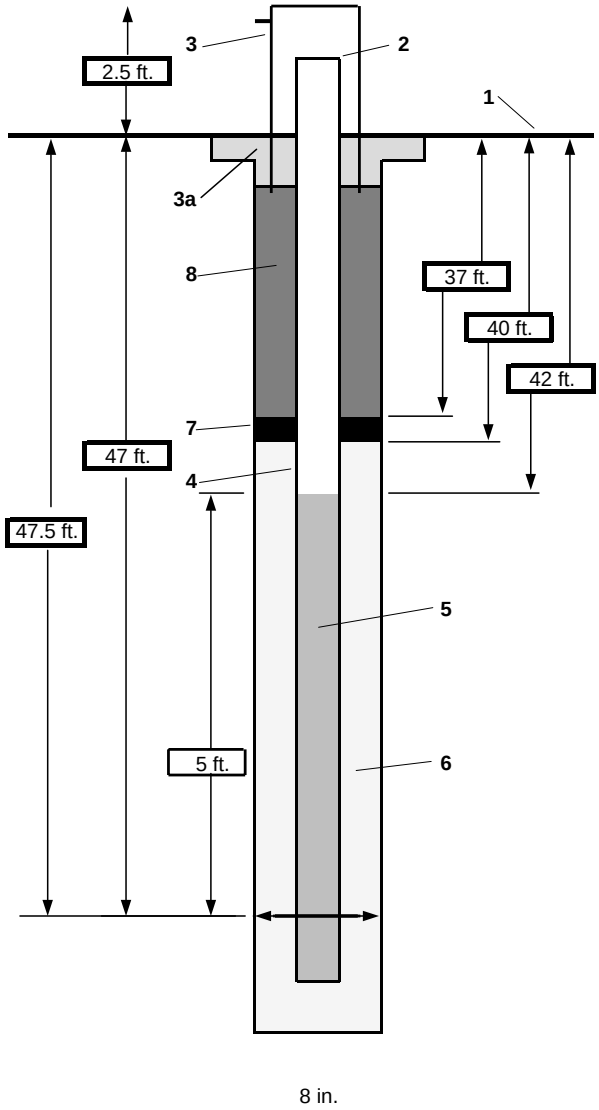
1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	50 lbs
8- Grout	
a) Grout mix used	Portland Type I/II Cement w/ bentonite
b) Method of placement	Poured
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

PROJECT NUMBER	WELL NUMBER	
156175.FI.FI	IS21MW04	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : NDWIH
LOCATION : Site 21 on hill near Bld 554
DRILLING CONTRACTOR : Parratt-Wolff Inc.
DRILLING METHOD AND EQUIPMENT USED : ATV Rotary Drill Rig, CME 850, 8" hollow stem augers
WATER LEVELS : First encountered at 42.5' bgs. START : 8/3/00 END : 8/3/00 LOGGER : David Kinney



1- Ground elevation at well	See survey results
2- Top of casing elevation	See survey results
3- Wellhead protection cover	locking 4" black iron stove pipe
a) concrete pad dimensions	3 X 3 feet
b) crashposts?	Four crashposts radially from pad
4- Dia./type of well casing	2" SCH 40 PVC
5- Type/slot size of screen	0.01" SCH 40 Slotted PVC
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	200 lbs
7- Type of seal	DSI SHURPLUG 3/8" Bentonite
a) Quantity used	50 lbs
8- Grout	
a) Grout mix used	Portland Type I/II Cement w/ bentonite
b) Method of placement	Poured
c) Vol. of well casing grout	
Development method	Pump/Surge
Development time	
Estimated purge volume	

Comments Driller Service Inc. (DSI) 704-322-1100

PROJECT NUMBER	WELL NUMBER	
156175.FI.SS	IS11MW06	SHEET 1 OF 1

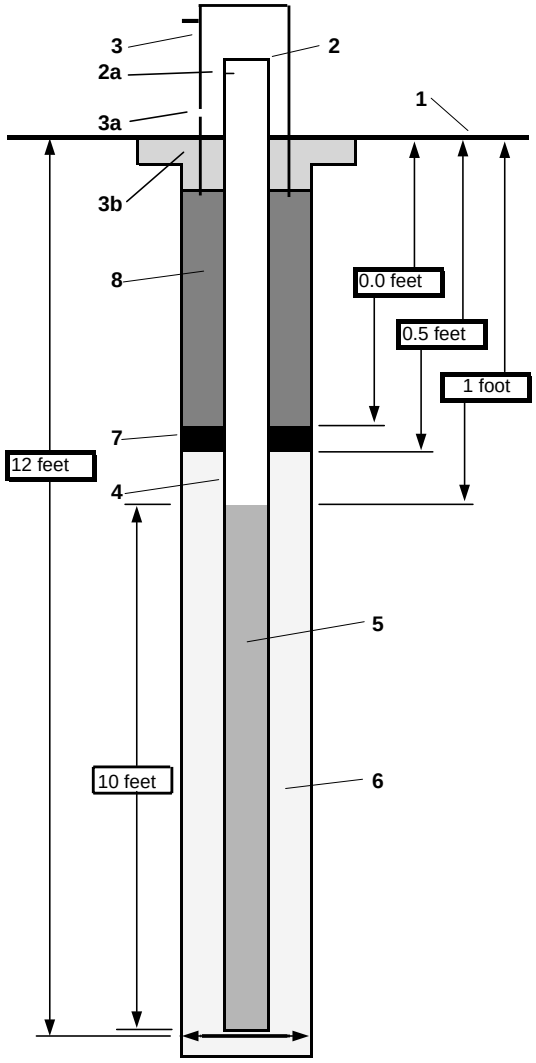
WELL COMPLETION DIAGRAM

PROJECT : NDWIH LOCATION : Site 11

DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : IR-A300 HSA rig

WATER LEVELS : Approx. 2 feet bgs. START : 02/26/02 1045 END : 02/26/02 1230 LOGGER : Stephen Brand



~8-inch

1- Ground elevation at well: 2.70 ft above msl

2- Top of casing elevation: 6.28 ft above ms
a) vent hole?: No, in flood zone

3- Wellhead protection cover type: Steel protective casing with locking cap.
a) weep hole?: No, in flood zone
b) concrete pad dimensions: 3x3 pad

4- Dia./type of well casing: 2-inch ID, Sch. 40, Tri-lock, screw thread PVC well casing.

5- Type/slot size of screen: 10-slot, schedule 40 PVC, 2-inch ID

6- Type screen filter: Industrial quartz 50 lb. Sacks, #0 sand,
a) Quantity used: Lot 408-S-1042, 8 bags.

7- Type of seal: Enviro-plug, chip, medium
a) Quantity used: less than one bag.

8- Grout
a) Grout mix used: None, no room, water table too shallow
b) Method of placement:
c) Vol. of well casing grout:

Development method: Surge and pump with Whale pump.

Development time: 1 hour

Estimated purge volume: 13 gallons

Comments: Pumped dry at low yield, very low yield well.

PROJECT NUMBER	WELL NUMBER	
156175.FI.SS	IS11MW07	SHEET 1 OF 1

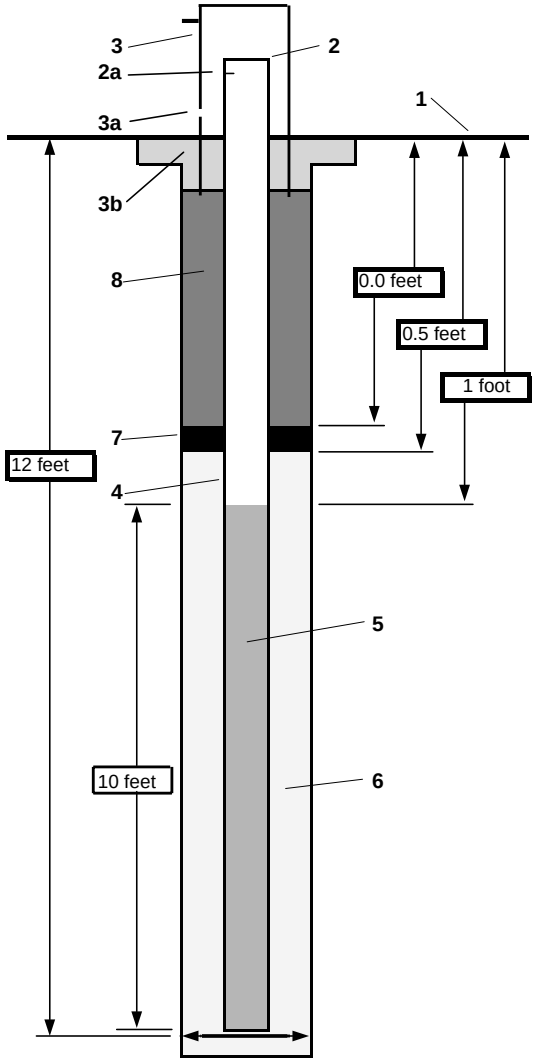
WELL COMPLETION DIAGRAM

PROJECT : NDWIH LOCATION : Site 11

DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : IR-A300 HSA rig

WATER LEVELS : Approx. 2 feet bgs. START : 02/26/02 1306 END : 02/26/02 1500 LOGGER : Stephen Brand



~8-inch

1- Ground elevation at well: 2.9 ft above msl

2- Top of casing elevation: 6.20 ft above ms
a) vent hole?: No, in flood zone

3- Wellhead protection cover type: Steel protective casing with locking cap.
a) weep hole?: No, in flood zone
b) concrete pad dimensions: 3x3 pad

4- Dia./type of well casing: 2-inch ID, Sch. 40, Tri-lock, screw thread PVC well casing.

5- Type/slot size of screen: 10-slot, schedule 40 PVC, 2-inch ID

6- Type screen filter: Industrial quartz 50 lb. Sacks, #0 sand,
a) Quantity used: Lot 408-S-1042, 8 bags.

7- Type of seal: Enviro-plug, chip, medium
a) Quantity used: less than one bag.

8- Grout
a) Grout mix used: None, no room, water table too shallow
b) Method of placement:
c) Vol. of well casing grout:

Development method: Surge and pump with Whale pump.

Development time: 1/2 hour

Estimated purge volume: 11 gallons

Comments: Pumped dry at low yield, very low yield well.

PROJECT NUMBER	WELL NUMBER	
156175.FI.SS	IS11MW08	SHEET 1 OF 1

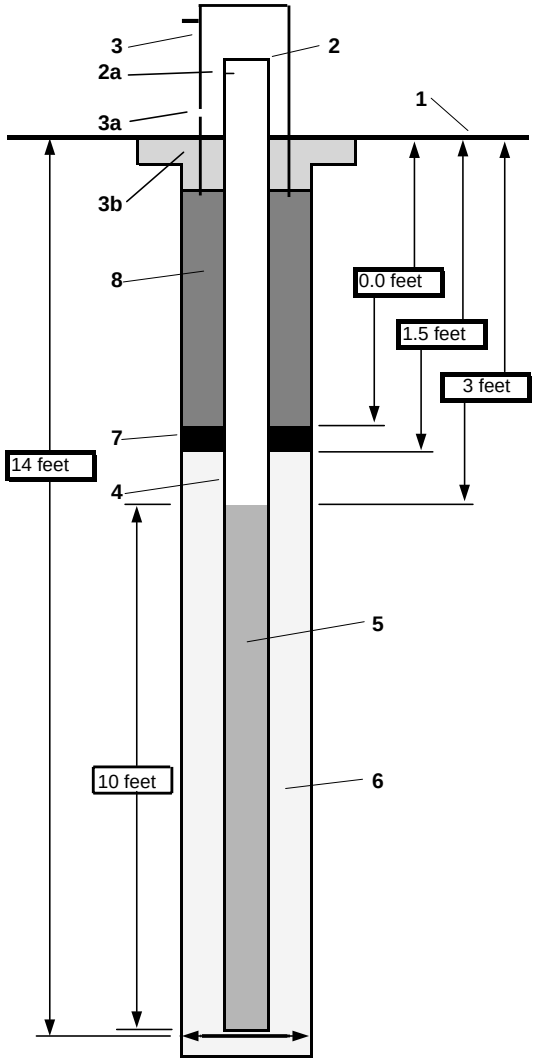
WELL COMPLETION DIAGRAM

PROJECT : NDWIH LOCATION : Site 11

DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : IR-A300 HSA rig

WATER LEVELS : Approx. 4 feet bgs. START : 02/27/02 0800 END : 02/27/02 0930 LOGGER : Stephen Brand



1- Ground elevation at well: 4.50 ft above msl

2- Top of casing elevation: 7.89 ft above ms
a) vent hole? No, in flood zone

3- Wellhead protection cover type: Steel protective casing with locking cap.
a) weep hole? No, in flood zone
b) concrete pad dimensions: 3x3 pad

4- Dia./type of well casing: 2-inch ID, Sch. 40, Tri-lock, screw thread PVC well casing.

5- Type/slot size of screen: 10-slot, schedule 40 PVC, 2-inch ID

6- Type screen filter: Industrial quartz 50 lb. Sacks, #0 sand,
a) Quantity used: Lot 408-S-1042, 8 bags.

7- Type of seal: Enviro-plug, chip, medium
a) Quantity used: less than one bag.

8- Grout
a) Grout mix used: None, no room, water table too shallow
b) Method of placement:
c) Vol. of well casing grout:

Development method: Surge and pump with Whale pump.

Development time: 1/2 hour

Estimated purge volume: 16.5 gallons

Comments: Pumped dry at low yield, very low yield well.

Appendix B

Survey Results
Sites 11, 13, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Site	Well Designation	Northing	Easting	Elevation at Ground (feet msl)	Elevation at Top of Casing (feet msl)
Site 11	IS11MW01	327508.85	1256128.57	2.61	5.36
	IS11MW02	327454.34	1256330.89	4.86	7.77
	IS11MW03	327504.75	1256479.43	3.75	6.56
	IS11MW04	327803.55	1256397.30	15.69	18.44
	IS11MW05	327998.43	1256533.81	22.08	23.98
	IS11MW06	327545.94	1256948.73	2.70	6.28
	IS11MW07	327493.73	1256865.07	2.90	6.20
	IS11MW08	327440.07	1256735.42	4.50	7.89
Site 17	IS17MW01	327736.12	1257101.39	3.98	6.67
	IS17MW02	327863.10	1257196.22	4.43	6.98
	IS17MW03	327918.55	1257104.89	13.01	15.41
Site 21	IS21MW01	332117.78	1260646.45	34.14	36.81
	IS21MW02	331772.79	1260551.09	43.65	46.16
	IS21MW03	331578.48	1260731.41	35.51	37.46
	IS21MW04	332090.98	1261046.12	76.59	79.27
Site 25	IS25MW01	332836.12	1262393.58	12.40	14.68
	IS25MW02	332959.90	1262643.97	12.87	15.48

Notes:
feet msl = feet above mean sea level

B 1 08205 SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER CH — 94 — 3604

fill in this form completely

Date Received (APA) 8 MM DD YY 13

OWNER INFORMATION

US NAVY — 15 Last Name Owner First Name 34

NSWC, INDIAN HEAD — 36 Street or RFD 55

INDIAN HEAD — 57 Town MD — 70 State 72 20640 — Zip 76

DRILLER INFORMATION

ROBERT STEVENS — Driller's Name M G D 017 — 76 License No. 81

PARRATT-WOLFF, INC. — Firm Name

PO BOX 1029, HILLSBOROUGH, NC 27278 — Address

Signature July 13, 2000 Date

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) N/A — 8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A — 14 20

B 3 LOCATION OF WELL

CHARLES — 8 COUNTY 21

NSWC, INDIAN HEAD — 23 SUBDIVISION 42

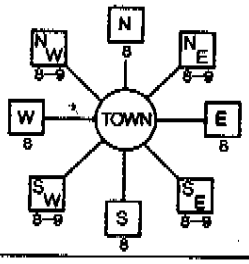
SECTION 44 46 LOT 48 50

INDIAN HEAD — 52 NEAREST TOWN 71

MILES FROM TOWN (enter 0 if in town) 1 M — 73 76 77 78

B 4

1 2 DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



BRONSON RD — 11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) 34 360 37

DISTANCE FROM ROAD FT

ENTER FT OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Charles — COUNTY NAME 00-8527-W — COUNTY NO.

STATE SIGNATURE ____ INSERT S → 41

DATE ISSUED 8-1-00 — 43 MM DD YY 48 CO SIGNATURE EXP. DATE 8-1-01

NORTH GRID 000 — 50 55 EAST GRID 000 — 57 63

APPROXIMATE DEPTH OF WELL 20 FEET — 24 28

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

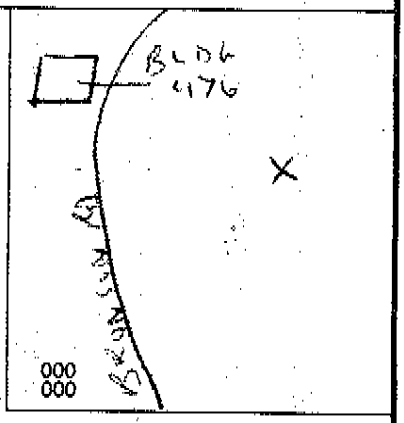
BORED (or Augered) — JETTED — Jetted & DRIVEN

30 AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary)

37 CABLE — REVerse-ROTary — DRive-POINT

other ____

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E ____

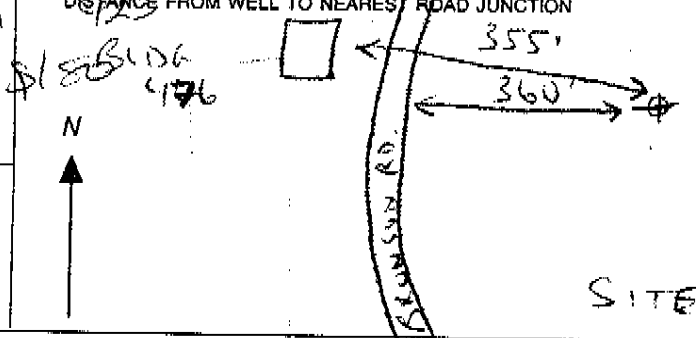
N ____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
- [Y] THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 — — — — — — — — 52

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SITE 21

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP — 54 63

PERMIT No. CH 94 — 3604 — 70 71 72 73 74 75 76 77 78 79

SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

IS21-MW04

B 1 08203 (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 3605 (70 – 79)

fill in this form completely

Date Received (APA) _____ (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD (57 Town 70) MD (State 72) 20640 (Zip 76)

DRILLER INFORMATION

ROBERT STEVENS (Driller's Name 76) M G D 017 (License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A (14 20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I INDUSTRIAL, COMMERICIAL, DEWATERING
- P PUBLIC WATER SUPPLY WELL
- T TEST, OBSERVATION, MONITORING
- G GEO-THERMAL

APPROXIMATE DEPTH OF WELL: 20 FEET (24 26)

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

30 BORED (or Augered) JETTED Jetted & DRIVEN
AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
37 CABLE REVerse-ROTary DRive-POINT
other _____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 – – – – – – – – 52

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP (54 63)

PERMIT No. CH– 94 – 3605 (70 71 72 73 74 75 76 77 78 79)

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

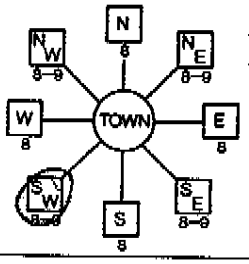
SECTION _____ (44 46) LOT _____ (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town): 1 M I (73 76 77 78)

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX) (1 2)



BRONSON RD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) — NORTH, WEST, EAST, SOUTH

34 20 37 DISTANCE FROM ROAD

ENTER FT OR MI FT (38 39)

TAX MAP: _____ BLK: _____ PARCEL _____

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

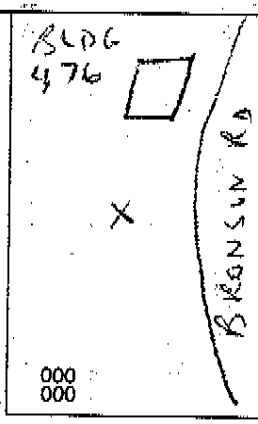
Charles (COUNTY NAME) 00-8528-W (COUNTY NO.)

STATE SIGNATURE _____ INSERT S → (41)

DATE ISSUED 8-1-00 (43 MM DD YY 48) CO-SIGNATURE [signature] EXP. DATE 7/1/or 8-1-01

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



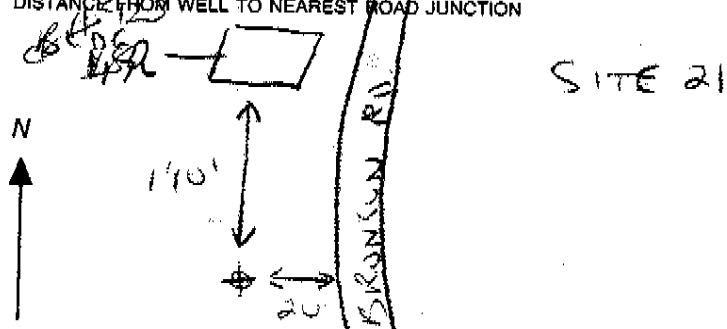
SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E _____

N _____

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

IS21 MW03

DENV-Permit 97

DRILLER

B 1 08201 SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH - 94 - 3606

fill in this form completely

Date Received (APA) _____ (MM DD YY)

OWNER INFORMATION

US NAVY (Last Name / Owner / First Name)

NSWC, INDIAN HEAD (Street or RFD)

INDIAN HEAD (Town) MD (State) 20640 (Zip)

DRILLER INFORMATION

ROBERT STEVENS (Driller's Name) M G D 017 (License No.)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 3 LOCATION OF WELL

CHARLES (COUNTY)

NSWC, INDIAN HEAD (SUBDIVISION)

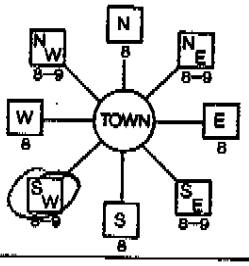
SECTION _____ LOT _____

INDIAN HEAD (NEAREST TOWN)

MILES FROM TOWN (enter 0 if in town): 1 M

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



BRONSON RD (NEAR WHAT ROAD)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH / WEST / EAST / SOUTH

DISTANCE FROM ROAD: 5 FT

TAX MAP: ____ BLK: ____ PARCEL ____

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- I INDUSTRIAL, COMMERICIAL, DEWATERING
- P PUBLIC WATER SUPPLY WELL
- T TEST, OBSERVATION, MONITORING
- G GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: Charles COUNTY NO.: 10-8529-W

STATE SIGNATURE _____ INSERT S

DATE ISSUED: 8-1-00 (MM DD YY) CO-SIGNATURE: [signature] EXP. DATE: 8-1-01

NORTH GRID: 000 EAST GRID: 000

APPROXIMATE DEPTH OF WELL: 20 FEET

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) / JETTED / Jetted & DRIVEN

AIR-ROTary / AIR-PERcussion / ROTARY (Hydraulic Rotary)

CABLE / REVerse-ROTary / DRive-POINT

other _____

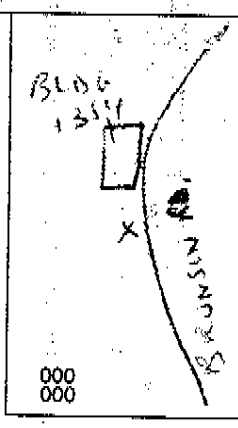
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E. _____

N _____

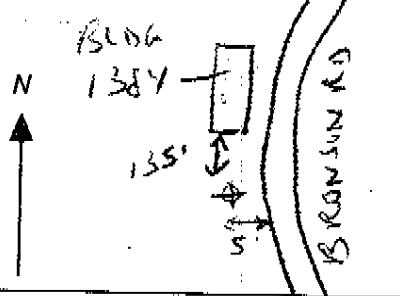


REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) _____

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP

PERMIT No. CH - 94 - 3606

SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

IS21 MW02

DENV-Permit 97

B 1 08200 SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH - 94 - 3607

fill in this form completely

Date Received (APA) 8 MM DD YY 13

OWNER INFORMATION

US NAVY — 15 Last Name Owner First Name 34

NSWC, INDIAN HEAD — 36 Street or RFD 55

INDIAN HEAD MD 20640 — 57 Town 70 State 72 Zip 76

DRILLER INFORMATION

ROBERT STEVENS — Driller's Name 76 License No. M G D 017 81

PARRATT-WOLFF, INC. — Firm Name

PO BOX 1029, HILLSBOROUGH, NC 27278 — Address

Signature July 13, 2000 Date

LOCATION OF WELL

B 3

CHARLES — 8 COUNTY 21

NSWC, INDIAN HEAD — 23 SUBDIVISION 42

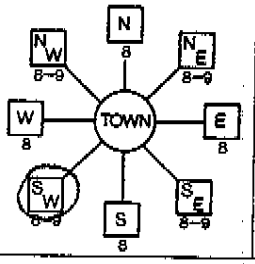
SECTION 44 46 LOT 48 50

INDIAN HEAD — 52 NEAREST TOWN 71

MILES FROM TOWN (enter 0 if in town) 1 — 73 76 M 77 78

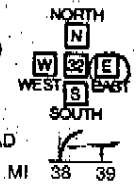
B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



BRONSON RD — 11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



34 10 37 DISTANCE FROM ROAD

ENTER FT OR MI FT 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

WELL INFORMATION

B 2 — 1 2

APPROX. PUMPING RATE (GAL. PER MIN.) N/A — 8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A — 14 20

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles — COUNTY NAME — CO-8530-W COUNTY NO.

STATE SIGNATURE ____ INSERT S → 41

DATE ISSUED 8-1-00 — 43 MM DD YY 48 — CO SIGNATURE — EXP. DATE 8-1-01

NORTH GRID 000 — 50 55 EAST GRID 000 — 57 63

APPROXIMATE DEPTH OF WELL 20 FEET — 24 28

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) — JETTED — Jetted & DRIVEN

30 AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary)

37 CABLE — REVerse-ROTary — DRive-POINT

other ____

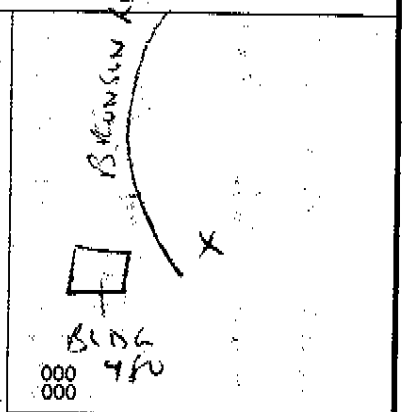
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E ____

N ____



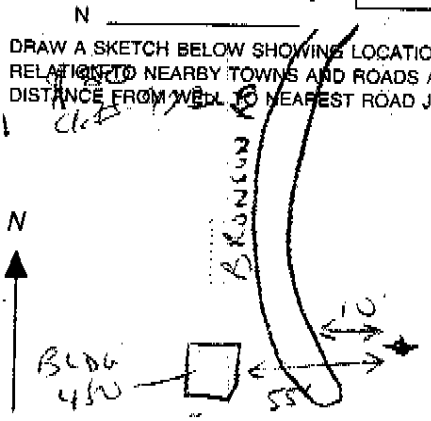
REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
- [Y] THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 — — — — — — — — 52

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION

SITE 21



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP — 54 63

PERMIT No. CH- 94- 3607 — 70 71 72 73 74 75 76 77 78 79

SPECIAL CONDITIONS
NOTE: APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

IS21-MW01

DENV-Permit 97

© DRILLER

B 1 18094 SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND PERMIT TO DRILL WELL

please print or type

STATE PERMIT NUMBER CH – 94 – 3496

fill in this form completely

Date Received (APA) 8 MM DD YY 13

OWNER INFORMATION

US NAVY — Last Name / Owner / First Name

NSWC, INDIAN HEAD — Street or RFD

INDIAN HEAD — Town; MD — State; 20640 — Zip

DRILLER INFORMATION

ROBERT STEVENS — Driller's Name; M GD 017 — License No.

PARRATT-WOLFF, INC. — Firm Name

PO BOX 1029, HILLSBOROUGH, NC 27278 — Address

Signature: Robert Stevens July 13, 2000 — Date

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

B 3 LOCATION OF WELL

CHARLES — COUNTY

NSWC, INDIAN HEAD — SUBDIVISION

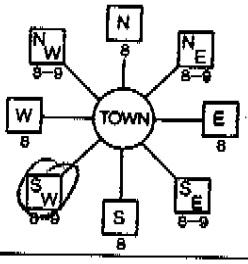
SECTION ____ LOT ____

INDIAN HEAD — NEAREST TOWN

MILES FROM TOWN (enter 0 if in town): 1 M

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



CARFEE RD — NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) — NORTH, WEST, EAST, SOUTH

DISTANCE FROM ROAD: 155 FT

TAX MAP: ____ BLK: ____ PARCEL ____

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Charles — COUNTY NAME; 00-8519-W — COUNTY NO.

STATE SIGNATURE ____ INSERT S

DATE ISSUED 8-1-00 — CO SIGNATURE — EXP. DATE 8-1-01

NORTH GRID 000 — EAST GRID 000

APPROXIMATE DEPTH OF WELL 20 FEET

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) — JETTED — Jetted & DRIVEN

30 AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary)

37 CABLE — REVerse-ROTary — DRive-POINT

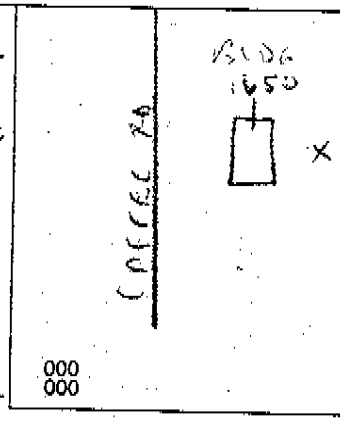
other ____

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E ____ N 000 000

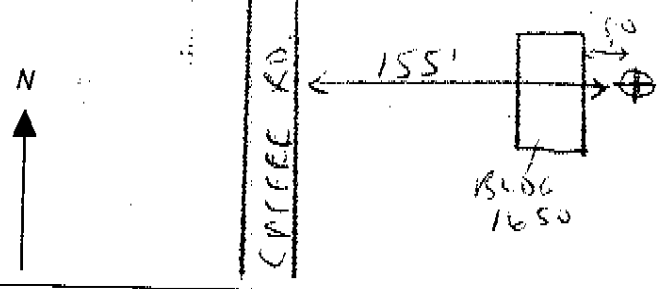


REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
- [Y] THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 – – – – – – – – – 52

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP

PERMIT No. CH – 94 – 3496

SPECIAL CONDITIONS

NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

ISH-MW05

DENV-Permit 97

© DRILLER

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH — 94 — 3494 (70–79)

fill in this form completely

Date Received (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name — Owner — First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD (57 Town) MD (70 State) 20640 (72 Zip 76)

DRILLER INFORMATION

ROBERT STEVENS (Driller's Name 76) M GD 017 (License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: Robert Stevens — Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A (8–12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A (14–20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D — DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F — FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I — INDUSTRIAL, COMMERICIAL, DEWATERING
- P — PUBLIC WATER SUPPLY WELL
- T — TEST, OBSERVATION, MONITORING
- G — GEO-THERMAL

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

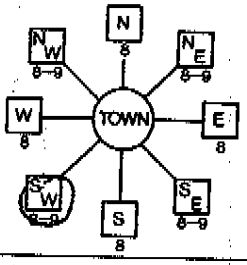
SECTION (44–46) LOT (48–50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town): 1 M (73–76 77 78)

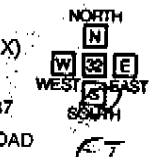
B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



CAFFEE RD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



DISTANCE FROM ROAD: 235 (34–37) ENTER FT OR MI: FT (38–39)

TAX MAP: ____ BLK: ____ PARCEL ____

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles (COUNTY NAME) 00-8517-W (COUNTY NO.)

STATE SIGNATURE ____ INSERT $ ____ (41)

DATE ISSUED 8-1-00 (43 MM DD YY 48) CO SIGNATURE ____ EXP. DATE 8-1-01

NORTH GRID 000 (50–55) EAST GRID 000 (57–63)

APPROXIMATE DEPTH OF WELL: 20 (24–26) FEET

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) — JETTED — Jetted & DRIVEN

30 AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary)

37 CABLE — REVerse-ROTary — DRive-POINT

other ____

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N — THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y — THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S — THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D — THIS WELL WILL DEEPEN AN EXISTING WELL

NSC #10779

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 — — — — — — — — 52

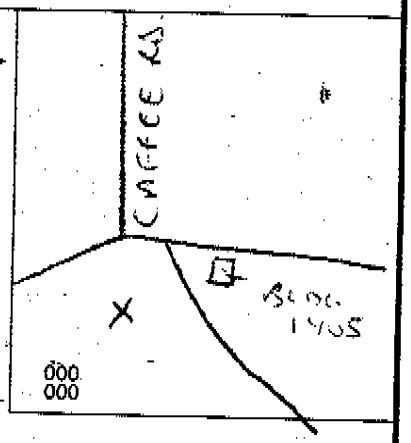
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E ____

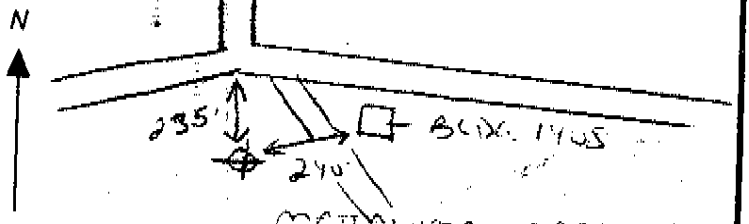
N ____



DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION

SITE 11

ck # 923 $80



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP (54–63)

PERMIT No. CH — 94 — 3494 (70 71 72 73 74 75 76 77 78 79)

SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

ES11-MW02

DENV-Permit 97

④ DRILLER

B 1 08212 (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 3497 (70 79)

fill in this form completely

Date Received (APA) (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 65)

INDIAN HEAD (57 Town) MD (70 State 72) 20640 (Zip 76)

DRILLER INFORMATION

ROBERT STEVENS (Driller's Name) M G D 017 (76 License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

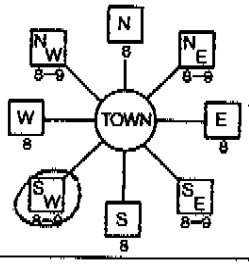
SECTION (44 46) LOT (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town) 1 (73 76 M 77 78)

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



CAFFEE RD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

34 25 37 DISTANCE FROM ROAD

ENTER FT OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A (14 20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles (COUNTY NAME) 00-8520-W (COUNTY NO.)

STATE SIGNATURE ____ INSERT S → 41

DATE ISSUED 8-1-00 (43 MM DD YY 48) [signature] 7/31/00 GO SIGNATURE 8-1-01 EXP. DATE

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

APPROXIMATE DEPTH OF WELL 20 (24 28) FEET

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

30 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

37 CABLE REVerse-ROTary DRive-POINT

other ____

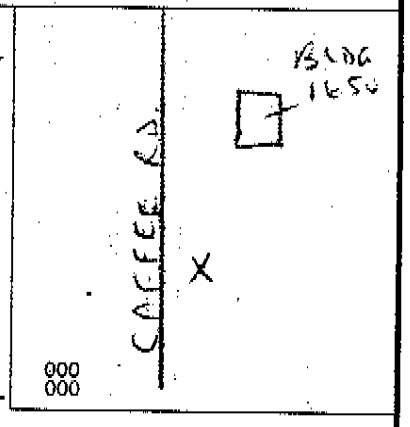
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E ____

N ____



REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
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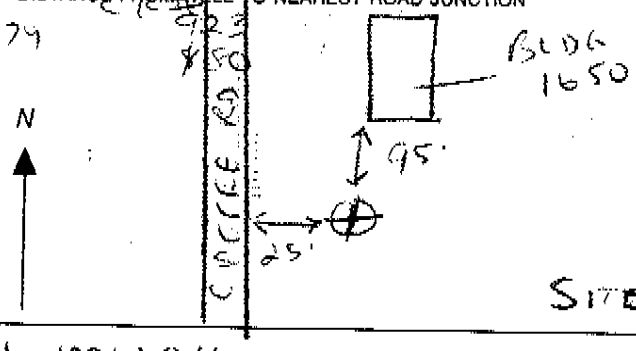
- 39 [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 ____ – ____ – ____ 52

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP (54 63)

PERMIT No. CH – 94 – 3497 (70 71 72 73 74 75 76 77 78 79)

SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

IS11-MW04

B 1 18095 (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 3495 (70 … 79)

fill in this form completely

Date Received (APA) _____ (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD (57 Town) MD (70 State 72) 20640 (Zip 76)

DRILLER INFORMATION

ROBERT STEVENS (Driller's Name 76) M G D 017 (License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A (14 20)

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

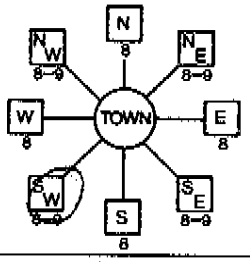
SECTION ____ (44 46) LOT ____ (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town) 1 M I (73 76 77 78)

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



CAFFEE RD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) — NORTH N, WEST W, 32, EAST E, SOUTH S

34 260 37 DISTANCE FROM ROAD

ENTER FT OR MI FT (38 39)

TAX MAP: ____ BLK: ____ PARCEL ____

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D — DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F — FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I — INDUSTRIAL, COMMERICIAL, DEWATERING
- P — PUBLIC WATER SUPPLY WELL
- T — TEST, OBSERVATION, MONITORING
- G — GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles (COUNTY NAME) 00-8518-W (COUNTY NO.)

STATE SIGNATURE _____ INSERT S → (41)

DATE ISSUED 8-1-00 (43 MM DD YY 48) [signature] CO SIGNATURE 7/31/00 EXP. DATE 891-01

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

APPROXIMATE DEPTH OF WELL 20 FEET (24 28)

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

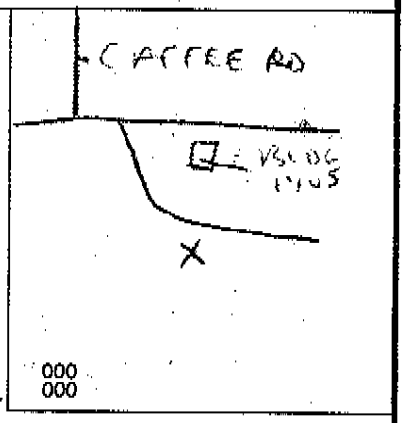
BORED (or Augered) — JETTED — Jetted & DRIVEN

30 AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary)

37 CABLE — REVerse-ROTary — DRive-POINT

other _____

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E _____

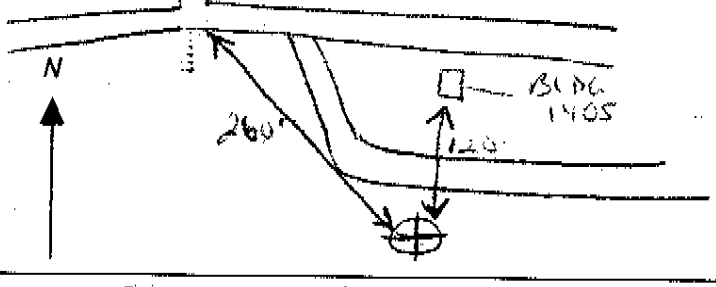
N _____

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N — THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y — THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S — THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D — THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 — — — — — — — — 52

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP (54 63)

PERMIT No. CH – 94 – 3495 (70 71 72 73 74 75 76 77 78 79)

SPECIAL CONDITIONS
NOTE – APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

ISI MW03

B 1 18097 (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 3493 (70 – 79)
fill in this form completely

Date Received (APA) _____ (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD (57 Town 70) MD (State 72) 20640 (Zip 76)

DRILLER INFORMATION

ROBERT STEVENS (Driller's Name 76) M G D 017 (License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: Robert Stevens Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A (14 20)

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

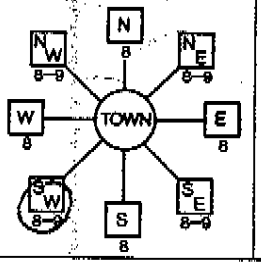
SECTION ____ (44 46) LOT ____ (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town) 1 M (73 76 77 78)

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX) (1 2)



CAFFEE ROAD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) (34 37)

DISTANCE FROM ROAD 285 ENTER FT OR MI FT (38 39)

TAX MAP: ____ BLK: ____ PARCEL ____

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I INDUSTRIAL, COMMERICIAL, DEWATERING
- P PUBLIC WATER SUPPLY WELL
- T TEST, OBSERVATION, MONITORING
- G GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Charles (COUNTY NAME) 00-8526-W (COUNTY NO.)

STATE SIGNATURE _____ INSERT $ → (41)

DATE ISSUED 8-1-00 (43 MM DD YY 48) CO SIGNATURE _____ EXP. DATE 8-1-01

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

APPROXIMATE DEPTH OF WELL 20 FEET (24 28)

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

30 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

37 CABLE REVerse-ROTary DRive-POINT

other _____

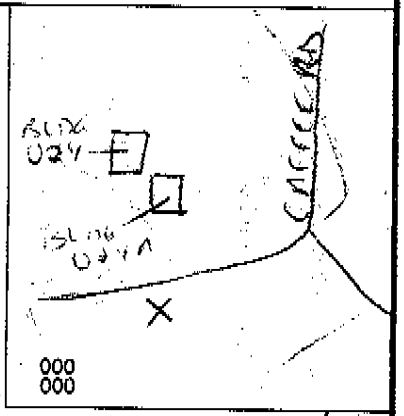
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E _____

N _____



REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

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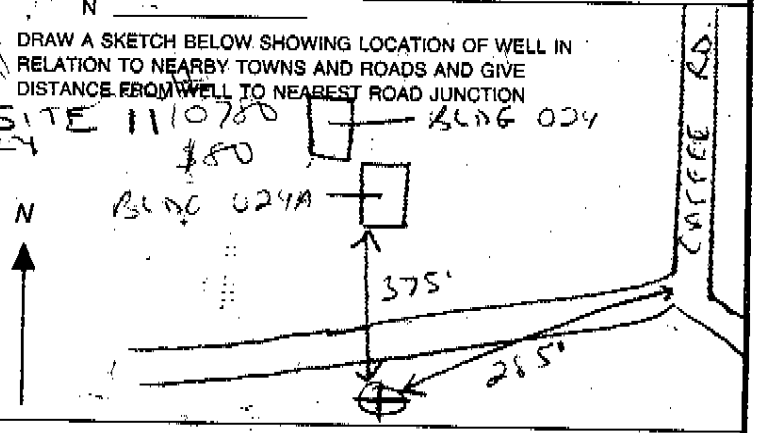
DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP (54 63)

PERMIT No. CH – 94 – 3493 (70 71 72 73 74 75 76 77 78 79)

SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

IS11-MW01

B 1 **08208** (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 3601 (70 – 78)

fill in this form completely

Date Received (APA) _____ (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD MD 20640 (57 Town 70 State 72 Zip 76)

DRILLER INFORMATION

ROBERT STEVENS M GD 017 (Driller's Name 76 License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A (14 20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I INDUSTRIAL, COMMERICIAL, DEWATERING
- P PUBLIC WATER SUPPLY WELL
- T TEST, OBSERVATION, MONITORING
- G GEO-THERMAL

APPROXIMATE DEPTH OF WELL: 20 FEET (24 28)

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

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37 CABLE REVerse-ROTary DRive-POINT

other _____

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Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP (54 63)

PERMIT No. CH – 94 – 3601 (70 71 72 73 74 75 76 77 78 79)

SPECIAL CONDITIONS

NOTE: APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

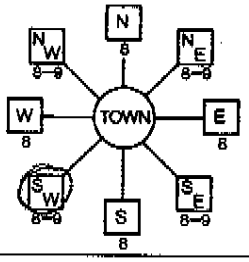
SECTION _____ (44 46) LOT _____ (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town): 1 M I (73 76 77 78)

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



CAFFEE RD. (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

34 37

DISTANCE FROM ROAD

ENTER FT OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles (COUNTY NAME) 00-8524-W (COUNTY NO.)

STATE SIGNATURE _____ INSERT S → 41

DATE ISSUED 6-1-00 (43 MM DD YY 48) CO SIGNATURE [signature] EXP. DATE 8-1-01

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

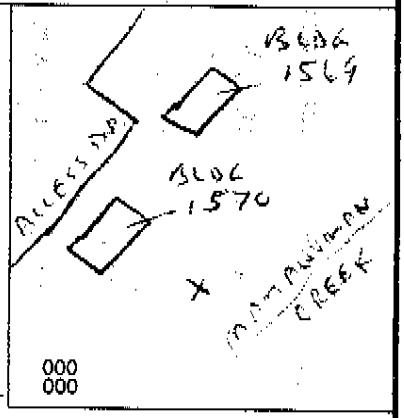
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

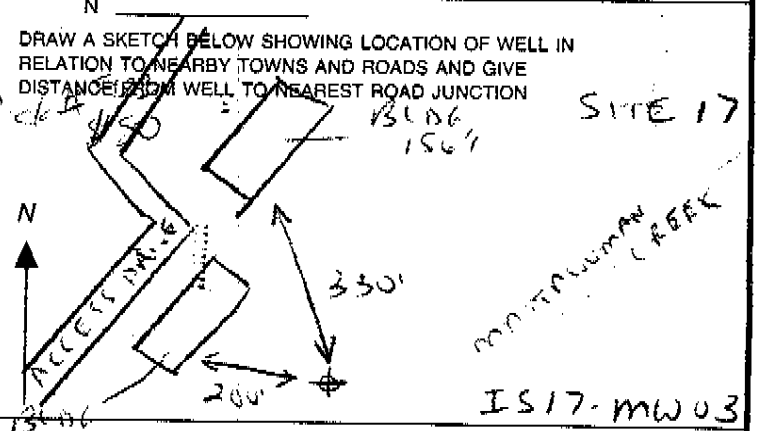
WRITE THE BOX NUMBER FROM THE MAP HERE

E _____

N _____



DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



B 1 08207 (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 3602 (70 – 79)

fill in this form completely

Date Received (APA) _____ (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD (57 Town 70) MD (State 72) 20640 (Zip 76)

DRILLER INFORMATION

ROBERT STEVENS (Driller's Name 76) M GD 017 (License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A (14 20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

APPROXIMATE DEPTH OF WELL: 20 FEET (24 28)

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

30 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

37 CABLE REVerse-ROTary DRive-POINT

other _____

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
- [Y] THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 __ __ – __ __ – __ __ __ 52

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP (54 63)

PERMIT No. CH – 94 – 3602 (70 71 72 73 74 75 76 77 78 79)

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

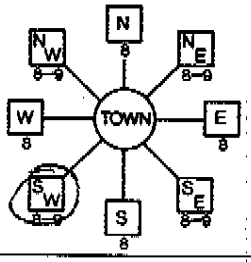
SECTION (44 46) LOT (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town): 1 M (73 76 77 78)

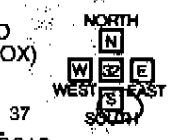
B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX) (1 2)



CAFEE RD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) (34 37)



DISTANCE FROM ROAD ENTER FT OR MI (38 39)

TAX MAP: ____ BLK: ____ PARCEL ____

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

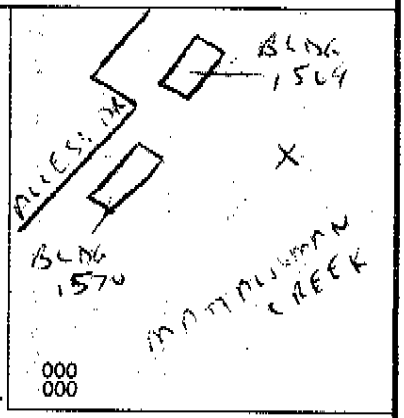
Charles (COUNTY NAME) 00-8525-W (COUNTY NO.)

STATE SIGNATURE _____ INSERT S → (41)

DATE ISSUED 8-1-00 (43 MM DD YY 48) CO-SIGNATURE [signature] EXP. DATE 8-1-01

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

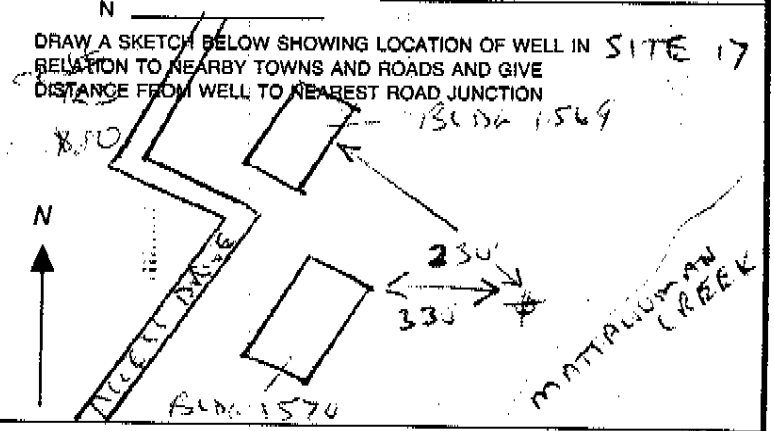
WRITE THE BOX NUMBER FROM THE MAP HERE

E _____

N _____

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION

SITE 17



SPECIAL CONDITIONS
NOTE – APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

IS17 MW02

B 1 **08206** SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH 94 3603 — fill in this form completely

Date Received (APA) _____ (MM DD YY)

OWNER INFORMATION

US NAVY — Last Name / Owner / First Name

NSWC, INDIAN HEAD — Street or RFD

INDIAN HEAD — Town; MD — State; 20640 — Zip

DRILLER INFORMATION

ROBERT STEVENS — Driller's Name; M G D 017 — License No.

PARRATT-WOLFF, INC. — Firm Name

PO BOX 1029, HILLSBOROUGH, NC 27278 — Address

Signature: Robert Stevens — Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

APPROXIMATE DEPTH OF WELL: 20 FEET

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) — JETTED — Jetted & DRIVEN

30 AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary)

37 CABLE — REVerse-ROTary — DRive-POINT

other _____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
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- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) _____

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP

PERMIT No. CH 94 3603

B 3 LOCATION OF WELL

CHARLES — COUNTY

NSWC, INDIAN HEAD — SUBDIVISION

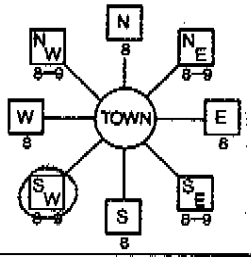
SECTION _____ LOT _____

INDIAN HEAD — NEAREST TOWN

MILES FROM TOWN (enter 0 if in town): 1 M

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



CAFEE RD — NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

DISTANCE FROM ROAD — ENTER FT OR MI

TAX MAP: ____ BLK: ____ PARCEL ____

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles — COUNTY NAME; 00-8526-W — COUNTY NO.

STATE SIGNATURE _____ INSERT S

DATE ISSUED 8-1-00 — CO-SIGNATURE 7/31/00 — EXP. DATE 8-1-01

NORTH GRID 000 — EAST GRID 000

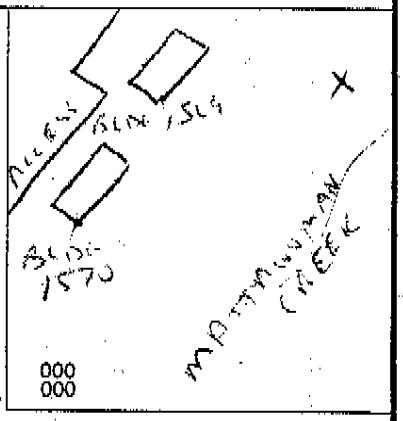
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

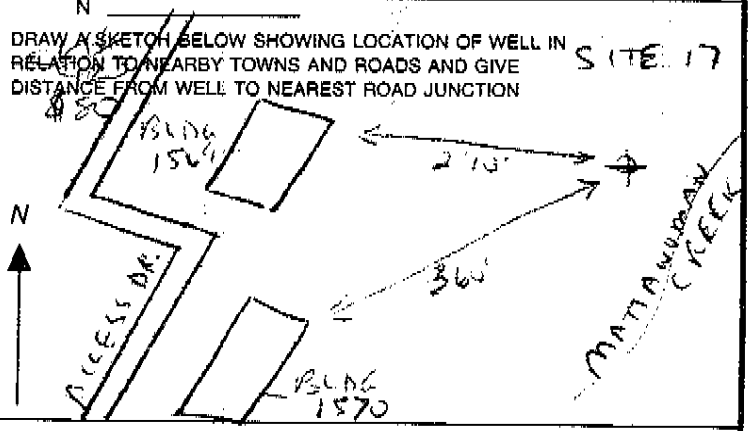
WRITE THE BOX NUMBER FROM THE MAP HERE

E _____

N _____



DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

IS17-MW01

B 1 08213 (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH - 94 - 3608 (70 79)
fill in this form completely

Date Received (APA) _____ (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD MD 20640 (57 Town 70 State 72 Zip 76)

DRILLER INFORMATION

ROBERT STEVENS M G D 017 (Driller's Name 76 License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A (14 20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

APPROXIMATE DEPTH OF WELL: 20 FEET (24 28)

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN
30 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
37 CABLE REVerse-ROTary DRive-POINT
other _____

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- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 — — — — — — — — 52

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP (54 63)

PERMIT No. CH - 94 - 3608 (70 71 72 73 74 75 76 77 78 79)

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

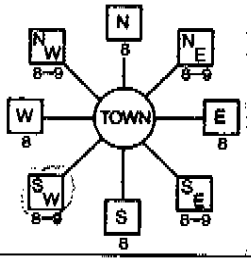
SECTION (44 46) LOT (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town): 1 M (73 76 77 78)

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



HERSEY RD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32 E, EAST, S SOUTH

34 435 37 DISTANCE FROM ROAD

ENTER FT OR MI FT (38 39)

TAX MAP: _____ BLK: _____ PARCEL _____

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Charles — COUNTY NAME
00-8531-W — COUNTY NO.

STATE SIGNATURE _____ INSERT S → 41

DATE ISSUED 8-1-00 (43 MM DD YY 48) CO SIGNATURE [signature] 7/31/00 EXP. DATE 8-1-01

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

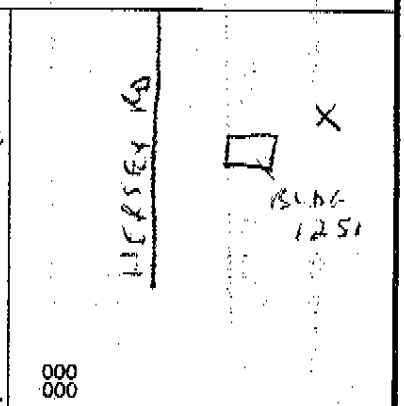
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →

SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

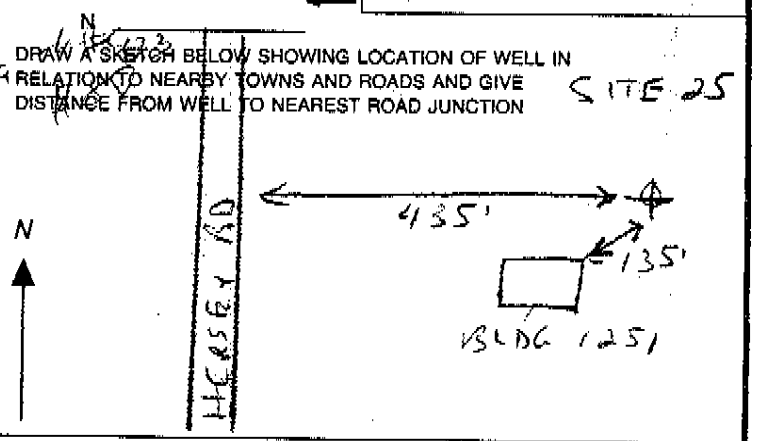
E _____

N _____



DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION

SITE 25



SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

IS25-MW02

B 1 08214 (1 2 3 6) SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH - 94 - 3609 (70 79)
fill in this form completely

Date Received (APA) _____ (8 MM DD YY 13)

OWNER INFORMATION

US NAVY (15 Last Name Owner First Name 34)

NSWC, INDIAN HEAD (36 Street or RFD 55)

INDIAN HEAD MD 20640 (57 Town 70 State 72 Zip 76)

DRILLER INFORMATION

ROBERT STEVENS M G D 017 (Driller's Name 76 License No. 81)

PARRATT-WOLFF, INC. (Firm Name)

PO BOX 1029, HILLSBOROUGH, NC 27278 (Address)

Signature: [signature] Date: July 13, 2000

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): N/A (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): N/A (14 20)

B 3 LOCATION OF WELL

CHARLES (8 COUNTY 21)

NSWC, INDIAN HEAD (23 SUBDIVISION 42)

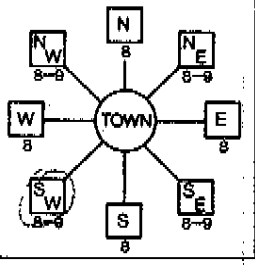
SECTION ____ (44 46) LOT ____ (48 50)

INDIAN HEAD (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town): 1 M I (73 76 77 78)

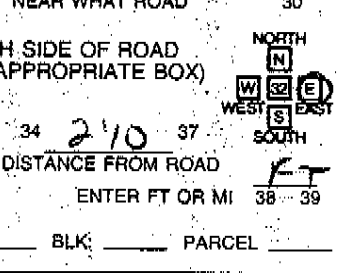
B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX) (1 2)



HERSEY RD (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX) (34 37)



DISTANCE FROM ROAD: 210 FT (38 39)

TAX MAP: ____ BLK ____ PARCEL ____

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I INDUSTRIAL, COMMERICIAL, DEWATERING
- P PUBLIC WATER SUPPLY WELL
- T TEST, OBSERVATION, MONITORING
- G GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles (COUNTY NAME) 00-8532-W (COUNTY NO.)

STATE SIGNATURE _____ INSERT S → (41)

DATE ISSUED 8-1-00 (43 MM DD YY 48) CO-SIGNATURE [signature] 7/13/00 EXP. DATE 8-1-01

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

APPROXIMATE DEPTH OF WELL 20 FEET (24 28)

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

30 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

37 CABLE REVerse-ROTary DRive-POINT

other _____

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

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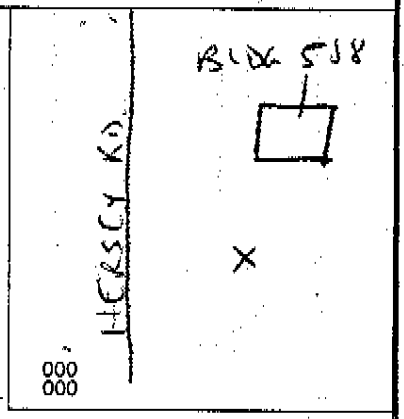
- 39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 - - 52

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



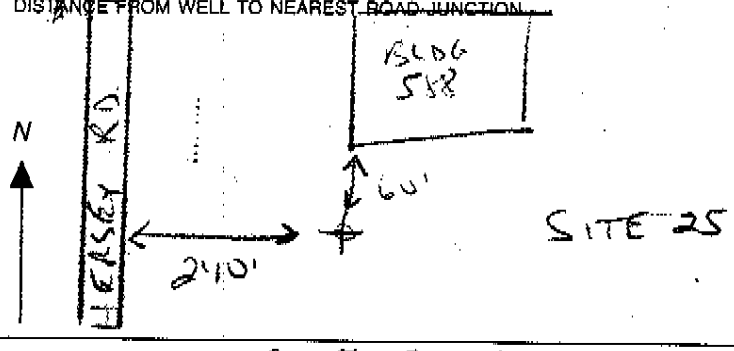
SOURCES OF DRILLING WATER
1. On-Site Hydrant
2. Well
3. Tank Truck

WRITE THE BOX NUMBER FROM THE MAP HERE

E _____

N _____

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION.



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: GAP (54 63)

PERMIT No. CH - 94 - 3609 (70 71 72 73 74 75 76 77 78 79)

SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

IS25. MW01

PROJECT NUMBER	TEST PIT NUMBER	
156175.FI.SS	IS21TP01	SHEET 1 OF 1

TEST PIT LOG

PROJECT : NDWIH | LOCATION : Site 21 along Bronson Road | LOGGER : Ben Francisco (edits by DK)

ELEVATION : See survey report | CONTRACTOR : Parratt-Wolff Inc.

EXCAVATION EQUIPMENT USED : CASE Backhoe with a bucket approximately 2' wide by 2' deep | DATE EXCAVATED: 8/2/00

WATER LEVEL AND DATE : Perched at 3' bgs. | APPROX. DIM: Length: 25 ft. Width: 2 ft. | Maximum Depth: 7 ft.

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE #/TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			FILL - Sandy Silt (ML), brown, with angular gravel, moist, soft	@2' OVM=0ppm
			@3' crushed 55 gallon drums and other wood and metallic debris	@3' perched water above a plastic liner (about the thickness of a heavy duty contractor trashbag) that is acting as a cap on the edge of the landfill
5			@4' **Sandy Gravel with Silt (GM)** wet, loose (perceived to be clean, possibly fill)	@4' bottom of landfill (OVM=0ppm)
				@6' OVM=0ppm
			Test Pit terminated at 7' bgs.	** Based on the trenching activities, the landfill terminates approximately 19 ft. west of the surveyed marker for IS21TP01
10				
15				

PROJECT NUMBER	TEST PIT NUMBER	
156175.FI.SS	IS21TP02	SHEET 1 OF 1

TEST PIT LOG

PROJECT : NDWIH | LOCATION : Site 21 along Bronson Road | LOGGER : Ben Francisco (edits by DK)

ELEVATION : See survey report | CONTRACTOR : Parratt-Wolff Inc.

EXCAVATION EQUIPMENT USED : CASE Backhoe with a bucket approximately 2' wide by 2' deep | DATE EXCAVATED: 8/2/00

WATER LEVEL AND DATE : Perched at 2' bgs. | APPROX. DIM: Length: 15 ft. Width: 2 ft. | Maximum Depth: 8 ft.

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE #/TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			FILL - Gravelly Sand with Silt (SM), orange, with angular gravel, moist, soft	
			@2' trash consisting of construction debris. Also appears to be stained black with petroleum subtance	@2' OVM=57 ppm; perched water above a plastic liner
				@4' OVM=27ppm
5			**@5' Clayey Sand (SC),** light gray, moist (perceived to be native soil)	@5' Bottom of landfill
			Test Pit terminated at 8' bgs.	** Based on the trenching activities, the landfill terminates approximately 8 ft. west of the surveyed marker for IS21TP02.
10				
15				

PROJECT NUMBER	TEST PIT NUMBER	
156175.FI.SS	IS21TP03	SHEET 1 OF 1

TEST PIT LOG

PROJECT : NDWIH | LOCATION : Site 21 along Bronson Road | LOGGER : Ben Francisco (edits by DK)

ELEVATION : See survey report | CONTRACTOR : Parratt-Wolff Inc.

EXCAVATION EQUIPMENT USED : CASE Backhoe with a bucket approximately 2' wide by 2' deep | DATE EXCAVATED: 8/2/00

WATER LEVEL AND DATE : Perched at 1' bgs. | APPROX. DIM: Length: 10 ft. Width: 2 ft. | Maximum Depth: 5 ft.

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE #/TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			FILL - Gravelly Sand w/ Silt (SM), orange, moist	@1' perched water above waste
			@1' waste consisting of construction debris, organic debris, tar paper, wood boards, and bricks.	@2' OVM=67ppm
			@4' Silty Clay (CL), orange, damp	@4' Bottom of landfill
5				
			Test Pit terminated at 5' bgs.	** Based on the trenching activities, the landfill terminates approximately 5 ft. west of the surveyed marker for IS21TP03. The waste terminates laterally into an orange gravelly sand w/ silt that appears to be native (or clean back fill)
10				
15				

PROJECT NUMBER	TEST PIT NUMBER	
156175.FI.SS	IS21TP04	SHEET 1 OF 1

TEST PIT LOG

PROJECT : NDWIH | LOCATION : Site 21 along Bronson Road | LOGGER : Ben Francisco (edits by DK)

ELEVATION : See survey report | CONTRACTOR : Parratt-Wolff Inc.

EXCAVATION EQUIPMENT USED : CASE Backhoe with a bucket approximately 2' wide by 2' deep | DATE EXCAVATED: 8/2/00

WATER LEVEL AND DATE : Perched at 2' bgs. | APPROX. DIM: Length: 6 ft. Width: 2 ft. | Maximum Depth: 5 ft.

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE #/TYPE	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			FILL - Clayey Gravel w/ Sand (GC), orange, with angular gravel, moist @1' waste consisting of construction debris, crushed 55 gallon drums, and wood boards.	@1' OVM=1 ppm
			@3' Clayey Sand (SC), light gray, moist (perceived to be native soil)	@3' Bottom of landfill
5				
			Test Pit terminated at 5' bgs.	** The surveyed marker for IS21TP04 is placed at the lateral boundary of the landfill.
10				
15				

PROJECT NUMBER	TEST PIT NUMBER	
156175.FI.SS	IS21TP05	SHEET 1 OF 1

TEST PIT LOG

PROJECT : NDWIH | LOCATION : Site 21 along Bronson Road | LOGGER : Ben Francisco (edits by DK)

ELEVATION : See survey report | CONTRACTOR : Parratt-Wolff Inc.

EXCAVATION EQUIPMENT USED : CASE Backhoe with a bucket approximately 2' wide by 2' deep | DATE EXCAVATED: 8/2/00

WATER LEVEL AND DATE : Not encountered. | APPROX. DIM: Length: 10 ft. Width: 2 ft. | Maximum Depth: 4 ft.

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE #/TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			FILL - Gravelly Silt w/ Sand (ML), brown, moist, construction debris, metal, wood, and fabric debris present.	@1' OVM=0 ppm
				@3' OVM=0 ppm
5			@4' **Silty Clay (CL)**, light gray/brown, appears native	
			Test Pit terminated at 5' bgs.	** The surveyed marker for IS21TP05 is placed at the lateral boundary between what appears to be clean fill and the fill described above that comprises the landfill. The clean fill extending westward to the road consists of an orange **Gravelly Sand w/ Silt (SM)**, moist, with trace wood and fabric
10				
15				

PROJECT NUMBER	TEST PIT NUMBER	
156175.FI.SS	IS21TP06	SHEET 1 OF 1

TEST PIT LOG

PROJECT : NDWIH | LOCATION : Site 21 along Bronson Road | LOGGER : Ben Francisco (edits by DK)

ELEVATION : See survey report | CONTRACTOR : Parratt-Wolff Inc.

EXCAVATION EQUIPMENT USED : CASE Backhoe with a bucket approximately 2' wide by 2' deep | DATE EXCAVATED: 8/2/00

WATER LEVEL AND DATE : Not encountered. | APPROX. DIM: Length: 8 ft. Width: 2 ft. | Maximum Depth: 5 ft.

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE #/TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			Sandy Gravel w/ Clay (GC), orange-red, moist	@1' OVM=0 ppm
			@2' **Clayey Sand (SC)**, grey to brown, moist, root matter and black staining	@3' OVM=0 ppm
5				
			Test Pit terminated at 5' bgs.	No apparent FILL encountered at this location.
10				
15				

PROJECT NUMBER	TEST PIT NUMBER	
156175.FI.SS	IS21TP07	SHEET 1 OF 1

TEST PIT LOG

PROJECT : NDWIH | LOCATION : Site 21 along Bronson Road | LOGGER : Ben Francisco (edits by DK)

ELEVATION : See survey report | CONTRACTOR : Parratt-Wolff Inc.

EXCAVATION EQUIPMENT USED : CASE Backhoe with a bucket approximately 2' wide by 2' deep | DATE EXCAVATED: 8/2/00

WATER LEVEL AND DATE : Not encountered. | APPROX. DIM: Length: 8 ft. Width: 2 ft. | Maximum Depth: 5 ft.

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL (FT)	SAMPLE #/TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
			Sandy Gravel w/ Silt (GM), orange, moist, trace 1-2' diameter boulders	@1' OVM=0 ppm
				@3' OVM=0 ppm
5				
			Test Pit terminated at 5' bgs.	No apparent FILL encountered at this location.
10				
15				

Geophysical Survey
Bronson Road Landfill - Site 21
Naval Surface Warefare Center
Indian Head, Maryland

Prepared For:

CH2MHill

13921 Park Center Road, Suite 600
Herndon, Virginia 20171

Prepared By:

Forrest Environmental Services, Inc.

3057 Crosen Court
Oak Hill, Virginia 20171
(703) 648-9090

July 2000

FES Project No. 00141

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A	ER Profiles

Executive Summary

Forrest Environmental Services, Inc. (FES) performed a preliminary electromagnetic (EM) survey to horizontally locate suspected metal and non-metal debris and an electrical resistivity (ER) survey to vertically locate metal and non-metal burial located at the Bronson Landfill - Site 21 in Indian Head, Maryland on 18-20 July 2000. The EM survey covered approximately 475 by 450 feet. Data were collected along linear traverses 25-foot apart with stations at 10-foot centers. Five ER survey lines (ER lines 1 through 2) were located within the landfill from the results of the EM survey.

The EM survey was performed using an EM-31 induction meter to measure the apparent conductivity of the subsurface. The depth of investigation by EM is a function of the intercoil spacing and the orientation of the antenna dipoles. The EM-31 has an intercoil spacing of 12 feet, and used in the vertical dipole mode, has an effective penetration depth of approximately 18 feet.

Two readings were obtained from the EM-31 at each measurement station that included.the apparent conductivity and the in-phase component. The background terrain conductivity value at the site was approximately 35 millimhos per meter (mmhos/m).

The ER survey was conducted using a Sting/Swift R1 earth resistivity meter. The electrode spacing (dipole size) was 10 feet (3 meters) and used 30 electrodes. Approximately 800 soundings were measured during the ER survey. The ER data were converted into a resistivity depth model and Rapid 2D resistivity inversion model using the least-squares method (RES2DINV).

The EM survey exhibited four negative anomaly areas that appear to be from a large mass of metal burial. The buried metal areas are located at the southwestern and northwestern section of the survey, and central section of the survey. The negative anomaly located at the southeastern section of the survey is from large mass of surface and buried metal. Two high conductive anomalies are located at the eastern section and central section of the survey. The high anomalies appear be the landfill boundary that includes dissimulated metal and non-metal burial.

The ER survey showed the landfill as conductive and resistive anomalies. The conductive anomalies appear to contain large masses of buried metal. The resistive anomalies appear to include dissimilar metal and non-metal debris and/or saturated soil. The landfill thickness ranges approximately from 10 to 30 feet. The landfill cap thickness ranges approximately from 5 to 10 feet.

1.0 Introduction

Forrest Environmental Services, Inc. (FES) performed a geophysical survey at the Bronson Road landfill located at the Naval Surface Warefare Center in Indian Head, Maryland on 18 through 20 July 2000. The survey consisted of a preliminary electromagnetic (EM) survey to locate and define the suspected buried metal and non-metal debris and an electric resistivity (ER) survey to delineate the horizontal and vertical extent of a landfill. The survey was located east of Bronson Road and Building 1384.

Line 0 North and station 0 East denotes the southwest corner of the survey. The geophysical survey was bordered by Bronson Road to the west, the access road to Building 0543 to the South, the tree line to the east, and a wet land area to the north. CH2MHill located stakes at 50 foot centers throughout the survey area. FES expanded the grid by 50 feet to the north, east, and west, and 100 feet to the south.

The EM survey was conducted west of Bronson Road (Figure 1). Data were collected along 20 linear traverses at 25-foot spacings with stations at 10-foot centers for the EM-31. The survey covered 475 by 450 feet.

The ER survey was conducted from using the EM data (Figure 1). Two electric resistivity lines were conducted that within the landfill area. ER Line 1 traversed east-west at 300 North. ER Line 1 started at Station 40 East. ER Line 2 traversed north-south at 200 East. ER Line 1 started at 0 North. ER lines 1 and 2 used 30 electrodes at 3 meters (10 foot) centers and was performed in a roll-along fashion and was 132 meters (440 feet) in length. The roll-along technique is discussed in Section 2. Approximately 800 soundings were collected.

Topographically, the site slopes to the west. The site consists of tall grass field with a few trees. The eastern section of the survey consists of areas of standing water to 1 foot above surface. Survey locations and physical features are shown in Figure 1.

Details of the geophysical survey are described in the following sections.

2.0 Equipment and Procedures

EM Survey

The EM survey was performed using an EM-31 induction meter to measure the apparent conductivity of the subsurface. The EM-31 consists of two horizontal coplanar loops, one acting as a transmitter and the other as a receiver. The transmitter induces electrical eddy currents in the earth, which in turn produce a secondary magnetic field. The receiver intercepts the secondary field, and the meter measures the terrain conductivity by comparing the strength of the secondary field to that of the primary field.

The depth of investigation by EM is a function of the intercoil spacing and the orientation of the antenna dipoles. The EM-31 has an intercoil spacing of 12 feet, and used in the vertical dipole mode, has an effective penetration depth of approximately 18 feet.

Two readings were obtained from the EM-31 at each measurement station. The EM was connected to a data logger that simultaneously recorded both the quadrature-phase component and the in-phase component. The quadrature-phase component measures the terrain conductivity of the subsurface, and will detect metallic and nonmetallic objects or features with conductivities that deviate from their surroundings. The background terrain conductivity value at the site was approximately 35 millimhos per meter (mmhos/m).

The in-phase component measurements are proportional to an effective, average magnetic susceptibility of the surrounding earth; this mode is sensitive to large metallic objects. The readings do not indicate true magnetic susceptibility because there is an unknown additive constant and multiplying factor that would be required to convert the measured values to magnetic susceptibility.

ER Survey

The geophysical survey instrument used during this survey was an earth resistivity meter that maps the resistivity changes in the earth. Resistivity is a fundamental parameter of the

material that describes how easily the material can transmit electrical current. High values of resistivity imply that the material is very resistant to the flow of electricity, and low values of resistivity imply that the material transmits electrical current very easily.

The primary factors affecting the resistivity of earth materials are porosity, water saturation, clay content, and ionic strength of the pore water. The minerals making up soil and rock generally do not readily conduct electric current. Most of the current flow takes place through the material's pore water in which the resistivity decreases with increasing porosity and water saturation. Clay minerals are conductive because of the availability of free ions in the sheet structure of the clay particles in which resistivity decreases with increasing clay content. Similarly, higher salinity in groundwater makes the water more conductive to electrical current and resistivity decreases. Hard competent bedrock, such as limestone or granite, generally has a high resistivity in the absence of fracture or other permeable features.

The geophysical survey instrument used during this survey was a Sting R1 earth resistivity meter (Sting) connected to a Swift automatic electrode system (Swift). The Sting measures the electrical resistivity of the earth and the Swift automates the resistivity measurement process using the multi-electrode system.

The Swift was connected to the Sting and SMART electrodes to optimize survey efficiency by gathering maximum information with a minimum of electrodes. Each SMART electrode is numbered by a computer chip located within the electrode. The Swift selects which electrodes to employ as the current and receiver. For example for this ER survey, the first sounding uses electrodes 1 and 4 as the transmitter and electrodes 2 and 3 as the receiver. The next sounding uses electrodes 2 and 5 as the transmitter and electrodes 3 and 4 as the receiver. The Swift also uses redundancies in the data set to reduce the effects of lateral heterogeneities in the earth and to calculate uncertainties in the data. The survey was conducted automatically using the Sting/Swift Schlumberger array system.

The earth resistivity meter works by introducing a measured current into the earth through two electrodes; the resultant voltage is then measured across two different electrodes. At the low currents used, the voltage is proportional to the current. The resistivity meter calculates the voltage/current ratio or resistance in ohms. The resistance is then converted to resistivity

using an algorithm which is a function of the electrode array configuration. Measured differences in the electrical resistivity of various earth materials are then used to map the geology and character of the soil and rock materials. For example, clays generally have low resistivities and limestones have high resistivities.

ER lines 1 and 2 were longer that the electrode system length, so the surveying was advanced in a roll-along or leapfrog fashion. At first, the Swift cables are laid out with consecutive numbering (electrodes' 1 through 30). After the data is collected, the first cable (electrodes' 1-15) is moved ahead of the second cable making the order of electrodes as 16 through 30, 1 through 15. Data was collected taking care not to take double measurements in the area where the two layouts overlap. Data were collected at ER lines 1 and 2 used one roll-along setup.

The depth of investigation by Sting is a function of the total distance of the electrode layout was 87 meters (190 feet) for ER lines 1 through 2. The Sting has an effective analysis depth of approximately 15 meters (50 feet) using a 3 meter (10 feet) electrode spacing. This depth is considered sufficient to locate voids at the Bronson Road site.

3.0 Interpretation Methods

EM

Generally, negative EM values can indicate the areal extent of large, shallow buried metal objects. The EM registers moderate-sized metal objects buried at depth as areas of high conductivity; therefore, both high and negative readings of apparent conductivity can indicate metal. However, areas of high conductivity can also be caused by conductive chemical compounds such as acids, sulfates, and salts in the subsurface and by conductive soils such as clay. Low conductivity materials such as wood and oil are generally not detected by the EM.

Contours of the EM data were generated by computer using Golden Software's SURFER®. Data gridding were performed using 5-foot spacings, and the Kriging algorithm was used for grid interpolation. Plots of the data results are discussed in the following section.

ER

The ER data were converted into a resistivity depth model using Rapid 2D resistivity inversion model and the least-squares method (RES2DINV). Soundings from each line were modeled to produce the measured apparent resistivity pseudo-sections. The model calculated the apparent resistivity pseudo-sections using finite-difference forward modeling. The least-squares optimization technique was used for the inversion routine that calculated the modeled resistivity section.

Low resistive materials can be caused by certain conductive soils such as clay and/or buried metal. High resistive materials are caused by burial.

Typical resistivities of the overburden were 100 ohm meters. Buried metal debris resistivities measured less than 50 ohm meters. Landfill burial such as office waste resistivities measures greater than 200 ohm meters.

4.0 Survey Results

EM Survey

The objective of the EM survey was to determine the horizontal boundary of the landfill. The EM terrain conductivity contour map (Figure 2) exhibited three negative anomalies. The negative anomalies are centered at 75 East 110 North, 125 East, 420 North, and 200 East 300 North. The negative anomalies appear to be large mass of metal burial. The average magnetic susceptibility contour map (Figure 3) confirms the EM terrain conductivity map and indicate an additional negative anomaly centered at 475 East 120 North. The negative anomaly is surface metal debris.

The EM survey also exhibited two high anomalies centered at 50 East 210 North and 300 East 250 North. The high EM anomalies appear to be dissimilar metal and non-metal debris and/or saturated soil.

ER Survey

The objective of the ER survey was to determine the vertical boundary of the landfill. ER cross-sections are provided in Appendix A.

ER Line 1 located three conductive anomalies located at 33 meters, 72 meters, and 102 meters East. The anomaly at 33 meters East is located approximately 17.5 meters (60 feet) below ground surface (bgs). The anomaly at 33 meters appears to be saturated sands associated with brackish groundwater or a clay seam. The anomalies centered at 72 meters and 102 meters East are located approximately between 2 to 8 meters (5 to 25 feet) bgs. The anomalies at 72 and 102 meters East appear to be buried metal and non-metal debris.

ER Line 2 located two resistive anomalies located at 36 meters and 69 meters North. The anomalies range approximately from 3 to 8 meters (10 to 26 feet) bgs on the southern anomaly and ranges approximately 3 to 10 meters (10 to 33 feet) for the northern anomaly

ER Line 2 located two conductive anomalies centered at 45 meters North and 96 meters North. The conductive anomalies appear to be saturated sands associated with brackish groundwater or a clay seam.

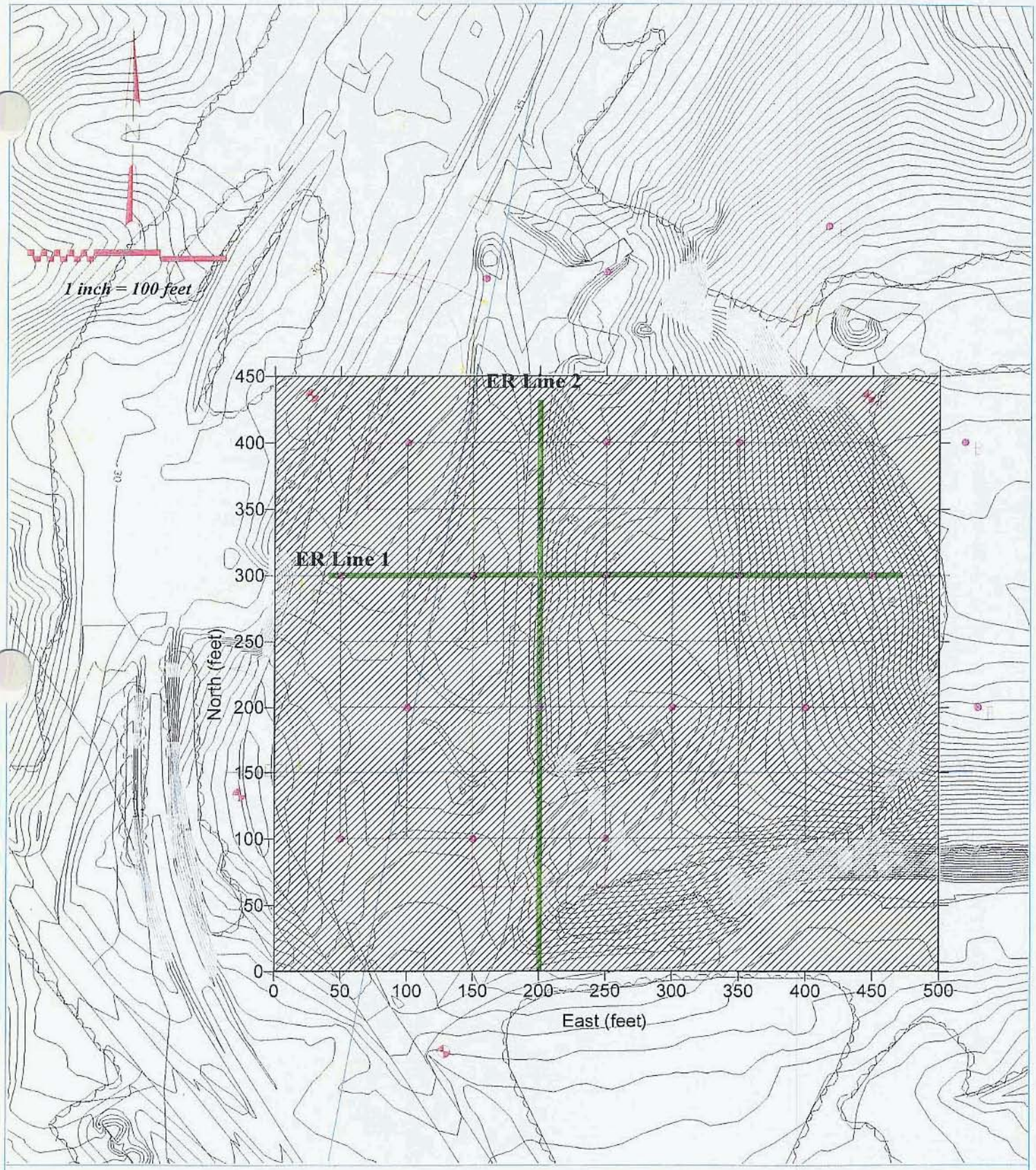
5.0 Conclusions

The objectives of the geophysical surveys were to delineate horizontally and vertically Bronson Road Landfill.

The EM survey exhibited four negative anomaly areas that appear to be from a large mass of metal burial (Figure 4). The buried metal areas are located at the southwestern and northwestern section of the survey, and central section of the survey. The negative anomaly located at the southeastern section of the survey is from large mass of surface and buried metal. Two high conductive anomalies are located at the eastern section and central section of the survey. The high anomalies appear be the landfill boundary that includes dissimulated metal and non-metal burial.

The ER survey showed the landfill as conductive and resistive anomalies. The conductive anomalies appear to contain large masses of buried metal. The resistive anomalies appear to include dissimilar metal and non-metal debris and/or saturated soil.

The landfill thickness ranges approximately from 10 to 30 feet. The landfill cap thickness ranges approximately from 5 to 10 feet.



Client:
CH2MHill

Forrest Environmental Services, Inc.
3057 Crosen Court
Oak Hill, Virginia 20171
(703) 648-0090

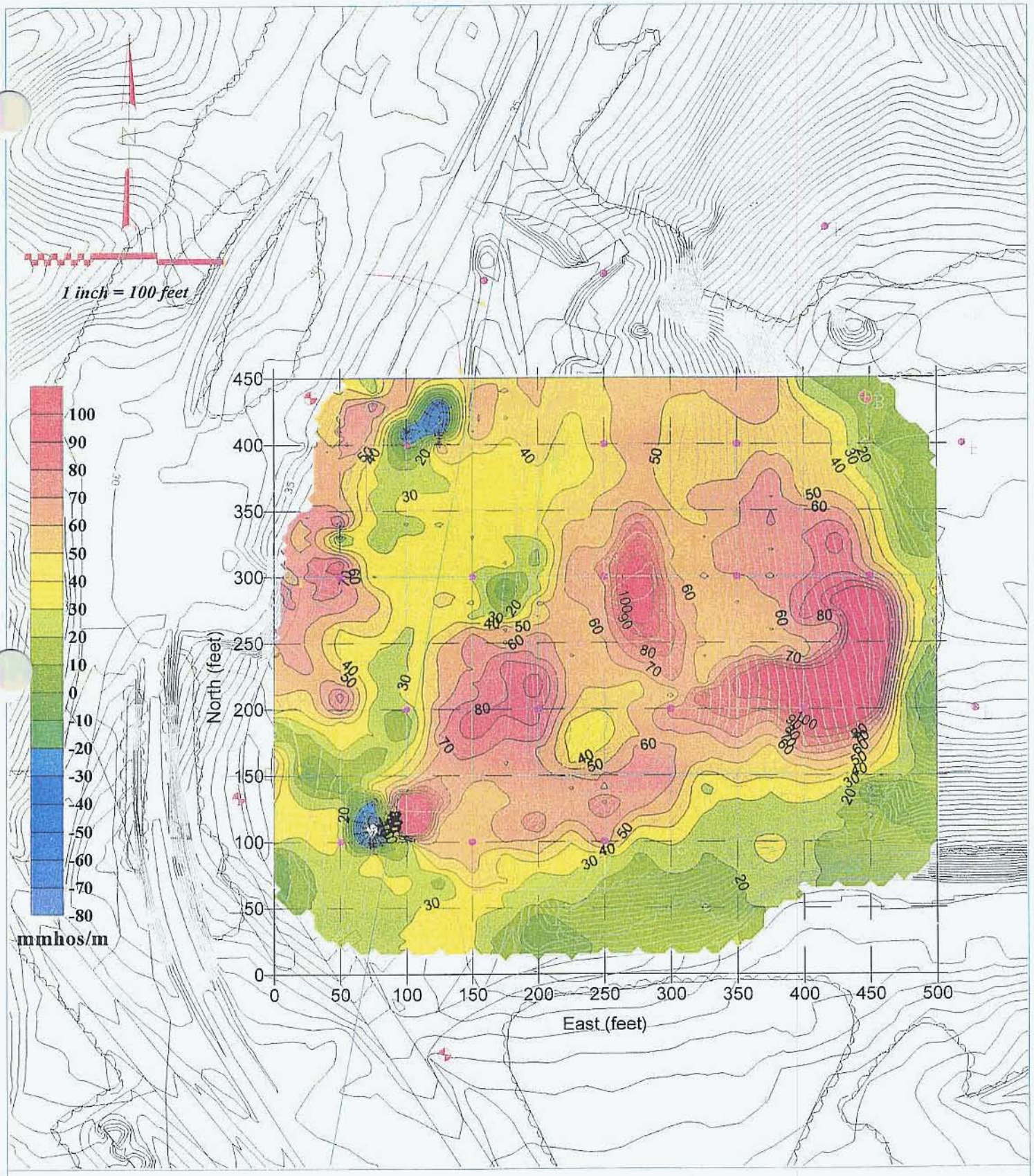
Legend

EM Survey Area

ER Line

Figure 1

Geophysical Boundary Map
Bronson Road Landfill - Site 21
Naval Surface Warefare Center
Indian Head, Maryland

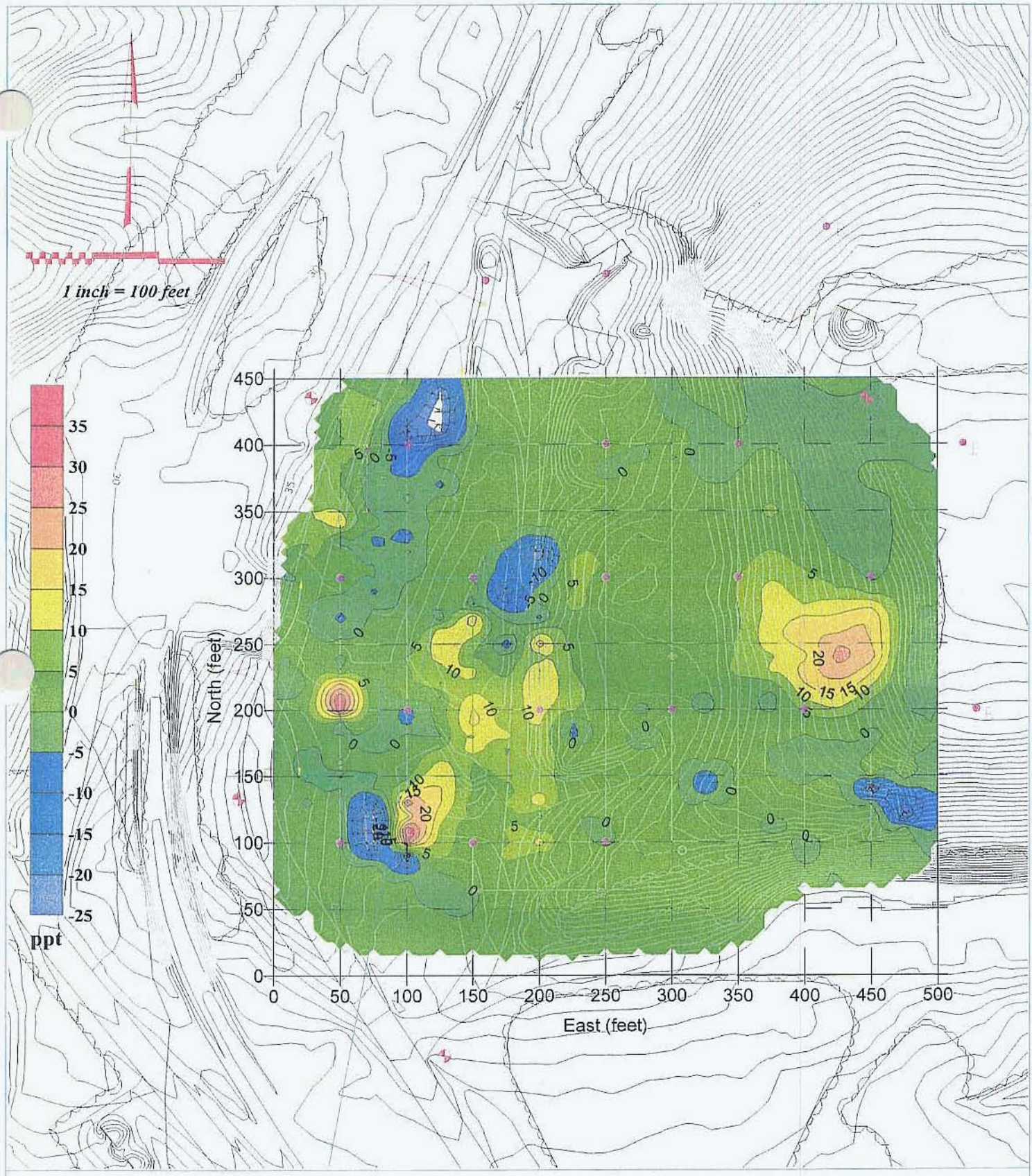


Client:
CH2MHill

Forrest Environmental Services, Inc.
3057 Crosen Court
Oak Hill, Virginia 20171
(703) 648-9090

Figure 2

EM Apparent Conductivity Contour Map
Bronson Road Landfill - Site 21
Naval Surface Warefare Center
Indian Head, Maryland



Client:
CH2MHill

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Oak Hill, Virginia 20171
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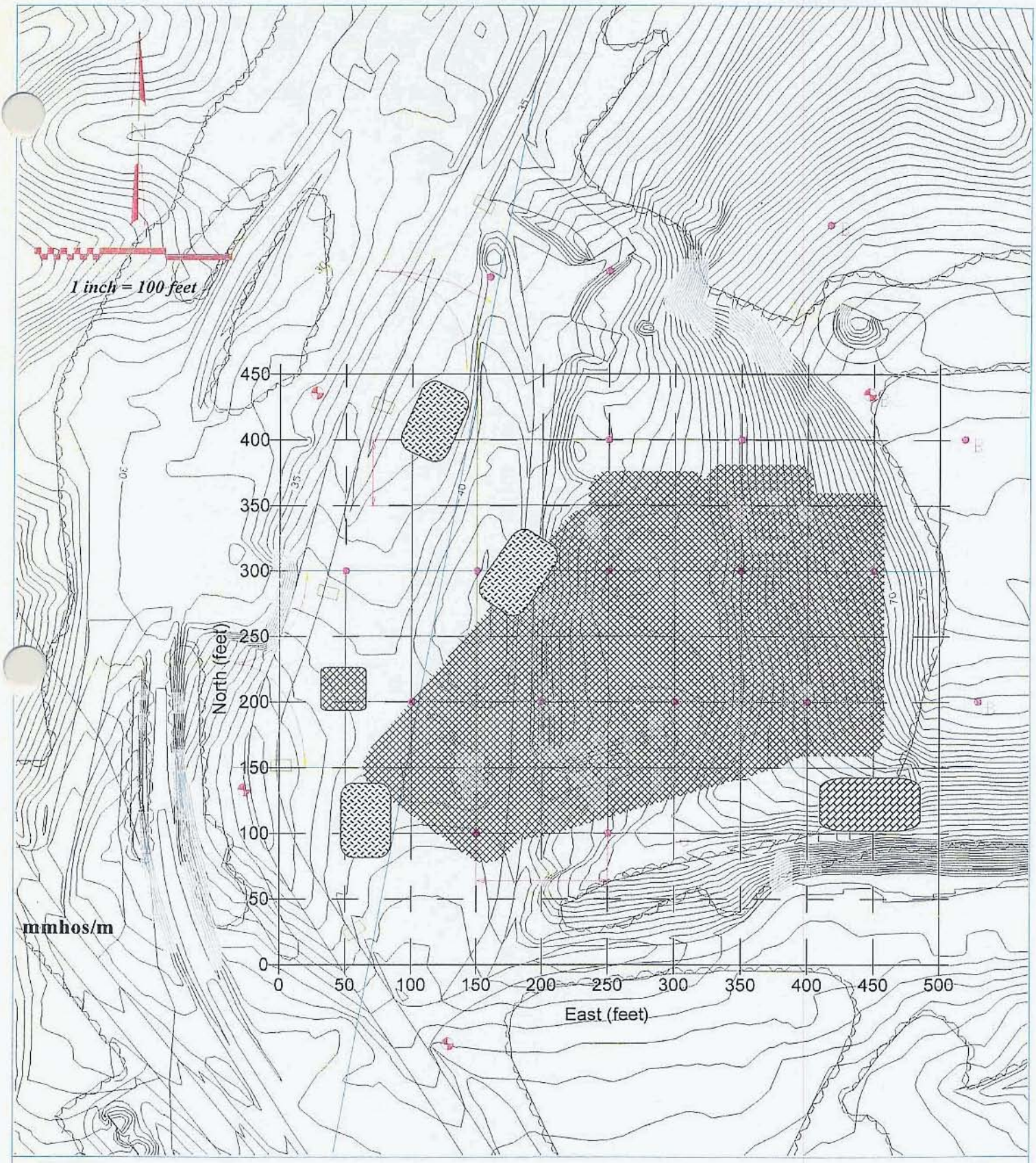
Figure 3

Average Magnetic Susceptibility Contour Map
Bronson Road Landfill - Site 21
Naval Surface Warefare Center
Indian Head, Maryland



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Legend

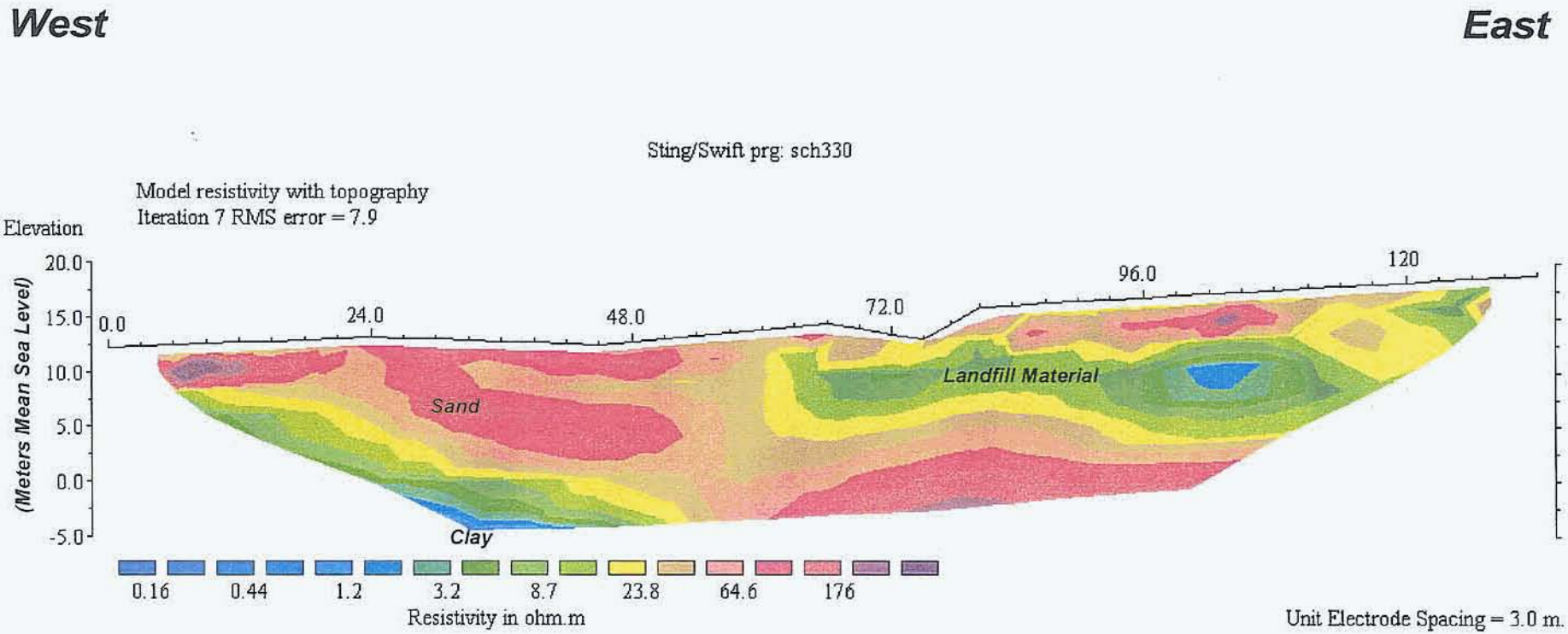
- **Surface & Buried Metal Debris**
- **Buried Metal Debris**
- **Buried Metal and Non-Metal Debris**

Figure 4

Geophysical Anomaly Map
Bronson Road Landfill - Site 21
Naval Surface Warefare Center
Indian Head, Maryland

Appendix A

ER Profiles



Horizontal scale is 21.41 pixels per unit spacing
Vertical exaggeration in model section display = 1.00
First electrode is located at 0.0 m.
Last electrode is located at 132.0 m.

Forrest Environmental Services, Inc.
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Oak Hill, Virginia 20171
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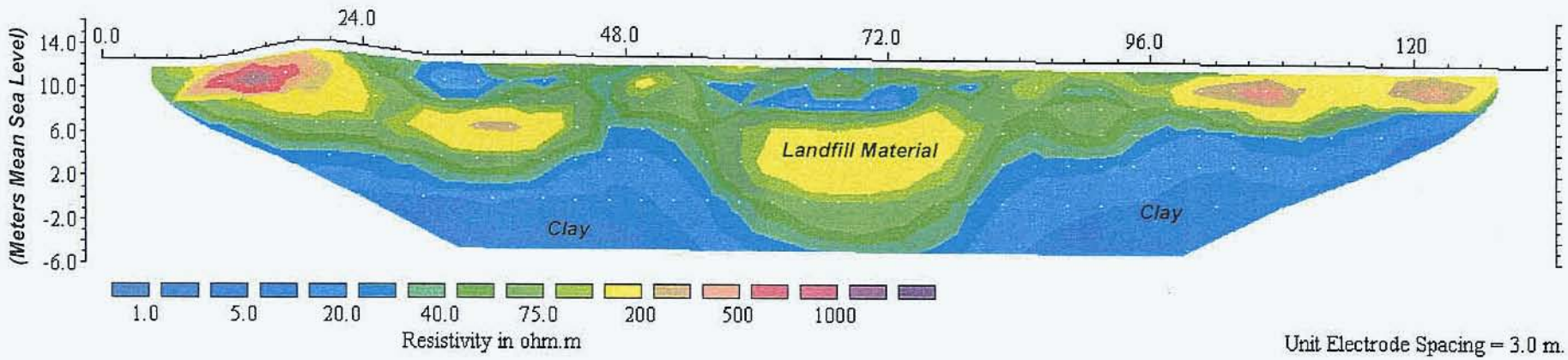
DATE: July 2000	SCALE: shown in meters	TITLE: *Electric Resistivity Line 1* *Site 21 - Bronson Road Landfill* *Naval Surface Warfare Center* *Indian Head, Maryland*
DRAWN BY:	APPROVED BY:	
JOB NO: 00141	DWG NO/REV NO: CH2BL1.SRF	CLIENT: **CH2MHill** FIGURE:

South **North**

Sting/Swift prg: sch330

Model resistivity with topography
Iteration 9 RMS error = 3.1



Unit Electrode Spacing = 3.0 m.

Horizontal scale is 21.41 pixels per unit spacing
Vertical exaggeration in model section display = 1.00
First electrode is located at 0.0 m.
Last electrode is located at 132.0 m.

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3057 Crosen Court
Oak Hill, Virginia 20171
(703) 648-9090

DATE: July 2000	SCALE: shown in meters	TITLE: *Electric Resistivity Line 2* *Site 21 - Bronson Road Landfill* *Naval Surface Warfare Center* *Indian Head, Maryland*	
DRAWN BY	APPROVED BY		
JOB NO: 00141	DWG NO / REV NO: CH2BL2.SRF	CLIENT: CH2MHill	FIGURE

TABLE 3-16

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detection	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)												
Acetone	2/3	2200	13000	7600	RN6SS0170101	Lognormal	13000	13000	NA	NA	7800000	200000000
Semivolatile Organic Compounds (ug/kg)												
Bis(2-Ethylhexyl)phthalate	1/3	640	640	640	RN6SS0170101	Lognormal	640	640	NA	NA	46	410
Pesticides/PCBs (ug/kg)												
4,4'-DDE	2/10	0.23	10	5.12	BGDSS0080101	Undefined	10	10	NA	NA	1900	17000
4,4'-DDT	2/10	0.38	9.4	4.89	BGDSS0080101	Undefined	9.4	9.4	NA	NA	1900	17000
Inorganics (mg/kg)												
Aluminum	12/12	2010	13400	7874	BGDSS0080101	Normal	9655	18329	7000 -100000	NA	78000	1000000
Arsenic	14/14	0.78	3.3	2.18	S26-MW03-001	Normal	2.56	4.25	<0.1 - 73	1.1 - 7.1	0.43	3.8
Barium	14/14	12.5	84.8	39.1	S26-MW03-001	Lognormal	55.4	144	10 - 1500	150 - 700	5500	140000
Beryllium	12/14	0.05	0.61	0.397	S26-MW03-001	Normal	0.45	0.905	<1 - 7	ND - 3	0.15	1.3
Cadmium	6/14	0.15	0.26	0.227	BGDSS0080101	Undefined	0.26	0.26	NA	<0.01 - 5.6	39	1000
Calcium	2/12	119	409	264	S26-MW03-001	Undefined	409	409	100 - 280000	NA	NA	NA
Chromium	14/14	3.5	20.8	12.0	S26-MW03-001	Normal	14.2	24.2	1 - 1000	15 - 100	390	10000
Cobalt	14/14	0.58	15	5.06	BGDSS0030101, S26-MW03-001	Lognormal	10.8	39.7	<0.3 - 70	ND - 20	4700	120000
Copper	12/14	1.8	17.3	5.15	BGDSS0080101	Lognormal	6.72	18.7	<1 - 700	5 - 70	3100	82000
Iron	12/12	2770	25300	10290	S26-MW03-001	Lognormal	15533	43170	100 - >100000	NA	23000	610000
Lead	12/14	3.5	149	20.0	BGDSS0080101	Undefined	149	149	<10 - 300	10 - 50	400[5]	1000[5]
Magnesium	12/12	143	1090	576	S26-MW03-001	Normal	729	1382	50 - 50000	NA	NA	NA
Manganese	12/12	22.7	882	197	S26-MW03-001	Lognormal	569	2248	<2 - 7000	NA	1800	47000
Mercury	12/14	0.03	0.06	0.043	RPLSS0030101	Normal	0.049	0.087	0.01 - 3.4	0.04 - 0.14	23	610
Nickel	14/14	1.7	10.5	4.9	S26-MW03-001	Lognormal	6.95	18.2	<5 - 700	ND - 30	1600	41000
Potassium	12/12	128	787	457	BGDSS0080101	Lognormal	685	1874	50 - 37000	NA	NA	NA
Selenium	11/14	0.168	0.83	0.541	BGDSS0040101	Normal	0.573	1.09	<0.1 - 3.9	<0.1 - 0.5	390	10000
Sodium	6/12	38.5	51.9	47.2	BGDSS0090101	Undefined	51.9	51.9	<500 - 50000	NA	NA	NA
Vanadium	14/14	9.83	38.7	19.2	S26-MW03-001	Lognormal	24.4	53.5	<7 - 300	20 - 150	550	14000
Zinc	14/14	6.2	30.8	18.1	S26-MW03-001	Normal	21.7	38.1	<5 - 2900	8 - 113	23000	610000
Miscellaneous (mg/kg)												
Ammonia	2/2	21.9	49.9	35.9	S26-MW03-001	Undefined	49.9	49.9	NA	NA	NA	NA
Nitrate/nitrite	1/2	1.9	1.9	1.9	S25-MW03-001	Undefined	1.9	1.9	NA	NA	130000/7800	1000000/200000
Total organic carbon	12/12	1620	14000	5953	BGDSS0080101	Lognormal	9876	30695	NA	NA	NA	NA
TPH	1/1	33.7	33.7	33.7	S26-MW03-001	Undefined	33.7	33.7	NA	10[4]	NA	NA

Notes:
1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984.
Values presented in table are surface soil values.
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991. Values presented in table are surface soil values.
3 - EPA Region III Risk-Based Concentrations, October 22, 1997.
4 - Value is presented in Maryland Department of the Environment, Title 26, Subtitle 10, Chapter 01 - Oil Pollution (COMAR 26.10.01.01).
5 - Values are presented in OSWER Directive #9355.4-12.
Bolded values represent exceedances of Region III RBCs.
NA - Not available

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TABLE 3-19

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detections	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U. S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)												
Acetone	1/3	1800	1800	1800	RPLSB0030101	Lognormal	1800	1800	NA	NA	7800000	200000000
Pesticides (ug/kg)												
4,4'-DDE	1/10	2.9	2.9	2.9	BGDSB0060101	Undefined	2.9	2.9	NA	NA	1900	17000
4,4'-DDT	1/10	2.4	2.4	2.4	BGDSB0060101	Lognormal	2.4	3.05	NA	NA	1900	17000
Inorganics (mg/kg)												
Aluminum	12/12	3070	25300	13633	BGDSB0030101	Normal	17570	34406	7000 - > 100000	NA	78000	1000000
Antimony	3/14	0.68	1.8	1.39	BGDSB0030101	Lognormal	0.97	3.6	<1 - 8.8	NA	31	820
Arsenic	13/14	1.8	10.4	4.8	BGDSB0030101	Lognormal	7.6	24.4	<0.1 - 73	1.1 -7.1	0.43	3.8
Barium	14/14	9.07	101	37.4	BGDSB0030101	Lognormal	61	191	10 - 1500	150 -700	5500	140000
Beryllium	12/14	0.12	1.1	0.433	BGDSB0030101	Lognormal	0.714	2.46	<1 - 7	ND - 3	0.15	1.3
Cadmium	5/14	0.15	0.27	0.22	BGDSB0060101-D, BGDSB0060101	Normal	0.204	0.388	NA	<0.01 - 5.6	39	1000
Calcium	2/12	50.7	134	92.4	BGDSB0100101	Lognormal	80.5	196	100 -280000	NA	NA	NA
Chromium	14/14	6.1	47.7	21.9	BGDSB0060101-D	Lognormal	34.1	101	1 - 1000	15 - 100	390	10000
Cobalt	14/14	0.79	133	12.4	BGDSB0030101	Undefined	133	133	<0.3 - 70	ND - 20	4700	120000
Copper	12/14	2.6	22.7	8.74	BGDSB0030101	Lognormal	15.8	56.5	<1 - 700	5 - 70	3100	82000
Iron	12/12	5370	61100	24192	BGDSB0040101	Lognormal	44744	151453	100 - >100000	NA	23000	610000
Lead	11/14	3.1	25.5	8.64	BGDSB0060101	Lognormal	12.8	37.5	<10 - 300	10 - 50	400[6]	1000[6]
Magnesium	12/12	215	1990	883	BGDSB0030101	Lognormal	1436	4307	50 - 50000	NA	NA	NA
Manganese	12/12	17.1	1270	157	BGDSB0030101	Undefined	1270	1270	<2 - 7000	NA	1800	47000
Mercury	11/14	0.01	0.07	0.03	RPLSB0030101	Lognormal	0.0458	0.13	0.01 - 3.4	0.04 - 0.14	23	610
Nickel	14/14	2.8	18.2	8.37	BGDSB0030101	Lognormal	8.7	22.1	<5 - 700	ND - 30	1600	41000
Potassium	12/12	250	3020	995	BGDSB0060101-D	Lognormal	1793	5998	50 - 37000	NA	NA	NA
Selenium	10/14	0.28	2.6	1.12	BGDSB0040101	Lognormal	2.29	8.93	<0.1 - 3.9	<0.1 - 0.5	390	10000
Silver	2/14	0.06	0.63	0.35	BGDSB0100101	Undefined	0.63	0.63	NA	NA	390	10000
Sodium	6/12	44.5	241	114	BGDSB0060101-D	Lognormal	209	826	<500 - 50000	NA	NA	NA
Thallium	2/14	0.53	3.1	1.82	BGDSB0040101	Undefined	3.1	3.1	NA	NA	5.5[4]	140[4]
Vanadium	14/14	9.4	61.4	30.9	BGDSB0050101	Lognormal	46.8	133	<7 - 300	20 - 150	550	14000
Zinc	14/14	7.9	70.4	21.4	BGDSB0030101	Lognormal	29.8	79.5	<5 - 2900	8 -113	23000	610000
Miscellaneous (mg/kg)												
Ammonia	2/2	7.8	9.5	8.65	S26-MW03-002	Undefined	9.5	9.5	NA	NA	NA	NA
Total organic carbon	11/12	261	3880	1485	BGDSB0060101	Normal	1910	4243	NA	NA	NA	NA
Total organic halides	1/10	55.2	55.2	55.2	BGDSB0040101	Undefined	55.2	55.2	NA	NA	NA	NA
TPH	1/1	39.1	39.1	39.1	S26-MW03-002	Undefined	39.1	39.1	NA	10[5]	NA	NA

Notes:
1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table)
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table).
3 - EPA Region III Risk-Based Concentrations, October 22, 1997
4 - Value presented is for thallic oxide
5 - Value is presented in Maryland Department of the Environment, Title 26, Subtitle 10, Chapter 01 - Oil Pollution (COMAR 26.10.01.01).
6 - Values are presented in OSWER Directive #9355.4-12.
Bolded values represent exceedances of Region III RBCs.
NA - Not available

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TABLE 3-8

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR NON-TURBID UNFILTERED GROUNDWATER SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detections	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Federal Maximum Contaminant Level[1]	Risk-Based Concentration[2]
Volatile Organic Compounds (ug/L)										
Carbon disulfide	1/2	6	6	6	RPLMW001U001	Undefined	6	6	NA	1000
Chloroform	1/2	2	2	2	RPLMW001U001	Undefined	2	2	100/80[3]	0.15
Toluene	1/2	7	7	7	RPLMW001U001	Undefined	7	7	1000	750
Semivolatile Organic Compounds (ug/L)										
Bis(2-Ethylhexyl)phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	6	4.8
Di-N-butyl phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	NA	3700
Diethyl phthalate	1/2	3	3	3	RPLMW001U001	Undefined	3	3	NA	29000
Energetics (ug/L)										
RDX	1/1	1.2	1.2	1.2	RN3MW001U001	Undefined	1.2	1.2	NA	0.61
Inorganics (ug/L)										
Aluminum	3/4	71	9620	3607	BGDMW004U001	Lognormal	9620	286545196	50-200[4]	37000
Barium	6/6	12.9	139	64	BGDMW004U001	Lognormal	139	254	2000	2600
Cadmium	1/6	2.8	2.8	2.8	BGDMW001U001	Undefined	2.8	2.8	5	18
Calcium	4/4	2340	18100	7402.5	BGDMW001U001	Lognormal	18100	599450	NA	NA
Chromium	3/6	2.5	16.4	7.7	BGDMW004U001	Lognormal	16.4	20.9	100	180
Cobalt	5/6	2.1	15.6	6.48	BGDMW004U001	Lognormal	15.6	39.6	NA	2200
Copper	2/6	4.4	22.4	13.4	BGDMW004U001	Undefined	22.4	22.4	1300[5]	1500
Iron	4/4	[illegible]	[illegible]	[illegible]	BGDMW004U001	Normal	[illegible]	57199	300[4]	11000
Magnesium	4/4	1250	3980	2157.5	BGDMW002U001	Lognormal	3980	31254	NA	NA
Manganese	4/4	104	824	354.6	BGDMW002U001	Lognormal	824	28180	50[4]	840
Mercury	1/6	0.13	0.13	0.13	RPLMW001U001	Undefined	0.13	0.13	2	11
Nickel	4/6	2.6	16.6	7.65	BGDMW004U001	Lognormal	16.6	39.0	100	730
Potassium	4/4	1340	6040	2745	BGDMW003U001	Lognormal	6040	83058	NA	NA
Sodium	4/4	3580	33000	16995	BGDMW002U001	Normal	31307	79585	NA	NA
Vanadium	1/6	20.9	20.9	20.9	BGDMW004U001	Lognormal	20.9	24.1	NA	260
Zinc	1/6	45.2	45.2	45.2	BGDMW004U001	Undefined	45.2	45.2	5000[4]	11000
Miscellaneous (mg/l)										
Chloride	4/4	4.3	40.1	19.3	BGDMW002U001	Lognormal	40.1	1863	250[4]	NA
Nitrate (ug/l)	4/4	0.05	0.40	0.158	BGDMW003U001	Lognormal	0.40	11.8	10000	58000
Sulfate	4/4	9.3	23.6	16.8	BGDMW001U001	Normal	23.6	47.0	500	NA
Total Organic Carbon	5/5	1.11	6.9	3.44	BGDMW004U001	Lognormal	6.9	45.0	NA	NA

Notes:
1 - Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, October 1996.
2 - EPA Region III Risk-Based Concentrations, October 22, 1997. Values presented are tap water values.
3 - 1994 Proposed rule for Disinfectants and Disinfection By-products, Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, October 1996.
4 - Secondary Maximum Contaminant Level (SMCL), Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, October 1996.
5 - Action Level, Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, October 1996.
Value is bolded which exceeds Region III RBCs or MCLs.
NA - Not available

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TABLE 3-12

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR FRESHWATER SEDIMENT SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detections	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils[1]	Maryland Soils[2]	Residential Risk-Based Concentration[3]	Industrial Risk-Based Concentration[3]
Pesticides/PCBs (ug/kg)												
4,4'-DDD	4/10	1.0	40	17.1	BGDSD0090101	Lognormal	29.9	118	NA	NA	2700	24000
4,4'-DDE	5/10	1.6	12	4.84	BGDSD0090101	Lognormal	6.85	26.1	NA	NA	1900	17000
4,4'-DDT	3/10	1.9	14	6.57	BGDSD0090101	Undefined	14	14	NA	NA	1900	17000
Inorganics (mg/kg)												
Aluminum	10/10	639	16600	4393	BGDSD0070101-D	Lognormal	13234	52362	7000 - 100000	NA	78000	1000000
Arsenic	9/10	0.25	10.6	3.3	BGDSD0070101	Lognormal	10.6	63	<0.1 - 73	1.1 - 7.1	0.43	3.8
Barium	10/10	5.8	175	42.0	BGDSD0070101, BGDSD0070101-D	Lognormal	145	577	10 - 1500	150 - 700	5500	140000
Beryllium	7/10	0.13	1.0	0.52	BGDSD0100101	Lognormal	1.0	10.9	<1 - 7	ND - 3	0.15	1.3
Cadmium	7/10	0.13	0.86	0.35	BGDSD0090101	Lognormal	0.57	1.85	NA	<0.01 - 5.6	39	1000
Calcium	6/10	110	10100	2917	BGDSD0090101	Lognormal	10100	88137	100 - 280000	NA	NA	NA
Chromium	10/10	3.3	29.7	11.6	BGDSD0070101-D	Lognormal	22.9	79.2	1 - 1000	15 - 100	390	10000
Cobalt	10/10	0.67	17.6	5.97	BGDSD0070101	Lognormal	17.6	118	<0.3 - 70	ND - 20	4700	120000
Copper	10/10	0.62	28.3	9.5	BGDSD0070101-D	Lognormal	28.3	297	<1 - 700	5 - 70	3100	82000
Iron	10/10	1760	42900	13202	BGDSD0070101	Lognormal	42900	193218	100 - >100000	NA	23000	610000
Lead	10/10	1.8	79.3	23.1	BGDSD0080101	Lognormal	79.3	476	<10 - 300	10 - 50	400[4]	1000[4]
Magnesium	10/10	96.7	3030	914	BGDSD0090101	Lognormal	3030	19043	50 - 50000	NA	NA	NA
Manganese	10/10	11.2	444	162	BGDSD0090101	Lognormal	444	2561	<2 - 7000	NA	1800	47000
Mercury	10/10	0.01	0.25	0.07	BGDSD0070101	Lognormal	0.196	0.778	0.01 - 3.4	0.04 - 0.14	23	610
Nickel	8/10	0.54	25.2	9.2	BGDSD0010101	Lognormal	25.2	362	<5 - 700	ND - 30	1600	41000
Potassium	10/10	95.2	2050	567	BGDSD0020101	Lognormal	1328	5061	50 - 37000	NA	NA	NA
Selenium	7/10	0.45	2.3	0.93	BGDSD0070101	Lognormal	1.73	6.45	<0.1 - 3.9	<0.1 - 0.5	390	10000
Silver	2/10	0.31	0.92	0.62	BGDSD0090101	Undefined	0.92	0.92	NA	NA	390	10000
Sodium	8/10	30.2	303	85.7	BGDSD0090101	Lognormal	144	472	<500 - 50000	NA	NA	NA
Vanadium	10/10	3.2	46.3	18.6	BGDSD0100101	Lognormal	46.3	196	<7 - 300	20 - 150	550	14000
Zinc	9/10	4.4	158	41.2	BGDSD0070101-D	Lognormal	158	1660	<5 - 2900	8 - 113	23000	610000
Miscellaneous (mg/kg)												
Total organic carbon	10/10	444	43500	10052	BGDSD0070101-D	Lognormal	43500	395297	NA	NA	NA	NA

Notes:
1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984. Values presented in table are surface soil values.
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991. Values presented in table are surface soil values.
3 - EPA Region III Risk-Based Concentrations, October 22, 1997.
4 - Values are presented in OSWER Directive #9355.4-12
Bolded values are exceedances of Region III RBCs
NA - Not available

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Table F-1

Inorganic Statistics - Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL	Site-Specific Background Maximum Concentration
Surface Soil Area A	Aluminum	28/28	25,600	9,855	12,900
	Antimony	16/28	18.9	ND	ND
	Arsenic	28/28	42.7	2.56	7.1
	Barium	28/28	367	55.4	68.6
	Beryllium	2/28	0.11	0.45	0.5
	Cadmium	25/28	147	0.26	0.25
	Calcium	26/28	184,000	409	682
	Chromium	28/28	156	14.2	16.1
	Cobalt	26/28	28.2	10.8	13
	Copper	28/28	4,960	6.72	11.6
	Cyanide	11/28	0.52	ND	0.66
	Iron	28/28	263,000	15,533	24,400
	Lead	28/28	132,000	149	29.4
	Magnesium	28/28	11,500	729	837
	Manganese	28/28	1,330	569	792
	Mercury	24/28	42	0.049	0.11
	Nickel	27/28	189	6.95	18.6
	Potassium	28/28	1,290	685	721
	Selenium	0/28	ND	0.573	1.2
	Silver	20/28	62.5	ND	0.84
	Sodium	8/28	2,120	51.9	120
	Thallium	4/28	5.5	ND	1.4
	Vanadium	28/28	60.2	24.4	26.7
	Zinc	28/28	10,000	21.7	33.6
Surface Soil Area B	Aluminum	11/11	23,400	9,855	12,900
	Antimony	7/11	9.5	ND	ND
	Arsenic	10/11	25.5	2.56	7.1
	Barium	11/11	127	55.4	68.6
	Beryllium	11/11	0.61	0.45	0.5
	Cadmium	9/11	20.4	0.26	0.25
	Calcium	11/11	8,130	409	682
	Chromium	11/11	151	14.2	16.1
	Cobalt	11/11	15.5	10.8	13
	Copper	11/11	1,380	6.72	11.6
	Cyanide	0/11	ND	ND	0.66
	Iron	11/11	130,000	15,533	24,400
	Lead	11/11	1,240	149	29.4
	Magnesium	11/11	1,800	729	837
	Manganese	11/11	733	569	792
	Mercury	6/11	0.41	0.049	0.11
	Nickel	11/11	77.7	6.95	18.6
	Potassium	11/11	795	685	721
	Selenium	11/11	5.7	0.573	1.2
	Silver	8/11	10.4	ND	0.84
	Sodium	11/11	3,430	51.9	120
	Thallium	1/11	5.2	ND	1.4
	Vanadium	11/11	30.2	24.4	26.7
	Zinc	11/11	1,990	21.7	33.6

Note: ND = Not detected
= Exceeds 95% UCL

Table F-1

Inorganic Statistics - Site 11
Sites 11, 13, 17, 21, and 25 RI Report
IHDIV-NSWC
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL	Site-Specific Background Maximum Concentration
Subsurface Soil Area A	Aluminum	3/3	10,500	17,570	17,900
	Antimony	0/3	ND	0.97	ND
	Arsenic	3/3	3.6	7.6	6.8
	Barium	3/3	85	61	65.5
	Beryllium	0/3	ND	0.714	0.39
	Cadmium	2/3	0.77	0.204	0.14
	Calcium	2/3	1,780	80.5	170
	Chromium	3/3	20	34.1	19.3
	Cobalt	3/3	14	133	5.5
	Copper	3/3	57	15.8	8.6
	Cyanide	0/3	ND	ND	0.68
	Iron	3/3	25,500	44,744	36,800
	Lead	3/3	58.1	12.8	13.7
	Magnesium	3/3	2,980	1,436	819
	Manganese	3/3	346	1,270	120
	Mercury	1/3	0.078	0.0458	0.18
	Nickel	3/3	23.5	8.7	8.1
	Potassium	2/3	617	1,793	653
	Selenium	0/3	ND	2.29	1.2
	Silver	1/3	3.2	0.63	0.85
	Sodium	0/3	ND	209	120
	Thallium	0/3	ND	3.1	1.4
	Vanadium	3/3	23.7	46.8	31.7
	Zinc	3/3	126	29.8	27.7
Subsurface Soil Area B	Aluminum	9/9	14,800	17,570	17,900
	Antimony	5/9	4.4	0.97	ND
	Arsenic	9/9	21.1	7.6	6.8
	Barium	9/9	127	61	65.5
	Beryllium	9/9	0.83	0.714	0.39
	Cadmium	7/9	8.3	0.204	0.14
	Calcium	9/9	35,600	80.5	170
	Chromium	9/9	41.5	34.1	19.3
	Cobalt	9/9	11	133	5.5
	Copper	9/9	690	15.8	8.6
	Cyanide	0/9	ND	ND	0.68
	Iron	9/9	27,300	44,744	36,800
	Lead	9/9	742	12.8	13.7
	Magnesium	9/9	2,390	1,436	819
	Manganese	9/9	368	1,270	120
	Mercury	7/9	0.36	0.0458	0.18
	Nickel	9/9	29	8.7	8.1
	Potassium	9/9	650	1,793	653
	Selenium	9/9	2.1	2.29	1.2
	Silver	7/9	9.2	0.63	0.85
	Sodium	9/9	1,870	209	120
	Thallium	0/9	ND	3.1	1.4
	Vanadium	9/9	38.3	46.8	31.7
	Zinc	9/9	1,120	29.8	27.7

Note: ND = Not detected
= Exceeds 95% UCL

Table F-1

Inorganic Statistics - Site 11
Sites 11, 13, 17, 21, and 25 RI Report
IHDIV-NSWC
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL
Groundwater Area A	Aluminum	4/5	31,400	9,620
	Antimony	2/5	4.2	ND
	Arsenic	3/5	8.2	ND
	Barium	5/5	1,680	139
	Beryllium	1/5	1.1	ND
	Cadmium	1/5	0.71	2.8
	Calcium	5/5	85,400	18,100
	Chromium	5/5	59.6	16.4
	Cobalt	4/5	59.7	15.6
	Copper	5/5	33.9	22.4
	Cyanide	1/5	10.1	ND
	Iron	5/5	51,000	19,900
	Lead	5/5	78.6	ND
	Magnesium	5/5	35,600	3,980
	Manganese	5/5	2,570	824
	Mercury	2/5	0.1	0.13
	Nickel	5/5	110	16.6
	Potassium	5/5	41,200	6,040
	Selenium	0/0	ND	ND
	Silver	2/5	6.1	ND
	Sodium	5/5	98,400	31,307
	Thallium	0/0	ND	ND
	Vanadium	4/5	55.4	20.9
	Zinc	5/5	217	45.2
Groundwater Area B	Aluminum	3/3	1,350	9,620
	Antimony	2/3	2.9	ND
	Arsenic	1/3	2.9	ND
	Barium	3/3	178	139
	Beryllium	3/3	0.64	ND
	Cadmium	0/3	ND	2.8
	Calcium	3/3	54,100	18,100
	Chromium	3/3	7.9	16.4
	Cobalt	0/3	ND	15.6
	Copper	3/3	7.3	22.4
	Cyanide	0/3	ND	ND
	Iron	3/3	44,700	19,900
	Lead	3/3	32.8	ND
	Magnesium	3/3	27,000	3,980
	Manganese	3/3	3,020	824
	Mercury	0/3	ND	0.13
	Nickel	3/3	6.4	16.6
	Potassium	3/3	6,300	6,040
	Selenium	2/3	2.9	ND
	Silver	1/3	0.68	ND
	Sodium	3/3	71,100	31,307
	Thallium	0/3	ND	ND
	Vanadium	3/3	3.6	20.9
	Zinc	3/3	39.9	45.2

Note: ND = Not detected
= Exceeds 95% UCL

Table F-1

Inorganic Statistics - Site 11
Sites 11, 13, 17, 21, and 25 RI Report
IHDIV-NSWC
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL
Sediment Area A	Aluminum	7/7	11,100	13,234
	Antimony	5/7	63.9	ND
	Arsenic	7/7	24.5	10.6
	Barium	7/7	169	145
	Beryllium	0/7	ND	1
	Cadmium	7/7	6.5	0.57
	Calcium	7/7	22,100	10,100
	Chromium	7/7	69.7	22.9
	Cobalt	6/7	16.8	17.6
	Copper	7/7	757	28.3
	Cyanide	1/7	0.12	ND
	Iron	7/7	134,000	42,900
	Lead	7/7	76,400	79.3
	Magnesium	7/7	3,190	3,030
	Manganese	7/7	940	444
	Mercury	7/7	0.53	0.196
	Nickel	7/7	46.4	25.2
	Potassium	7/7	1,070	1,328
	Selenium	1/7	1.7	1.73
	Silver	6/7	10.9	0.92
	Sodium	0/7	ND	144
	Thallium	2/7	4.2	ND
	Vanadium	7/7	43.4	46.3
	Zinc	7/7	1,910	158
Sediment Area B	Aluminum	1/1	11,300	13,234
	Antimony	1/1	3.1	ND
	Arsenic	1/1	10.3	10.6
	Barium	1/1	34.3	145
	Beryllium	1/1	0.28	1
	Cadmium	1/1	4	0.57
	Calcium	1/1	778	10,100
	Chromium	1/1	77	22.9
	Cobalt	1/1	5.8	17.6
	Copper	1/1	342	28.3
	Cyanide	0/1	ND	ND
	Iron	1/1	51,600	42,900
	Lead	1/1	335	79.3
	Magnesium	1/1	929	3,030
	Manganese	1/1	378	444
	Mercury	1/1	0.11	0.196
	Nickel	1/1	26.1	25.2
	Potassium	1/1	380	1,328
	Selenium	1/1	2.9	1.73
	Silver	1/1	3.2	0.92
	Sodium	1/1	1,750	144
	Thallium	0/1	ND	ND
	Vanadium	1/1	15	46.3
	Zinc	1/1	514	158

Note: ND = Not detected
= Exceeds 95% UCL

Table F-1

Inorganic Statistics - Site 11
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL	Site-Specific Background Maximum Concentration
Waste	Aluminum	2/2	24,100	17,570	17,900
	Antimony	1/2	13.6	0.97	ND
	Arsenic	2/2	17.1	7.6	6.8
	Barium	2/2	147	61	65.5
	Beryllium	1/2	0.044	0.714	0.39
	Cadmium	2/2	139	0.204	0.14
	Calcium	2/2	10,400	80.5	170
	Chromium	2/2	212	34.1	19.3
	Cobalt	2/2	17.2	133	5.5
	Copper	2/2	1,270	15.8	8.6
	Cyanide	2/2	0.56	ND	0.68
	Iron	2/2	76,000	44,744	36,800
	Lead	2/2	4,200	12.8	13.7
	Magnesium	2/2	4,800	1,436	819
	Manganese	2/2	500	1,270	120
	Mercury	2/2	45.9	0.0458	0.18
	Nickel	2/2	107	8.7	8.1
	Potassium	2/2	803	1,793	653
	Selenium	1/2	1.9	2.29	1.2
	Silver	2/2	23.8	0.63	0.85
	Sodium	2/2	847	209	120
	Thallium	2/2	1.2	3.1	1.4
	Vanadium	2/2	73.5	46.8	31.7
	Zinc	2/2	4,110	29.8	27.7

Note: ND = Not detected
= Exceeds 95% UCL

Table F-2

Inorganic Statistics - Site 13
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL	Site-Specific Background Maximum Concentration
Surface Soil	Aluminum	9/9	9,170	9,855	6,370
	Antimony	0/9	ND	ND	ND
	Arsenic	9/9	11	2.56	5.1
	Barium	9/9	105	55.4	29.3
	Beryllium	0/9	ND	0.45	ND
	Cadmium	6/9	1.3	0.26	ND
	Calcium	9/9	4,660	409	2,420
	Chromium	9/9	29.8	14.2	28.9
	Cobalt	9/9	14.7	10.8	2.6
	Copper	9/9	17.4	6.72	4.1
	Cyanide	0/9	ND	ND	ND
	Iron	9/9	16,800	15,533	20,800
	Lead	9/9	211	149	9.6
	Magnesium	9/9	2,550	729	1,990
	Manganese	9/9	600	569	95.1
	Mercury	8/9	0.58	0.049	ND
	Nickel	9/9	34.2	6.95	3.4
	Potassium	9/9	389	685	2,620
	Selenium	1/9	1.4	0.573	ND
	Silver	0/9	ND	ND	ND
	Sodium	0/9	ND	51.9	ND
	Thallium	0/9	ND	ND	ND
	Vanadium	9/9	34.6	24.4	20.4
	Zinc	9/9	444	21.7	28.3
Subsurface Soil	Aluminum	5/5	5,820	17,570	
	Antimony	0/5	ND	0.97	
	Arsenic	4/5	13	7.6	
	Barium	5/5	26	61	
	Beryllium	0/5	ND	0.714	
	Cadmium	1/5	0.2	0.204	
	Calcium	1/5	74.9	80.5	
	Chromium	5/5	32.1	34.1	
	Cobalt	5/5	5.3	133	
	Copper	5/5	8.8	15.8	
	Cyanide	0/5	ND	ND	
	Iron	5/5	31,400	44,744	
	Lead	5/5	7.1	12.8	
	Magnesium	5/5	362	1,436	
	Manganese	5/5	96.2	1,270	
	Mercury	0/5	ND	0.0458	
	Nickel	5/5	6.5	8.7	
	Potassium	5/5	468	1,793	
	Selenium	0/5	ND	2.29	
	Silver	0/5	ND	0.63	
	Sodium	0/5	ND	209	
	Thallium	0/5	ND	3.1	
	Vanadium	5/5	18.8	46.8	
	Zinc	5/5	25.1	29.8	

Note: ND = Not detected
= Exceeds 95% UCL

Table F-3

Inorganic Statistics - Site 17
Sites 11, 13, 17, 21, and 25
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL
Surface Soil	Aluminum	15/15	10,500	9,855
	Antimony	2/15	1.5	ND
	Arsenic	14/15	13.6	2.56
	Barium	15/15	116	55.4
	Beryllium	5/15	0.5	0.45
	Cadmium	9/15	6.9	0.26
	Calcium	15/15	4,490	409
	Chromium	15/15	32.9	14.2
	Cobalt	15/15	29	10.8
	Copper	15/15	90.7	6.72
	Cyanide	3/15	0.64	ND
	Iron	15/15	224,000	15,533
	Lead	15/15	602	149
	Magnesium	15/15	1,540	729
	Manganese	15/15	752	569
	Mercury	6/15	0.41	0.049
	Nickel	15/15	32.8	6.95
	Potassium	15/15	1,200	685
	Selenium	2/15	1.6	0.573
	Silver	3/15	0.81	ND
	Sodium	8/15	600	51.9
	Thallium	2/15	1.4	ND
	Vanadium	15/15	29.4	24.4
	Zinc	15/15	1,140	21.7
Subsurface Soil	Aluminum	15/15	9,760	17,570
	Antimony	0/15	ND	0.97
	Arsenic	15/15	7.6	7.6
	Barium	15/15	105	61
	Beryllium	4/15	0.75	0.714
	Cadmium	10/15	1.5	0.204
	Calcium	13/15	2,350	80.5
	Chromium	15/15	15.9	34.1
	Cobalt	15/15	17.3	133
	Copper	15/15	519	15.8
	Cyanide	3/15	0.66	ND
	Iron	15/15	37,700	44,744
	Lead	15/15	99.4	12.8
	Magnesium	15/15	1,580	1,436
	Manganese	15/15	222	1,270
	Mercury	5/15	1.1	0.0458
	Nickel	15/15	13.8	8.7
	Potassium	14/15	830	1,793
	Selenium	2/15	1.4	2.29
	Silver	3/15	0.85	0.63
	Sodium	5/15	464	209
	Thallium	3/15	1.5	3.1
	Vanadium	15/15	32.3	46.8
	Zinc	15/15	114	29.8

Note: ND = Not detected
= Exceeds 95% UCL

Table F-3

Inorganic Statistics - Site 17
Sites 11, 13, 17, 21, and 25
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL
Groundwater	Aluminum	3/3	31,500	9,620
	Antimony	1/3	3.6	ND
	Arsenic	1/3	4	ND
	Barium	3/3	202	139
	Beryllium	1/3	0.18	ND
	Cadmium	1/3	0.3	2.8
	Calcium	3/3	37,800	18,100
	Chromium	3/3	86.9	16.4
	Cobalt	5/3	32.7	15.6
	Copper	3/3	39.7	22.4
	Cyanide	1/3	0.1	ND
	Iron	3/3	71,000	19,900
	Lead	2/3	13.9	ND
	Magnesium	3/3	15,700	3,980
	Manganese	3/3	2,620	824
	Mercury	0/3	ND	0.13
	Nickel	3/3	73.4	16.6
	Potassium	3/3	7,720	6,040
	Selenium	1/3	4.3	ND
	Silver	0/3	ND	ND
	Sodium	3/3	46,400	31,307
	Thallium	0/3	ND	ND
	Vanadium	3/3	49	20.9
	Zinc	1/3	128	45.2
Sediment	Aluminum	6/6	13,100	13,234
	Antimony	3/6	3.5	ND
	Arsenic	6/6	32.7	10.6
	Barium	6/6	95	145
	Beryllium	4/6	0.39	1
	Cadmium	4/6	18.7	0.57
	Calcium	5/6	3,350	10,100
	Chromium	6/6	43.4	22.9
	Cobalt	6/6	12.2	17.6
	Copper	6/6	483	28.3
	Cyanide	0/6	ND	ND
	Iron	6/6	118,000	42,900
	Lead	6/6	1,140	79.3
	Magnesium	6/6	1,550	3,030
	Manganese	6/6	763	444
	Mercury	4/6	0.34	0.196
	Nickel	5/6	39.4	25.2
	Potassium	6/6	796	1,328
	Selenium	0/6	ND	1.73
	Silver	2/6	8.3	0.92
	Sodium	3/6	604	144
	Thallium	0/6	ND	ND
	Vanadium	6/6	33.6	46.3
	Zinc	6/6	939	158

Note: ND = Not detected
= Exceeds 95% UCL

Table F-4

Inorganic Statistics - Site 21
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Base-Wide Background 95% UCL	Site-Specific Background Maximum Concentration
Surface Soil	Aluminum	17/17	9,830	9,855	10,100
	Antimony	0/17	ND	ND	ND
	Arsenic	17/17	51.8	2.56	7.7
	Barium	17/17	67.6	55.4	45.3
	Beryllium	1/17	0.066	0.45	ND
	Cadmium	11/17	1.5	0.26	0.16
	Calcium	17/17	4,870	409	609
	Chromium	17/17	36.6	14.2	19.6
	Cobalt	17/17	7.9	10.8	4.7
	Copper	17/17	48	6.72	9.7
	Cyanide	12/17	0.66	ND	0.73
	Iron	17/17	29,500	15,533	22,200
	Lead	17/17	57	149	25.7
	Magnesium	17/17	1,630	729	582
	Manganese	17/17	398	569	397
	Mercury	14/17	1.5	0.049	0.12
	Nickel	17/17	19.2	6.95	7
	Potassium	17/17	720	685	636
	Selenium	3/17	2.7	0.573	ND
	Silver	1/17	16.5	ND	ND
	Sodium	5/17	271	51.9	ND
	Thallium	0/17	ND	ND	ND
	Vanadium	17/17	65.1	24.4	36.4
	Zinc	17/17	134	21.7	22.9
Groundwater	Aluminum	4/4	5,180	9,620	
	Antimony	0/4	ND	ND	
	Arsenic	1/4	3.6	ND	
	Barium	4/4	108	139	
	Beryllium	0/4	ND	ND	
	Cadmium	2/4	0.76	2.8	
	Calcium	4/4	29,700	18,100	
	Chromium	3/4	103	16.4	
	Cobalt	4/4	161	15.6	
	Copper	4/4	47.5	22.4	
	Cyanide	2/4	1.7	ND	
	Iron	4/4	24,200	19,900	
	Lead	3/4	6.7	ND	
	Magnesium	4/4	31,300	3,980	
	Manganese	4/4	23,100	824	
	Mercury	2/4	0.12	0.13	
	Nickel	3/4	85.7	16.6	
	Potassium	4/4	4,400	6,040	
	Selenium	0/4	ND	ND	
	Silver	1/4	1.3	ND	
	Sodium	4/4	74,900	31,307	
	Thallium	0/4	ND	ND	
	Vanadium	3/4	12.5	20.9	
	Zinc	4/4	164	45.2	

Note: ND = Not detected
= Exceeds 95% UCL

Table F-4

Inorganic Statistics - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Frequency of Detection	Maximum Concentration (mg/kg)	Base-Wide Background 95% UCL	Site-Specific Background Maximum Concentration
Surface Soil	Aluminum	20/20	13,600	9000	9,030
	Antimony	2/20	2.1	ND	ND
	Arsenic	20/20	23.8	5.2	6.5
	Barium	20/20	111	47.6	42.2
	Beryllium	0/20	ND	1.1	ND
	Cadmium	20/20	47.2	2.5	2.5
	Calcium	14/20	3,410	573	270
	Chromium	20/20	124	15.9	17.4
	Cobalt	20/20	13.2	7.5	5
	Copper	19/20	108	8.0	10.2
	Cyanide	1/20	0.22	0.73	ND
	Iron	20/20	24,400	16,000	15,900
	Lead	20/20	174	21.7	35
	Magnesium	17/20	6,680	722	634
	Manganese	20/20	971	388	619
	Mercury	16/20	0.39	0.06	0.083
	Nickel	20/20	120	6.6	5.1
	Potassium	20/20	748	597	420
	Selenium	5/19	2.3	0.62	ND
	Silver	9/19	201	0.84	ND
	Sodium	0/20	ND	120	ND
	Thallium	1/19	1.9	2.3	ND
	Vanadium	20/20	72.8	26.7	29.5
	Zinc	10/20	529	23.6	26.8
Subsurface Soil	Aluminum	6/6	15,000	17,570	
	Antimony	5/6	1.4	0.97	
	Arsenic	6/6	7.6	7.6	
	Barium	6/6	37.2	61	
	Beryllium	0/6	ND	0.714	
	Cadmium	6/6	0.32	0.204	
	Calcium	1/6	333	80.5	
	Chromium	6/6	22.6	34.1	
	Cobalt	6/6	3.2	133	
	Copper	6/6	13.6	15.8	
	Cyanide	0/6	ND	ND	
	Iron	6/6	30,100	44,744	
	Lead	6/6	11.9	12.8	
	Magnesium	6/6	531	1,436	
	Manganese	6/6	103	1,270	
	Mercury	2/6	0.1	0.0458	
	Nickel	6/6	7.4	8.7	
	Potassium	4/6	677	1,793	
	Selenium	6/6	2.1	2.29	
	Silver	2/6	18.3	0.63	
	Sodium	0/6	ND	209	
	Thallium	0/6	ND	3.1	
	Vanadium	6/6	43.3	46.8	
	Zinc	6/6	34.4	29.8	

ND = Not Detected
= Exceeds 95% UCL

Table F-4

Inorganic Statistics - Site 25
Sites 11, 13, 17, 21, and 25 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Frequency of Detection	Maximum Concentration (mg/kg)	Base-Wide Background 95% UCL
Groundwater				
10/24/2000	Aluminum	1/2	292	9,620
	Antimony	0/2	ND	ND
	Arsenic	0/2	ND	ND
	Barium	2/2	352	139
	Beryllium	1/2	2.4	ND
	Cadmium	0/2	ND	2.8
	Calcium	2/2	11,300	18,100
	Chromium	0/2	ND	16.4
	Cobalt	2/2	64.7	15.6
	Copper	1/2	4	22.4
	Cyanide	0/2	ND	ND
	Iron	2/2	1,160	19,900
	Lead	0/2	ND	ND
	Magnesium	2/2	11,400	3,980
	Manganese	2/2	2,040	824
	Mercury	0/2	ND	0
	Nickel	2/2	29	17
	Potassium	2/2	5,540	6,040
	Selenium	0/2	ND	ND
	Silver	0/2	ND	ND
	Sodium	2/2	120,000	31,307
	Thallium	0/2	ND	ND
	Vanadium	1/2	0.94	20.9
	Zinc	1/2	77.7	45.2
Groundwater				
2/26/2002	Aluminum	0/2	ND	9,620
	Antimony	0/2	ND	ND
	Arsenic	0/2	ND	ND
	Barium	2/2	243	139
	Beryllium	1/2	1.8	ND
	Cadmium	0/2	ND	2.8
	Calcium	2/2	7,790	18,100
	Chromium	0/2	ND	16.4
	Cobalt	2/2	44.4	15.6
	Copper	0/2	ND	22.4
	Cyanide	0/2	ND	ND
	Iron	2/2	1,030	19,900
	Lead	0/2	ND	ND
	Magnesium	2/2	7,510	3,980
	Manganese	2/2	1,470	824
	Mercury	0/2	ND	0
	Nickel	1/2	17	16.6
	Potassium	2/2	5,060	6,040
	Selenium	0/2	ND	ND
	Silver	0/2	ND	ND
	Sodium	2/2	84,900	31,307
	Thallium	0/2	ND	ND
	Vanadium	0/2	ND	20.9
	Zinc	2/2	47.7	45.2

ND = Not Detected
= Exceeds 95% UCL

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 11, NDWIH

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Site 11 Surface Soil	Trespasser/Visitor	Adolescent	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
					Adult	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Site workers may be exposed to surface soil during maintenance activities, site inspections, or daily duties.
						Ingestion	On-site	Quant	Site workers may be exposed to surface soil during maintenance activities, site inspections, or daily duties.
		Air	Emissions from Site 11 Soil	Trespasser/Visitor	Adolescent	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale emissions from soil.
					Adult	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale emissions from soil.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Site workers may inhale vapors or fugitive dust from soil during maintenance activities, site inspections, or daily duties.
Current/Future	Surface Water	Surface Water	Mattawoman and Unnamed Creeks	Recreational User	Adult	Dermal Absorption	On-site	Quant	Recreational users may contact surface water.
						Ingestion	On-site	Quant	Recreational users may contact surface water.
					Child	Dermal Absorption	On-site	Quant	Recreational users may contact surface water.
						Ingestion	On-site	Quant	Recreational users may contact surface water.
	Sediment	Sediment	Mattawoman and Unnamed Creeks	Recreational User	Adult	Dermal Absorption	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
						Ingestion	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
					Child	Dermal Absorption	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
						Ingestion	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
		Animal Tissues	Fish	Fisher	Adult	Ingestion	On-site/Off-site	Qual	Fish tissue samples not collected for Site 11. Ingestion of fish caught in Mattawoman Creek and the unnamed creek was not quantatatively evaluated in the risk assessment.
					Child	Ingestion	On-site/Off-site	Qual	Fish tissue samples not collected for Site 11. Ingestion of fish caught in Mattawoman Creek and the unnamed creek was not quantatatively evaluated in the risk assessment.
Future	Groundwater	Groundwater	Shallow Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child/Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
			Shallow Aquifer - Water	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers may contact groundwater while performing construction or excavation activities.
						Ingestion	On-site	None	Incidental ingestion of groundwater by construction workers would be minimal during construction or excavation activities.
		Air	Shallow Aquifer - Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Inhalation	On-site	None	Children are assumed not to shower.
					Child/Adult	Inhalation	On-site	None	Adult will be used to evaluate child/adult since children are assumed not to shower.
			Shallow Aquifer - Volatilization	Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors from groundwater while performing construction or excavation activities.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 11, NDWIH

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil*	Soil	Site 11 Soil	Resident	Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction worker may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Construction worker may be exposed to surface and subsurface soil during excavation activities.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Site workers may be exposed to surface and subsurface soil during maintenance activities, site inspections, or daily duties.
						Ingestion	On-site	Quant	Site workers may be exposed to surface and subsurface soil during maintenance activities, site inspections, or daily duties.
				Trespasser/Visitor	Adolescent	Dermal Absorption	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
					Adult	Dermal Absorption	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
		Air	Emissions from Site 11 Soil	Resident	Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors or fugitive dust from soil during excavation activities.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Site workers may be exposed to vapors or fugitive dust from Site 11 soils during maintenance activities, site inspections, or daily duties.
				Trespasser/Visitor	Adolescent	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors or fugitive dust from Site 11 soils.
					Adult	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors or fugitive dust from Site 11 soils.

* Surface and subsurface soil

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
67-64-1	Acetone	0.0031	J	0.065	J	MG/KG	IS11SS340001	5/39	0.011 - 0.064	0.065	N/A	7,000 N	0.25	SSL	NO	BSL
74-83-9	Bromomethane	0.002	J	0.002	J	MG/KG	IS11SS500001 IS11SS510001	4/39	0.011 - 0.064	0.002	N/A	11 N	0.0041	SSL	NO	BSL
74-87-3	Chloromethane	6.00E-04	J	7.00E-04	J	MG/KG	IS11SS500001	2/39	0.011 - 0.064	0.0007	N/A	N/A	0.001	SSL	NO	NTX
110-82-7	Cyclohexane	8.00E-04	J	8.00E-04	J	MG/KG	IS11SS510001	1/39	0.011 - 0.064	0.0008	N/A	N/A	N/A		NO	NTX
79-20-9	Methyl acetate	0.0015		0.024	J	MG/KG	IS11SS180001	11/39	0.011 - 0.064	0.024	N/A	7,821 N	2.5	SSL	NO	BSL
75-09-2	Methylene chloride	8.00E-04	J	0.002	J	MG/KG	IS11SS430001 IS11SS440001P	5/39	0.011 - 0.064	0.002	N/A	85.2 C	0.0019	SSL	NO	BSL
100-42-5	Styrene	0.023	J	0.032	J	MG/KG	IS11SS170001	2/39	0.011 - 0.064	0.032	N/A	1,564 N	5.7	SSL	NO	BSL
108-88-3	Toluene	0.0016		0.0016		MG/KG	IS11SS280001	1/39	0.011 - 0.064	0.0016	N/A	1,564 N	0.879	SSL	NO	BSL
79-01-6	Trichloroethene	0.0016	J	0.0096	J	MG/KG	IS11SS330001P	3/39	0.011 - 0.064	0.0096	N/A	C	0.015	SSL	NO	BSL
10061-01-5	cis-1,3-Dichloropropene	0.018	UJ	0.018	UJ	MG/KG	IS11SS250001 IS11SS350001	1/39	0.011 - 0.064	0.018	N/A	6.39 C	0.003	SSL	NO	BSL
10061-02-6	trans-1,3-Dichloropropene	0.018	UJ	0.018	UJ	MG/KG	IS11SS250001 IS11SS350001	1/39	0.011 - 0.064	0.018	N/A	6.39 C	0.003	SSL	NO	BSL
91-57-6	2-Methylnaphthalene	0.014	J	0.13	J	MG/KG	IS11SS310001	5/39	0.37 - 1.2	0.13	N/A	156 N	2.2	SSL	NO	BSL
99-99-0	4-Nitrotoluene	0.12	J	0.25		MG/KG	IS11SS140001	2/13	0.25 - 0.25	0.25	N/A	78.2 N	N/A		NO	BSL
83-32-9	Acenaphthene	0.02	J	0.25	J	MG/KG	IS11SS310001	7/39	0.37 - 1.2	0.25	N/A	469 N	10	SSL	NO	BSL
208-96-8	Acenaphthylene	0.011	J	0.068	J	MG/KG	IS11SS450001	5/39	0.37 - 1.2	0.068	N/A	156 N	N/A		NO	BSL
98-86-2	Acetophenone	0.057	J	0.76		MG/KG	IS11SS140001	15/39	0.37 - 1.2	0.76	N/A	782 N	0.0000218	SSL	NO	BSL
120-12-7	Anthracene	0.011	J	0.66	J	MG/KG	IS11SS100001	17/39	0.37 - 1.2	0.66	N/A	2,346 N	47	SSL	NO	BSL
100-52-7	Benzaldehyde	0.009	J	0.37	J	MG/KG	IS11SS210001	21/39	0.37 - 1.2	0.37	N/A	782 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	0.054	J	3.3		MG/KG	IS11SS100001	27/39	0.37 - 1.2	3.3	N/A	0.875 C	1.46	SSL	YES	ASL
50-32-8	Benzo(a)pyrene	0.047	J	0.86	J	MG/KG	IS11SS310001	23/39	0.37 - 1.2	0.86	N/A	0.0875 C	0.374	SSL	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.09	J	4.3		MG/KG	IS11SS310001	27/39	0.37 - 1.2	4.3	N/A	0.875 C	4.51	SSL	YES	ASL
191-24-2	Benzo(g,h,i)perylene	0.061	J	0.37	J	MG/KG	IS11SS450001	5/39	0.37 - 1.2	0.37	N/A	235 N	N/A		NO	BSL
207-08-9	Benzo(k)fluoranthene	0.061	J	2.2		MG/KG	IS11SS100001	26/39	0.37 - 1.2	2.2	N/A	8.75 C	45.1	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	0.086	J	0.096	J	MG/KG	IS11SS230001	2/39	0.37 - 1.2	0.096	N/A	1,564 N	1700	SSL	NO	BSL
86-74-8	Carbazole	0.013	J	0.21	J	MG/KG	IS11SS310001	8/39	0.37 - 1.2	0.21	N/A	31.9 C	0.47	SSL	NO	BSL
218-01-9	Chrysene	0.079	J	3.5		MG/KG	IS11SS100001	27/39	0.37 - 1.2	3.5	N/A	87.5 C	146	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	0.035	J	0.29	J	MG/KG	IS11SS220001	6/39	0.37 - 1.2	0.29	N/A	782 N	496	SSL	NO	BSL
117-84-0	Di-n-octylphthalate	0.016	J	0.59	L	MG/KG	IS11SS250001	5/39	0.37 - 1.2	0.59	N/A	156 N	240000	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.018	J	0.59	J	MG/KG	IS11SS310001 IS11SS250001	18/39	0.37 - 1.2	0.59	N/A	0.0875 C	139	SSL	YES	ASL
132-64-9	Dibenzofuran	0.013	J	0.13	J	MG/KG	IS11SS310001	5/39	0.37 - 1.2	0.13	N/A	16 N	0.77	SSL	NO	BSL
84-66-2	Diethylphthalate	0.038	J	0.16	J	MG/KG	IS11SS160001	7/39	0.37 - 1.2	0.16	N/A	6,257 N	45	SSL	NO	BSL
131-11-3	Dimethyl phthalate	0.38	J	0.38	J	MG/KG	IS11SS440001	1/39	0.37 - 1.2	0.38	N/A	78,214 N	N/A		NO	BSL
206-44-0	Fluoranthene	0.009	J	6.8		MG/KG	IS11SS100001	31/39	0.37 - 1.2	6.8	N/A	313 N	625	SSL	NO	BSL
86-73-7	Fluorene	0.026	J	0.59		MG/KG	IS11SS250001	9/39	0.37 - 1.2	0.59	N/A	313 N	N/A		NO	BSL
118-74-1	Hexachlorobenzene	0.59		0.59		MG/KG	IS11SS250001	1/39	0.37 - 1.2	0.59	N/A	0.399 C	0.052	SSL	YES	ASL
87-68-3	Hexachlorobutadiene	0.59		0.59		MG/KG	IS11SS250001	1/39	0.37 - 1.2	0.59	N/A	8.2 C	8.2	SSL	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
193-39-5	Indeno(1,2,3-cd)pyrene	0.043	J	0.99	J	MG/KG	IS11SS310001	25/39	0.37 - 1.2	0.99	N/A	0.875 C	12.7	SSL	YES	ASL
91-20-3	Naphthalene	0.012	J	0.065	J	MG/KG	IS11SS230001	4/39	0.37 - 1.2	0.065	N/A	156 N	0.015	SSL	NO	BSL
85-01-8	Phenanthrene	0.024	J	3.1		MG/KG	IS11SS100001	26/39	0.37 - 1.2	3.1	N/A	235 N	N/A		NO	BSL
108-95-2	Phenol	0.12	J	0.16	J	MG/KG	IS11SS210001	2/39	0.37 - 1.2	0.16	N/A	2,300 N	13	SSL	NO	BSL
129-00-0	Pyrene	0.06	J	2.4		MG/KG	IS11SS100001	26/39	0.37 - 1.2	2.4	N/A	235 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.071	J	3.3		MG/KG	IS11SS330001P	18/39	0.37 - 1.2	3.3	N/A	45.6 C	2890	SSL	NO	BSL
86-30-6	n-Nitrosodiphenylamine	0.066	J	0.13	J	MG/KG	IS11SS290001	3/39	0.37 - 1.2	0.13	N/A	130 C	0.76	SSL	NO	BSL
118-96-7	2,4,6-Trinitrotoluene	0.36		0.36		MG/KG	IS11SS260001	1/39	0.25 - 1	0.36	N/A	2.10E+01 C	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	0.15	J	0.15	J	MG/KG	IS11SS100001	1/39	0.25 - 1	0.15	N/A	15.6 N	0.057	SSL	NO	BSL
606-20-2	2,6-Dinitrotoluene	0.09	J	0.098	J	MG/KG	IS11SS270001P	2/39	0.25 - 1	0.098	N/A	7.82 N	0.025	SSL	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	0.13	J	0.13	J	MG/KG	IS11SS260001	1/39	0.25 - 1	0.13	N/A	0.47 N	N/A		NO	BSL
88-72-2	2-Nitrotoluene	0.17	J	0.17	J	MG/KG	IS11SS250001	1/39	0.25 - 1	0.17	N/A	78.2 N	N/A		NO	BSL
19406-51-0	4-Amino-2,6-dinitrotoluene	0.17	J	0.17	J	MG/KG	IS11SS260001	1/39	0.25 - 1.2	0.17	N/A	0.47 N	N/A		NO	BSL
2691-41-0	HMX	0.22	J	3.7		MG/KG	IS11SS260001	3/39	0.5 - 1	3.7	N/A	391 N	N/A		NO	BSL
55-63-0	Nitroglycerin	27		27		MG/KG	IS11SS440001P	1/39	1.1 - 10	27	N/A	45.6 C	N/A		NO	BSL
14797-73-0	Perchlorate	0.11		480		MG/KG	IS11SS260001	4/39	0.0046 - 0.16	480	N/A	21 N	N/A		YES	ASL
121-82-4	RDX	0.19	J	0.86		MG/KG	IS11SS270001P	4/39	0.5 - 1	0.86	N/A	5.81 C	N/A		NO	BSL
7429-90-5	Aluminum	2,410		25,600		MG/KG	IS11SS260001	39/39	4.2 - 80.808	25600	N/A	7,821 N	N/A		YES	ASL
7440-36-0	Antimony	0.39	L	18.9	L	MG/KG	IS11SS170001 IS11SS310001	23/38	0.96 - 24.242	18.9	N/A	3.13 N	1.32	SSL	YES	ASL
7440-38-2	Arsenic	1.7	L	42.7	L	MG/KG	IS11SS260001	38/39	0.81 - 4.04	42.7	N/A	0.426 C	0.0261	SSL	YES	ASL
7440-39-3	Barium	7.9	J	367		MG/KG	IS11SS160001	39/39	0.09 - 80.808	367	N/A	548 N	211	SSL	NO	BSL
7440-41-7	Beryllium	0.049		0.61	J	MG/KG	IS11SS480001	13/39	0.045 - 2.02	0.61	N/A	15.6 N	120	SSL	NO	BSL
7440-43-9	Cadmium	0.11	J	147	J	MG/KG	IS11SS270001	34/39	0.09 - 2.02	147	N/A	7.80 N	5.5	SSL	YES	ASL
7440-70-2	Calcium	168	J	184,000	J	MG/KG	IS11SS340001	37/39	1.8 - 2020.2	184000	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	3.6	L	156	L	MG/KG	IS11SS260001	39/39	0.45 - 4.04	156	N/A	23.5 N	4.2	SSL	YES	ASL
7440-48-4	Cobalt	2.6	J	28.2	L	MG/KG	IS11SS060001	37/39	0.49 - 20.202	28.2	N/A	160 N	N/A		NO	BSL
7440-50-8	Copper	2.1	J	4,960	J	MG/KG	IS11SS240001	39/39	0.43 - 10.101	4960	N/A	313 N	1050	SSL	YES	ASL
57-12-5	Cyanide	0.09	J	0.52	J	MG/KG	IS11SS260001	11/28	0.56 - 1.7	0.52	N/A	156 N	14.7	SSL	NO	BSL
7439-89-6	Iron	5,770		263,000		MG/KG	IS11SS100001	39/39	6.1 - 46.62	263000	N/A	2,300 N	N/A		YES	ASL
7439-92-1	Lead	2.6	J	132,000		MG/KG	IS11SS220001	39/39	0.29 - 29.2	132000	N/A	400	N/A		YES	ASL
7439-95-4	Magnesium	188	J	11,500		MG/KG	IS11SS270001	39/39	3 - 2020.2	11500	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	21.9		1,330		MG/KG	IS11SS100001	39/39	0.09 - 6.061	1330	N/A	156 N	95.2	SSL	YES	ASL
7439-97-6	Mercury	0.066	UL	42	L	MG/KG	IS11SS150001	30/39	0.056 - 0.65	42	N/A	2.35 N	N/A		YES	ASL
7440-02-0	Nickel	1.2	J	189		MG/KG	IS11SS150001	38/39	0.43 - 16.162	189	N/A	156 N	N/A		YES	ASL
7440-09-7	Potassium	95.7	J	1,290	J	MG/KG	IS11SS260001	39/39	11.7 - 2020.2	1290	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	0.99	J	5.7		MG/KG	IS11SS510001	11/39	0.96 - 3.2	5.7	N/A	39.1 N	1.9	SSL	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-22-4	Silver	0.56	J	62.5		MG/KG	IS11SS310001	28/39	0.69 - 4.04	62.5	N/A	39.1 N	3.1	SSL	YES	ASL
7440-23-5	Sodium	120	J	3,430		MG/KG	IS11SS480001	19/39	98.3 - 2020.2	3430	N/A	N/A	N/A		NO	NUT
7440-28-0	Thallium	1.3	J	5.5		MG/KG	IS11SS220001	5/34	1.2 - 4.04	5.5	N/A	0.548 N	0.364	SSL	YES	ASL
7440-62-2	Vanadium	3.7	J	60.2		MG/KG	IS11SS310001	39/39	0.31 - 20.202	60.2	N/A	2.3 N	511	SSL	YES	ASL
7440-66-6	Zinc	12.4	J	10,000	J	MG/KG	IS11SS100001	39/39	0.13 - 8.081	10000	N/A	2,346 N	1360	SSL	YES	ASL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Residential Soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for mercuric chloride used for mercury.
RBC value for naphthalene used for acenaphthylene.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
Perchlorate screening toxicity value calculated using provisional RfD (see text).
[6] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic

N = Noncarcinogenic
SSL = Region III Soil Screening Level, for groundwater migration, DAF 20
Cancer benchmark value = 1E-06, adjusted HQ=0.1
(EPA Region III RBC Table)

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
67-64-1	Acetone	1.9E-07	J	4.0E-06	J	MG/M3	IS11SS340001	5/39	0.011 - 0.064	4.0E-06	N/A	3.3E-01 N	0.25	SSL	NO	BSL
74-83-9	Bromomethane	1.5E-12	J	1.5E-12	J	MG/M3	IS11SS500001 IS11SS510001	4/39	0.011 - 0.064	1.5E-12	N/A	5.1E-04 N	0.0001	SSL	NO	BSL
74-87-3	Chloromethane	4.65E-07	J	5.4E-07	J	MG/M3	IS11SS500001	2/39	0.011 - 0.064	5.4E-07	N/A	9.5E-02 C	0.001	SSL	NO	BSL
110-82-7	Cyclohexane	6.1E-13	J	6.1E-13	J	MG/M3	IS11SS510001	1/39	0.011 - 0.064	6.1E-13	N/A	6.2E-01 N	N/A		NO	BSL
79-20-9	Methyl acetate	1.1E-12		1.8E-11	J	MG/M3	IS11SS180001	11/39	0.011 - 0.064	1.8E-11	N/A	3.7E-01 N	2.5	SSL	NO	BSL
75-09-2	Methylene chloride	2.47E-07	J	6.2E-07	J	MG/M3	IS11SS430001 IS11SS440001P	5/39	0.011 - 0.064	6.2E-07	N/A	3.8E-03 C	0.0019	SSL	NO	BSL
100-42-5	Styrene	1.3E-06	J	1.8E-06	J	MG/M3	IS11SS170001	2/39	0.011 - 0.064	1.8E-06	N/A	1.0E-01 N	5.7	SSL	NO	BSL
108-88-3	Toluene	3.1E-07		3.1E-07		MG/M3	IS11SS280001	1/39	0.011 - 0.064	3.1E-07	N/A	4.2E-02 N	0.879	SSL	NO	BSL
79-01-6	Trichloroethene	3.8E-07	J	2.3E-06	J	MG/M3	IS11SS330001P	3/39	0.011 - 0.064	2.3E-06	N/A	1.6E-05 C	0.000026	SSL	NO	BSL
10061-01-5	cis-1,3-Dichloropropene	1.4E-11	UJ	1.4E-11	UJ	MG/M3	IS11SS250001 IS11SS350001	1/39	0.011 - 0.064	1.4E-11	N/A	N/A	N/A		NO	NTX
10061-02-6	trans-1,3-Dichloropropene	7.5E-06	UJ	7.5E-06	UJ	MG/M3	IS11SS250001 IS11SS350001	1/39	0.011 - 0.064	7.5E-06	N/A	N/A	0.003	SSL	NO	NTX
91-57-6	2-Methylnaphthalene	1.9E-07	J	1.7E-06	J	MG/M3	IS11SS310001	5/39	0.37 - 1.2	1.7E-06	N/A	7.3E-03 N	2.2	SSL	NO	BSL
99-99-0	4-Nitrotoluene	9.1E-11	J	1.9E-10		MG/M3	IS11SS140001	2/13	0.25 - 0.25	1.9E-10	N/A	3.7E-03 N	N/A		NO	BSL
83-32-9	Acenaphthene	7.1E-08	J	8.8E-07	J	MG/M3	IS11SS310001	7/39	0.37 - 1.2	8.8E-07	N/A	2.2E-02 N	10	SSL	NO	BSL
208-96-8	Acenaphthylene	1.5E-07	J	9.4E-07	J	MG/M3	IS11SS450001	5/39	0.37 - 1.2	9.4E-07	N/A	0.329 N	N/A		NO	BSL
98-86-2	Acetophenone	4.3E-11	J	5.8E-10		MG/M3	IS11SS140001	15/39	0.37 - 1.2	5.8E-10	N/A	3.7E-02 N	0.0000218	SSL	NO	BSL
120-12-7	Anthracene	1.1E-08	J	6.5E-07	J	MG/M3	IS11SS100001	17/39	0.37 - 1.2	6.5E-07	N/A	1.1E-01 N	47	SSL	NO	BSL
100-52-7	Benzaldehyde	6.8E-12	J	2.8E-10	J	MG/M3	IS11SS210001	21/39	0.37 - 1.2	2.8E-10	N/A	3.7E-02 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	4.1E-11	J	2.5E-09		MG/M3	IS11SS100001	27/39	0.37 - 1.2	2.5E-09	N/A	8.6E-06 C	1.46	SSL	NO	BSL
50-32-8	Benzo(a)pyrene	3.6E-11	J	6.5E-10	J	MG/M3	IS11SS310001	23/39	0.37 - 1.2	6.5E-10	N/A	2.0E-06 C	0.374	SSL	NO	BSL
205-99-2	Benzo(b)fluoranthene	6.8E-11	J	3.3E-09		MG/M3	IS11SS310001	27/39	0.37 - 1.2	3.3E-09	N/A	8.6E-06 C	4.51	SSL	NO	BSL
191-24-2	Benzo(g,h,i)perylene	1.2E-08	J	7.5E-08	J	MG/M3	IS11SS450001	5/39	0.37 - 1.2	7.5E-08	N/A	11.0 N	N/A		NO	BSL
207-08-9	Benzo(k)fluoranthene	4.6E-11	J	1.7E-09		MG/M3	IS11SS100001	26/39	0.37 - 1.2	1.7E-09	N/A	8.6E-05 C	45.1	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	6.5E-11	J	7.3E-11	J	MG/M3	IS11SS230001	2/39	0.37 - 1.2	7.3E-11	N/A	7.3E-02 N	1700	SSL	NO	BSL
86-74-8	Carbazole	9.8E-12	J	1.6E-10	J	MG/M3	IS11SS310001	8/39	0.37 - 1.2	1.6E-10	N/A	3.1E-04 C	0.47	SSL	NO	BSL
218-01-9	Chrysene	6.0E-11	J	2.7E-09		MG/M3	IS11SS100001	27/39	0.37 - 1.2	2.7E-09	N/A	8.6E-04 C	146	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	2.7E-11	J	2.2E-10	J	MG/M3	IS11SS220001	6/39	0.37 - 1.2	2.2E-10	N/A	3.7E-02 N	496	SSL	NO	BSL
117-84-0	Di-n-octylphthalate	1.2E-11	J	4.5E-10	L	MG/M3	IS11SS250001	5/39	0.37 - 1.2	4.5E-10	N/A	7.3E-03 N	240000	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.4E-11	J	4.5E-10	J	MG/M3	IS11SS310001 IS11SS250001	18/39	0.37 - 1.2	4.5E-10	N/A	8.6E-07 C	139	SSL	NO	BSL
132-64-9	Dibenzofuran	5.0E-08	J	5.0E-07	J	MG/M3	IS11SS310001	5/39	0.37 - 1.2	5.0E-07	N/A	7.3E-04 N	0.77	SSL	NO	BSL
84-66-2	Diethylphthalate	2.9E-11	J	1.2E-10	J	MG/M3	IS11SS160001	7/39	0.37 - 1.2	1.2E-10	N/A	2.9E-01 N	45	SSL	NO	BSL
131-11-3	Dimethyl phthalate	2.9E-10	J	2.9E-10	J	MG/M3	IS11SS440001	1/39	0.37 - 1.2	2.9E-10	N/A	3.7E+00 N	N/A		NO	BSL
206-44-0	Fluoranthene	6.8E-12	J	5.2E-09		MG/M3	IS11SS100001	31/39	0.37 - 1.2	5.2E-09	N/A	1.5E-02 N	625	SSL	NO	BSL
86-73-7	Fluorene	3.9E-08	J	8.9E-07		MG/M3	IS11SS250001	9/39	0.37 - 1.2	8.9E-07	N/A	1.5E-02 N	N/A		NO	BSL
118-74-1	Hexachlorobenzene	4.5E-10		4.5E-10		MG/M3	IS11SS250001	1/39	0.37 - 1.2	4.5E-10	N/A	3.9E-06 C	0.052	SSL	NO	BSL
87-68-3	Hexachlorobutadiene	4.5E-10		4.5E-10		MG/M3	IS11SS250001	1/39	0.37 - 1.2	4.5E-10	N/A	8.0E-05 C	8.2	SSL	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
193-39-5	Indeno(1,2,3-cd)pyrene	3.3E-11	J	7.5E-10	J	MG/M3	IS11SS310001	25/39	0.37 - 1.2	7.5E-10	N/A	8.6E-06 C	12.7	SSL	NO	BSL
91-20-3	Naphthalene	1.7E-07	J	9.0E-07	J	MG/M3	IS11SS230001	4/39	0.37 - 1.2	9.0E-07	N/A	3.3E-04 N	0.015	SSL	NO	BSL
85-01-8	Phenanthrene	1.8E-11	J	2.3E-09		MG/M3	IS11SS100001	26/39	0.37 - 1.2	2.3E-09	N/A	1.1E-02 N	N/A		NO	BSL
108-95-2	Phenol	9.1E-11	J	1.2E-10	J	MG/M3	IS11SS210001	2/39	0.37 - 1.2	1.2E-10	N/A	1.1E-01 N	13	SSL	NO	BSL
129-00-0	Pyrene	1.2E-08	J	4.9E-07		MG/M3	IS11SS100001	26/39	0.37 - 1.2	4.9E-07	N/A	1.1E-02 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	5.4E-11	J	2.5E-09		MG/M3	IS11SS330001P	18/39	0.37 - 1.2	2.5E-09	N/A	4.5E-04 C	2890	SSL	NO	BSL
86-30-6	n-Nitrosodiphenylamine	5.0E-11	J	9.8E-11	J	MG/M3	IS11SS290001	3/39	0.37 - 1.2	9.8E-11	N/A	1.3E-03 C	0.76	SSL	NO	BSL
118-96-7	2,4,6-Trinitrotoluene	2.7E-10		2.7E-10		MG/M3	IS11SS260001	1/39	0.25 - 1	2.7E-10	N/A	2.1E-04 C	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	1.1E-10	J	1.1E-10	J	MG/M3	IS11SS100001	1/39	0.25 - 1	1.1E-10	N/A	7.3E-04 N	0.057	SSL	NO	BSL
606-20-2	2,6-Dinitrotoluene	6.8E-11	J	7.4E-11	J	MG/M3	IS11SS270001P	2/39	0.25 - 1	7.4E-11	N/A	3.7E-04 N	0.025	SSL	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	9.8E-11	J	9.8E-11	J	MG/M3	IS11SS260001	1/39	0.25 - 1	9.8E-11	N/A	N/A	N/A		NO	NTX
88-72-2	2-Nitrotoluene	1.3E-10	J	1.3E-10	J	MG/M3	IS11SS250001	1/39	0.25 - 1	1.3E-10	N/A	3.7E-03 N	N/A		NO	BSL
19406-51-0	4-Amino-2,6-dinitrotoluene	1.3E-10	J	1.3E-10	J	MG/M3	IS11SS260001	1/39	0.25 - 1.2	1.3E-10	N/A	N/A	N/A		NO	NTX
2691-41-0	HMX	1.7E-10	J	2.8E-09		MG/M3	IS11SS260001	3/39	0.5 - 1	2.8E-09	N/A	1.8E-02 N	N/A		NO	BSL
55-63-0	Nitroglycerin	2.0E-08		2.0E-08		MG/M3	IS11SS440001P	1/39	1.1 - 10	2.0E-08	N/A	4.5E-04 N	N/A		NO	BSL
14797-73-0	Perchlorate	8.3E-11		3.6E-07		MG/M3	IS11SS260001	4/39	0.0046 - 0.16	3.6E-07	N/A	N/A	N/A		NO	NTX
121-82-4	RDX	1.4E-10	J	6.5E-10		MG/M3	IS11SS270001P	4/39	0.5 - 1	6.5E-10	N/A	5.7E-05 C	N/A		NO	BSL
7429-90-5	Aluminum	1.8E-06		1.9E-05		MG/M3	IS11SS260001	39/39	4.2 - 80.808	1.9E-05	N/A	3.7E-04 N	N/A		NO	BSL
7440-36-0	Antimony	3.0E-10	L	1.4E-08	L	MG/M3	IS11SS170001 IS11SS310001	23/38	0.96 - 24.242	1.4E-08	N/A	1.5E-04 N	1.32	SSL	NO	BSL
7440-38-2	Arsenic	1.3E-09	L	3.2E-08	L	MG/M3	IS11SS260001	38/39	0.81 - 4.04	3.2E-08	N/A	4.1E-07 C	0.0261	SSL	NO	BSL
7440-39-3	Barium	6.0E-09	J	2.8E-07		MG/M3	IS11SS160001	39/39	0.09 - 80.808	2.8E-07	N/A	5.1E-05 N	211	SSL	NO	BSL
7440-41-7	Beryllium	3.7E-11		4.6E-10	J	MG/M3	IS11SS480001	13/39	0.045 - 2.02	4.6E-10	N/A	7.5E-07 C	120	SSL	NO	BSL
7440-43-9	Cadmium	8.3E-11	J	1.1E-07	J	MG/M3	IS11SS270001	34/39	0.09 - 2.02	1.1E-07	N/A	9.9E-07 C	5.5	SSL	NO	BSL
7440-70-2	Calcium	1.3E-07	J	1.4E-04	J	MG/M3	IS11SS340001	37/39	1.8 - 2020.2	1.4E-04	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	2.7E-09	L	1.2E-07	L	MG/M3	IS11SS260001	39/39	0.45 - 4.04	1.2E-07	N/A	1.5E-07 C	4.2	SSL	NO	BSL
7440-48-4	Cobalt	2.0E-09	J	2.1E-08	L	MG/M3	IS11SS060001	37/39	0.49 - 20.202	2.1E-08	N/A	6.4E-08 N	N/A		NO	BSL
7440-50-8	Copper	1.6E-09	J	3.8E-06	J	MG/M3	IS11SS240001	39/39	0.43 - 10.101	3.8E-06	N/A	1.5E-02 N	1050	SSL	NO	BSL
57-12-5	Cyanide	6.8E-11	J	3.9E-10	J	MG/M3	IS11SS260001	11/28	0.56 - 1.7	3.9E-10	N/A	7.3E-03 N	14.7	SSL	NO	BSL
7439-89-6	Iron	4.4E-06		2.0E-04		MG/M3	IS11SS100001	39/39	6.1 - 46.62	2.0E-04	N/A	1.1E-01 N	N/A		NO	BSL
7439-92-1	Lead	2.0E-09	J	1.0E-04		MG/M3	IS11SS220001	39/39	0.29 - 29.2	1.0E-04	N/A	N/A	N/A		NO	NTX
7439-95-4	Magnesium	1.4E-07	J	8.7E-06		MG/M3	IS11SS270001	39/39	3 - 2020.2	8.7E-06	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	1.7E-08		1.0E-06		MG/M3	IS11SS100001	39/39	0.09 - 6.061	1.0E-06	N/A	5.2E-06 N	95.2	SSL	NO	BSL
7439-97-6	Mercury	5.0E-11	UL	3.2E-08	L	MG/M3	IS11SS150001	30/39	0.056 - 0.65	3.2E-08	N/A	3.1E-05 N	N/A		NO	BSL
7440-02-0	Nickel	9.1E-10	J	1.4E-07		MG/M3	IS11SS150001	38/39	0.43 - 16.162	1.4E-07	N/A	7.3E-03 N	N/A		NO	BSL
7440-09-7	Potassium	7.3E-08	J	9.8E-07	J	MG/M3	IS11SS260001	39/39	11.7 - 2020.2	9.8E-07	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	7.5E-10	J	4.3E-09		MG/M3	IS11SS510001	11/39	0.96 - 3.2	4.3E-09	N/A	1.8E-03	1.9	SSL	NO	BSL
7440-22-4	Silver	4.2E-10	J	4.7E-08		MG/M3	IS11SS310001	28/39	0.69 - 4.04	4.7E-08	N/A	1.8E-03 N	3.1	SSL	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-23-5	Sodium	9.1E-08	J	2.6E-06		MG/M3	IS11SS480001	19/39	98.3 - 2020.2	2.6E-06	N/A	N/A	N/A		NO	NUT
7440-28-0	Thallium	9.8E-10	J	4.2E-09		MG/M3	IS11SS220001	5/34	1.2 - 4.04	4.2E-09	N/A	2.6E-05 N	0.364	SSL	NO	BSL
7440-62-2	Vanadium	2.8E-09	J	4.6E-08		MG/M3	IS11SS310001	39/39	0.31 - 20.202	4.6E-08	N/A	1.1E-04 N	511	SSL	NO	BSL
7440-66-6	Zinc	9.4E-09	J	7.6E-06	J	MG/M3	IS11SS100001	39/39	0.13 - 8.081	7.6E-06	N/A	1.1E-01 N	1360	SSL	NO	BSL

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.2.A.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Ambient Air, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,I)perylene.
RBC value for mercuric chloride used for mercury.
RBC value for naphthalene used for acenaphthylene.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 11, NDWIH

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	
Bromomethene	N/A	N/A	N/A	N/A	N/A	N/A	
Chloromethane	1.10E-01	1.80E+00	1.05E-05	3.50E+01	2.10E-01	6.50E+03	
Methyl acetate	N/A	N/A	N/A	N/A	N/A	N/A	
Methylene Chloride	1.01E-01	8.98E-02	1.17E-05	1.17E01	7.02E-02	1.30E04	
Styrene	7.10E-02	1.13E-01	8.00E-06	7.76E+02	4.66E+00	3.10E+02	
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E00	5.26E+02	
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	
cis-1,3-Dichloropropene	N/A	N/A	N/A	N/A	N/A	N/A	
trans-1,3-Dichloropropene	6.26E-02	7.26E-01	1.00E-05	4.57E+01	2.74E-01	2.80E+03	
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E01	2.54E+01	
4-Nitrotoluene	N/A	5.77E-06	N/A	1.51E+01	9.08E-02	1.60E+03	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E01	4.24E+00	
Acetophenone	N/A	4.99E-04	N/A	4.68E+01	2.81E-01	1.66E+03	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Dibenzofuran	6.19E-02	3.98E-03		5.48E+03	3.29E+01	5.65E+00	
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman and Unnamed Creeks

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
1634-04-4	Methyl-tert-butyl ether (MTBE)	1	J	1	J	UG/L	IS11SW01	1/10	10 - 10	1	N/A	26 C	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1	J	1	J	UG/L	IS11SW01	1/10	10 - 11	1	N/A	47.8 C	N/A	N/A	NO	BSL
99-65-0	1,3-Dinitrobenzene	0.075	J	0.075	J	UG/L	IS11SW01	1/10	0.2 - 5.4	0.075	N/A	3.65 N	N/A	N/A	NO	BSL
2691-41-0	HMX	0.4	J	0.41	J	UG/L	IS11SW06	2/10	0.5 - 7.2	0.41	N/A	1,825 N	N/A	N/A	NO	BSL
14797-73-0	Perchlorate	1.6	J	3.6	J	UG/L	IS11SW04	3/10	0.23 - 5	3.6	N/A	4 N	N/A	N/A	NO	BSL
7429-90-5	Aluminum	239		995		UG/L	IS11SW05	10/10	18.8 - 200	995	N/A	36,500 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	35.8	J	35.8	J	UG/L	IS11SW08	1/10	4.3 - 60	35.8	N/A	14.6 N	N/A	N/A	YES	ASL
7440-38-2	Arsenic	8	J	8	J	UG/L	IS11SW08	1/10	3.6 - 10	8	N/A	0.446 C	N/A	N/A	YES	ASL
7440-39-3	Barium	24	J	200	J	UG/L	IS11SW08	10/10	0.4 - 200	200	N/A	2,555 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	0.21	J	3.1	J	UG/L	IS11SW08	2/10	0.2 - 5	3.1	N/A	73 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	3	J	3	J	UG/L	IS11SW08	1/10	0.4 - 5	3	N/A	18.3 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	10,100	J	68,000	J	UG/L	IS11SW10	10/10	8.2 - 5000	68000	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	0.84	J	6.9	J	UG/L	IS11SW08	3/10	2 - 10	6.9	N/A	110 N	N/A	N/A	NO	BSL
7440-48-4	Cobalt	0.97	J	32	J	UG/L	IS11SW08	3/10	2.2 - 50	32	N/A	730 N	N/A	N/A	NO	BSL
7440-50-8	Copper	4.2	J	22.4	J	UG/L	IS11SW08	8/10	1.9 - 25	22.4	N/A	1,460 N	N/A	N/A	NO	BSL
7439-89-6	Iron	465	J	3,180	J	UG/L	IS11SW05	10/10	27.3 - 100	3180	N/A	11,000 N	N/A	N/A	NO	BSL
7439-92-1	Lead	1.3		38.4	J	UG/L	IS11SW01	10/10	1.3 - 3	38.4	N/A	15	N/A	N/A	YES	ASL
7439-95-4	Magnesium	3,760		103,000	J	UG/L	IS11SW09	10/10	13.4 - 5000	103000	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	95.3		180	J	UG/L	IS11SW10	10/10	0.4 - 15	180	N/A	730 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	3.3		28.1	J	UG/L	IS11SW08	3/10	1.9 - 40	28.1	N/A	730 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	2,090		57,100	J	UG/L	IS11SW09	10/10	52.4 - 5000	57100	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	5.2	L	5.2	L	UG/L	IS11SW08	1/10	4.3 - 5	5.2	N/A	183 N	N/A	N/A	NO	BSL
7440-22-4	Silver	6.4	J	6.4	J	UG/L	IS11SW08	1/10	3.1 - 10	6.4	N/A	183 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	11,900	J	836,000	J	UG/L	IS11SW08	10/10	439 - 25000	836000	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	11.5		11.5		UG/L	IS11SW08	1/10	5.3 - 10	11.5	N/A	2.56 N	N/A	N/A	YES	ASL
7440-62-2	Vanadium	1.5	J	32.1	J	UG/L	IS11SW08	9/10	1.4 - 50	32.1	N/A	11 N	N/A	N/A	YES	ASL

[1] Minimum/Maximum detected concentration. Total metals results used since direct contact with surface water may occur.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Ten times the tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
Lead screening toxicity value is 15 ug/L, the EPA Safe Drinking Water Act action level for lead.
Perchlorate screening toxicity value calculated using provisional RfD (see text).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	4.5	J	15		UG/L	IS11MW070302	2/7	10 - 10	15	N/A	317 N	200	PMCL	NO	BSL
75-34-3	1,1-Dichloroethane	3.8	J	3.8	J	UG/L	IS11MW040900	1/7	10 - 10	3.8	N/A	79.8 N	N/A		NO	BSL
75-35-4	1,1-Dichloroethene	2.6	J	9	J	UG/L	IS11MW070302	2/7	10 - 10	9	N/A	35 N	7	PMCL	NO	BSL
67-64-1	Acetone	10		11		UG/L	IS11MW060302P	3/7	10 - 10	11	N/A	550.0 N	N/A		NO	BSL
71-43-2	Benzene	1	J	1	J	UG/L	IS11MW060302 IS11MW060302P	1/7	10 - 10	1	N/A	0.340 C	0.2	PMCL	YES	ASL
74-83-9	Bromomethane	2	J	2	J	UG/L	IS11MW060302P	1/7	10 - 10	2	N/A	0.852 N	N/A		YES	ASL
75-00-3	Chloroethane	3.8	J	3.8	J	UG/L	IS11MW010900	1/7	10 - 10	3.8	N/A	3.64 C	N/A		YES	ASL
74-87-3	Chloromethane	2	J	2	J	UG/L	IS11MW060302 IS11MW070302	3/7	10 - 10	2	N/A	19 C	N/A		NO	BSL
110-82-7	Cyclohexane	0.6	J	0.6	J	UG/L	IS11MW060302P	1/7	10 - 10	0.6	N/A	1200	N/A		NO	BSL
100-41-4	Ethylbenzene	0.4	J	0.4	J	UG/L	IS11MW060302P	1/7	10 - 10	0.4	N/A	130 N	700	PMCL	NO	BSL
79-20-9	Methyl acetate	5	J	5	J	UG/L	IS11MW030900P	1/7	10 - 10	5	N/A	608 N	N/A		NO	BSL
108-88-3	Toluene	0.4	J	18		UG/L	IS11MW030900P	4/7	10 - 10	18	N/A	74.7 N	1000	PMCL	NO	BSL
106-44-5	4-Methylphenol	0.8	J	23		UG/L	IS11MW030900	4/6	10 - 10	23	N/A	18.3 N	N/A		YES	ASL
83-32-9	Acenaphthene	0.4	J	0.4	J	UG/L	IS11MW060302 IS11MW060302P	1/6	10 - 10	0.4	N/A	36.5 N	N/A		NO	BSL
98-86-2	Acetophenone	0.4	J	0.4	J	UG/L	IS11MW060302P	1/6	10 - 10	0.4	N/A	61 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	0.064	J	0.064	J	UG/L	IS11MW010900	1/6	0.2 - 6.6	0.064	N/A	0.365 N	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	0.16	J	0.16	J	UG/L	IS11MW030900P	1/6	0.2 - 6.6	0.16	N/A	7.3 N	N/A		NO	BSL
606-20-2	2,6-Dinitrotoluene	0.11	J	0.11	J	UG/L	IS11MW030900P	1/6	0.2 - 8.8	0.11	N/A	3.65 N	N/A		NO	BSL
99-08-1	3-Nitrotoluene	0.15	J	0.15	J	UG/L	IS11MW040900	1/6	0.2 - 6.6	0.15	N/A	12.0 N	N/A		NO	BSL
99-99-0	4-Nitrotoluene	0.15	J	0.37		UG/L	IS11MW030900	2/6	0.2 - 6.6	0.37	N/A	6.1 N	N/A		NO	BSL
121-82-4	RDX	0.16	J	0.16	J	UG/L	IS11MW040900	1/6	0.5 - 6.6	0.16	N/A	0.609 C	4	PMCL	NO	BSL
479-45-8	Tetryl	0.12	J	0.12	J	UG/L	IS11MW040900	1/6	0.2 - 8.8	0.12	N/A	36.5 N	N/A		NO	BSL
7429-90-5	Aluminum	192	J	31,400		UG/L	IS11MW040900	6/7	19.9 - 200	31400	N/A	3,650 N	50 - 200	SMCL	YES	ASL
7440-36-0	Antimony	1.8	J	4.2		UG/L	IS11MW020900	4/7	3.1 - 60	4.2	N/A	1.46 N	6	PMCL	YES	ASL
7440-38-2	Arsenic	2.9	J	8.2		UG/L	IS11MW040900	4/7	3.2 - 10	8.2	N/A	0.0446 C	5	PMCL	YES	ASL
7440-39-3	Barium	151	J	1,680		UG/L	IS11MW010900	7/7	0.15 - 200	1680	N/A	256 N	2000	PMCL	YES	ASL
7440-41-7	Beryllium	0.51	J	0.64		UG/L	IS11MW060302	3/7	0.08 - 5	0.64	N/A	7.3 N	N/A		NO	BSL
7440-70-2	Calcium	8,690	J	85,400		UG/L	IS11MW030900	7/7	7.7 - 5000	85400	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	1.1	J	59.6		UG/L	IS11MW040900	7/7	1.1 - 10	59.6	N/A	11.0 N	100	PMCL	YES	ASL
7440-48-4	Cobalt	1	J	59.7		UG/L	IS11MW040900	3/7	0.83 - 50	59.7	N/A	73 N	N/A		NO	BSL
7440-50-8	Copper	1.4	J	33.9		UG/L	IS11MW040900	7/7	1.3 - 25	33.9	N/A	146 N	1000	SMCL	NO	BSL
57-12-5	Cyanide	10.1	L	10.1	L	UG/L	IS11MW010900	1/4	10 - 10	10.1	N/A	73 N	200	PMCL	NO	BSL
7439-89-6	Iron	8,590	L	51,000	L	UG/L	IS11MW040900	7/7	16 - 100	51000	N/A	1,100 N	300	SMCL	YES	ASL
7439-92-1	Lead	1.9	J	78.6		UG/L	IS11MW010900	7/7	1.9 - 3	78.6	N/A	15	15	AL	YES	ASL
7439-95-4	Magnesium	9,700	J	35,600		UG/L	IS11MW010900	7/7	14.2 - 5000	35600	N/A	N/A	N/A		NO	NUT

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7439-96-5	Manganese	188	J	3,020		UG/L	IS11MW080302	7/7	0.15 - 15	3020	N/A	73 N	50	SMCL	YES	ASL
7439-97-6	Mercury	0.1		0.1		UG/L	IS11MW010900 IS11MW020900	2/7	0.1 - 0.2	0.1	N/A	1.10 N	2	PMCL	NO	BSL
7440-02-0	Nickel	2		110		UG/L	IS11MW040900	7/7	2 - 40	110	N/A	73 N	N/A		YES	ASL
7440-09-7	Potassium	3,350		41,200		UG/L	IS11MW020900	7/7	19.5 - 5000	41200	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	2.5		2.9		UG/L	IS11MW070302	2/7	4 - 5	2.9	N/A	18.3 N	50	PMCL	NO	BSL
7440-22-4	Silver	0.68	J	6.1	J	UG/L	IS11MW010900	3/7	1.1 - 10	6.1	N/A	18.3 N	100	SMCL	NO	BSL
7440-23-5	Sodium	33,400	J	98,400	J	UG/L	IS11MW010900	7/7	244 - 5000	98400	N/A	N/A	N/A		NO	NUT
7440-62-2	Vanadium	2.1	J	55.4	J	UG/L	IS11MW040900	6/7	0.76 - 50	55.4	N/A	1.1 N	N/A		YES	ASL
7440-66-6	Zinc	15.7	J	217	J	UG/L	IS11MW040900	7/7	1.2 - 20	217	N/A	1,095 N	5000	PMCL	NO	BSL

[1] Minimum/Maximum detected concentration. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Tap Water, October 15,2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 15 ug/L, the EPA Safe Drinking Water Act action level for lead.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water at Excavation Pit

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	4.5	J	15		UG/L	IS11MW070302	2/7	10 - 10	15	N/A	317 N	200	PMCL	NO	BSL
75-34-3	1,1-Dichloroethane	3.8	J	3.8	J	UG/L	IS11MW040900	1/7	10 - 10	3.8	N/A	79.8 N	N/A		NO	BSL
75-35-4	1,1-Dichloroethene	2.6	J	9	J	UG/L	IS11MW070302	2/7	10 - 10	9	N/A	35 N	7	PMCL	NO	BSL
67-64-1	Acetone	10		11		UG/L	IS11MW060302P	3/7	10 - 10	11	N/A	550 N	N/A		NO	BSL
71-43-2	Benzene	1	J	1	J	UG/L	IS11MW060302 IS11MW060302P	1/7	10 - 10	1	N/A	0.340 C	0.2	PMCL	YES	ASL
74-83-9	Bromomethane	2	J	2	J	UG/L	IS11MW060302P	1/7	10 - 10	2	N/A	0.852 N	N/A		YES	ASL
75-00-3	Chloroethane	3.8	J	3.8	J	UG/L	IS11MW010900	1/7	10 - 10	3.8	N/A	3.64 C	N/A		YES	ASL
74-87-3	Chloromethane	2	J	2	J	UG/L	IS11MW060302 IS11MW070302	3/7	10 - 10	2	N/A	19 C	N/A		NO	BSL
110-82-7	Cyclohexane	0.6	J	0.6	J	UG/L	IS11MW060302P	1/7	10 - 10	0.6	N/A	1200	N/A		NO	BSL
100-41-4	Ethylbenzene	0.4	J	0.4	J	UG/L	IS11MW060302P	1/7	10 - 10	0.4	N/A	130 N	700	PMCL	NO	BSL
79-20-9	Methyl acetate	5	J	5	J	UG/L	IS11MW030900P	1/7	10 - 10	5	N/A	608 N	N/A		NO	BSL
108-88-3	Toluene	0.4	J	18		UG/L	IS11MW030900P	4/7	10 - 10	18	N/A	74.7 N	1000	PMCL	NO	BSL
106-44-5	4-Methylphenol	0.8	J	23		UG/L	IS11MW030900	4/6	10 - 10	23	N/A	18.3 N	N/A		YES	ASL
83-32-9	Acenaphthene	0.4	J	0.4	J	UG/L	IS11MW060302 IS11MW060302P	1/6	10 - 10	0.4	N/A	36.5 N	N/A		NO	BSL
98-86-2	Acetophenone	0.4	J	0.4	J	UG/L	IS11MW060302P	1/6	10 - 10	0.4	N/A	61 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	0.064	J	0.064	J	UG/L	IS11MW010900	1/6	0.2 - 6.6	0.064	N/A	0.365 N	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	0.16	J	0.16	J	UG/L	IS11MW030900P	1/6	0.2 - 6.6	0.16	N/A	7.3 N	N/A		NO	BSL
606-20-2	2,6-Dinitrotoluene	0.11	J	0.11	J	UG/L	IS11MW030900P	1/6	0.2 - 8.8	0.11	N/A	3.65 N	N/A		NO	BSL
99-08-1	3-Nitrotoluene	0.15	J	0.15	J	UG/L	IS11MW040900	1/6	0.2 - 6.6	0.15	N/A	12.0 N	N/A		NO	BSL
99-99-0	4-Nitrotoluene	0.15	J	0.37		UG/L	IS11MW030900	2/6	0.2 - 6.6	0.37	N/A	6.1 N	N/A		NO	BSL
121-82-4	RDX	0.16	J	0.16	J	UG/L	IS11MW040900	1/6	0.5 - 6.6	0.16	N/A	0.609 C	4	PMCL	NO	BSL
479-45-8	Tetryl	0.12	J	0.12	J	UG/L	IS11MW040900	1/6	0.2 - 8.8	0.12	N/A	36.5 N	N/A		NO	BSL
7429-90-5	Aluminum	192	J	31,400		UG/L	IS11MW040900	6/7	19.9 - 200	31400	N/A	3,650 N	50 - 200	SMCL	YES	ASL
7440-36-0	Antimony	1.8	J	4.2		UG/L	IS11MW020900	4/7	3.1 - 60	4.2	N/A	1.46 N	6	PMCL	YES	ASL
7440-38-2	Arsenic	2.9	J	8.2		UG/L	IS11MW040900	4/7	3.2 - 10	8.2	N/A	0.0446 C	5	PMCL	YES	ASL
7440-39-3	Barium	151	J	1,680		UG/L	IS11MW010900	7/7	0.15 - 200	1680	N/A	256 N	2000	PMCL	YES	ASL
7440-41-7	Beryllium	0.51	J	0.64		UG/L	IS11MW060302	3/7	0.08 - 5	0.64	N/A	7.3 N	N/A		NO	BSL
7440-70-2	Calcium	8,690	J	85,400		UG/L	IS11MW030900	7/7	7.7 - 5000	85400	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	1.1	J	59.6		UG/L	IS11MW040900	7/7	1.1 - 10	59.6	N/A	11.0 N	100	PMCL	YES	ASL
7440-48-4	Cobalt	1	J	59.7		UG/L	IS11MW040900	3/7	0.83 - 50	59.7	N/A	73 N	N/A		NO	BSL
7440-50-8	Copper	1.4	J	33.9		UG/L	IS11MW040900	7/7	1.3 - 25	33.9	N/A	146 N	1000	SMCL	NO	BSL
57-12-5	Cyanide	10.1	L	10.1	L	UG/L	IS11MW010900	1/4	10 - 10	10.1	N/A	73 N	200	PMCL	NO	BSL
7439-89-6	Iron	8,590	L	51,000	L	UG/L	IS11MW040900	7/7	16 - 100	51000	N/A	1,100 N	300	SMCL	YES	ASL
7439-92-1	Lead	1.9	J	78.6		UG/L	IS11MW010900	7/7	1.9 - 3	78.6	N/A	15	15	AL	YES	ASL
7439-95-4	Magnesium	9,700	J	35,600		UG/L	IS11MW010900	7/7	14.2 - 5000	35600	N/A	N/A	N/A		NO	NUT

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water at Excavation Pit

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7439-96-5	Manganese	188	J	3,020		UG/L	IS11MW080302	7/7	0.15 - 15	3020	N/A	73 N	50	SMCL	YES	ASL
7439-97-6	Mercury	0.1		0.1		UG/L	IS11MW010900 IS11MW020900	2/7	0.1 - 0.2	0.1	N/A	1.10 N	2	PMCL	NO	BSL
7440-02-0	Nickel	2		110		UG/L	IS11MW040900	7/7	2 - 40	110	N/A	73 N	N/A		YES	ASL
7440-09-7	Potassium	3,350		41,200		UG/L	IS11MW020900	7/7	19.5 - 5000	41200	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	2.5		2.9		UG/L	IS11MW070302	2/7	4 - 5	2.9	N/A	18.3 N	50	PMCL	NO	BSL
7440-22-4	Silver	0.68	J	6.1	J	UG/L	IS11MW010900	3/7	1.1 - 10	6.1	N/A	18.3 N	100	SMCL	NO	BSL
7440-23-5	Sodium	33,400	J	98,400	J	UG/L	IS11MW010900	7/7	244 - 5000	98400	N/A	N/A	N/A		NO	NUT
7440-62-2	Vanadium	2.1	J	55.4	J	UG/L	IS11MW040900	6/7	0.76 - 50	55.4	N/A	1.1 N	N/A		YES	ASL
7440-66-6	Zinc	15.7	J	217	J	UG/L	IS11MW040900	7/7	1.2 - 20	217	N/A	1,095 N	5000	PMCL	NO	BSL

[1] Minimum/Maximum detected concentration. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 15 ug/L, the EPA Safe Drinking Water Act action level for lead.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	4.5	J	15		UG/L	IS11MW070302	2/7	10 - 10	15	N/A	317 N	200	PMCL	NO	BSL
75-34-3	1,1-Dichloroethane	3.8	J	3.8	J	UG/L	IS11MW040900	1/7	10 - 10	3.8	N/A	79.8 N	N/A		NO	BSL
75-35-4	1,1-Dichloroethene	2.6	J	9	J	UG/L	IS11MW070302	2/7	10 - 10	9	N/A	35 N	7	PMCL	NO	BSL
67-64-1	Acetone	10		11		UG/L	IS11MW060302P	3/7	10 - 10	11	N/A	550.0 N			NO	BSL
71-43-2	Benzene	1	J	1	J	UG/L	IS11MW060302 IS11MW060302P	1/7	10 - 10	1	N/A	0.340 C			YES	ASL
74-83-9	Bromomethane	2	J	2	J	UG/L	IS11MW060302P	1/7	10 - 10	2	N/A	0.852 N			YES	ASL
75-00-3	Chloroethane	3.8	J	3.8	J	UG/L	IS11MW010900	1/7	10 - 10	3.8	N/A	3.64 C	N/A		YES	ASL
74-87-3	Chloromethane	2	J	2	J	UG/L	IS11MW060302 IS11MW070302	3/7	10 - 10	2	N/A	19 C			NO	BSL
110-82-7	Cyclohexane	0.6	J	0.6	J	UG/L	IS11MW060302P	1/7	10 - 10	0.6	N/A	1200			NO	BSL
100-41-4	Ethylbenzene	0.4	J	0.4	J	UG/L	IS11MW060302P	1/7	10 - 10	0.4	N/A	130 N			NO	BSL
79-20-9	Methyl acetate	5	J	5	J	UG/L	IS11MW030900P	1/7	10 - 10	5	N/A	608 N	N/A		NO	BSL
108-88-3	Toluene	0.4	J	18		UG/L	IS11MW030900P	4/7	10 - 10	18	N/A	74.7 N	1000	PMCL	NO	BSL
83-32-9	Acenaphthene	0.4	J	0.4	J	UG/L	IS11MW060302 IS11MW060302P	1/6	10 - 10	0.4	N/A	36.5 N			NO	BSL
98-86-2	Acetophenone	0.4	J	0.4	J	UG/L	IS11MW060302P	1/6	10 - 10	0.4	N/A	61 N			NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards

Table 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aqifer - Water Vapors at Excavation Pit

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	4.5	J	15		UG/L	IS11MW070302	2/7	10 - 10	15	N/A	317 N	200	PMCL	NO	BSL
75-34-3	1,1-Dichloroethane	3.8	J	3.8	J	UG/L	IS11MW040900	1/7	10 - 10	3.8	N/A	79.8 N	N/A		NO	BSL
75-35-4	1,1-Dichloroethene	2.6	J	9	J	UG/L	IS11MW070302	2/7	10 - 10	9	N/A	35 N	7	PMCL	NO	BSL
67-64-1	Acetone	10		11		UG/L	IS11MW060302P	3/7	10 - 10	11	N/A	550.0 N			NO	BSL
71-43-2	Benzene	1	J	1	J	UG/L	IS11MW060302 IS11MW060302P	1/7	10 - 10	1	N/A	0.340 C			YES	ASL
74-83-9	Bromomethane	2	J	2	J	UG/L	IS11MW060302P	1/7	10 - 10	2	N/A	0.852 N			YES	ASL
75-00-3	Chloroethane	3.8	J	3.8	J	UG/L	IS11MW010900	1/7	10 - 10	3.8	N/A	3.64 C	N/A		YES	ASL
74-87-3	Chloromethane	2	J	2	J	UG/L	IS11MW060302 IS11MW070302	3/7	10 - 10	2	N/A	19 C			NO	BSL
110-82-7	Cyclohexane	0.6	J	0.6	J	UG/L	IS11MW060302P	1/7	10 - 10	0.6	N/A	1200			NO	BSL
100-41-4	Ethylbenzene	0.4	J	0.4	J	UG/L	IS11MW060302P	1/7	10 - 10	0.4	N/A	130 N			NO	BSL
79-20-9	Methyl acetate	5	J	5	J	UG/L	IS11MW030900P	1/7	10 - 10	5	N/A	608 N	N/A		NO	BSL
108-88-3	Toluene	0.4	J	18		UG/L	IS11MW030900P	4/7	10 - 10	18	N/A	74.7 N	1000	PMCL	NO	BSL
83-32-9	Acenaphthene	0.4	J	0.4	J	UG/L	IS11MW060302 IS11MW060302P	1/6	10 - 10	0.4	N/A	36.5 N			NO	BSL
98-86-2	Acetophenone	0.4	J	0.4	J	UG/L	IS11MW060302P	1/6	10 - 10	0.4	N/A	61 N			NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 11 Soil*

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
78-93-3	2-Butanone	0.0043	J	0.0043	J	MG/KG	IS11SB040608	1/51	0.011 - 0.064	0.0043	N/A	4,693 N	0.79	SSL	NO	BSL
67-64-1	Acetone	0.0026	J	0.065	J	MG/KG	IS11SS340001	11/51	0.011 - 0.064	0.065	N/A	7,000 N	0.25	SSL	NO	BSL
74-83-9	Bromomethane	0.002	J	0.002	J	MG/KG	IS11SB530002 IS11SS510001	5/51	0.011 - 0.064	0.002	N/A	11.0 N	0.0041	SSL	NO	BSL
75-15-0	Carbon disulfide	1.00E-03	J	1.00E-03	J	MG/KG	IS11SB490002P	1/51	0.011 - 0.064	0.001	N/A	782 N	1.9	SSL	NO	BSL
74-87-3	Chloromethane	6.00E-04	J	7.00E-04	J	MG/KG	IS11SS500001	2/51	0.011 - 0.064	0.0007	N/A	N/A	0.001	SSL	NO	NTX
110-82-7	Cyclohexane	8.00E-04	J	0.0045	J	MG/KG	IS11SB120103	4/51	0.011 - 0.064	0.0045	N/A	N/A	N/A		NO	NTX
79-20-9	Methyl acetate	0.0015		0.024	J	MG/KG	IS11SS180001	11/51	0.011 - 0.064	0.024	N/A	7,821 N	2.5	SSL	NO	BSL
75-09-2	Methylene chloride	8.00E-04	J	0.003	J	MG/KG	IS11SB440002	9/51	0.011 - 0.064	0.003	N/A	85.2 C	0.0019	SSL	NO	BSL
100-42-5	Styrene	0.023	J	0.032	J	MG/KG	IS11SS170001	2/51	0.011 - 0.064	0.032	N/A	1,564 N	5.7	SSL	NO	BSL
108-88-3	Toluene	0.0016		0.0016		MG/KG	IS11SS280001	1/51	0.011 - 0.064	0.0016	N/A	1,564 N	0.879	SSL	NO	BSL
79-01-6	Trichloroethene	9.00E-04	J	0.0096	J	MG/KG	IS11SS330001P	4/51	0.011 - 0.064	0.0096	N/A	1.6 C	0.015	SSL	NO	BSL
1330-20-7	Xylene, total	0.0018	J	0.0018	J	MG/KG	IS11SB120103	1/51	0.011 - 0.064	0.0018	N/A	15,643 N	17	SSL	NO	BSL
10061-01-5	cis-1,3-Dichloropropene	0.018	UJ	0.018	UJ	MG/KG	IS11SS250001 IS11SS350001	1/51	0.011 - 0.064	0.018	N/A	6.39 C	0.003	SSL	NO	BSL
10061-02-6	trans-1,3-Dichloropropene	0.018	UJ	0.018	UJ	MG/KG	IS11SS250001 IS11SS350001	1/51	0.011 - 0.064	0.018	N/A	6.39 C	0.003	SSL	NO	BSL
91-57-6	2-Methylnaphthalene	0.012	J	0.13	J	MG/KG	IS11SS310001	9/51	0.37 - 1.2	0.13	N/A	156 N	2.2	SSL	NO	BSL
99-99-0	4-Nitrotoluene	0.12	J	0.25		MG/KG	IS11SS140001	2/13	0.25 - 0.25	0.25	N/A	78.2 N	N/A		NO	BSL
83-32-9	Acenaphthene	0.017	J	0.25	J	MG/KG	IS11SS310001	9/51	0.37 - 1.2	0.25	N/A	469 N	10	SSL	NO	BSL
208-96-8	Acenaphthylene	0.011	J	0.31	J	MG/KG	IS11SB440002	9/51	0.37 - 1.2	0.31	N/A	160 N	N/A		NO	BSL
98-86-2	Acetophenone	0.048	J	0.76		MG/KG	IS11SS140001	17/51	0.37 - 1.2	0.76	N/A	780 N	0.0000218	SSL	NO	BSL
120-12-7	Anthracene	0.011	J	0.66	J	MG/KG	IS11SS100001	22/51	0.37 - 1.2	0.66	N/A	2,346 N	47	SSL	NO	BSL
100-52-7	Benzaldehyde	0.008	J	0.37	J	MG/KG	IS11SS210001	29/51	0.37 - 1.2	0.37	N/A	782 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	0.021	J	3.3		MG/KG	IS11SS100001	34/51	0.37 - 1.2	3.3	N/A	0.875 C	1.46	SSL	YES	ASL
50-32-8	Benzo(a)pyrene	0.021	J	1.1		MG/KG	IS11SB440002	30/51	0.37 - 1.2	1.1	N/A	0.0875 C	0.374	SSL	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.018	J	4.3		MG/KG	IS11SS310001	35/51	0.37 - 1.2	4.3	N/A	0.875 C	4.51	SSL	YES	ASL
191-24-2	Benzo(g,h,i)perylene	0.061	J	0.6		MG/KG	IS11SB440002	10/51	0.37 - 1.2	0.6	N/A	235 N	N/A		NO	BSL
207-08-9	Benzo(k)fluoranthene	0.023	J	2.2		MG/KG	IS11SS100001	32/51	0.37 - 1.2	2.2	N/A	8.75 C	45.1	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	0.011	J	0.096	J	MG/KG	IS11SS230001	3/51	0.37 - 1.2	0.096	N/A	1,564 N	1700	SSL	NO	BSL
86-74-8	Carbazole	0.013	J	0.21	J	MG/KG	IS11SS310001	12/51	0.37 - 1.2	0.21	N/A	31.9 C	0.47	SSL	NO	BSL
218-01-9	Chrysene	0.03	J	3.5		MG/KG	IS11SS100001	34/51	0.37 - 1.2	3.5	N/A	87.5 C	146	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	0.035	J	0.29	J	MG/KG	IS11SS220001	6/51	0.37 - 1.2	0.29	N/A	782 N	496	SSL	NO	BSL
117-84-0	Di-n-octylphthalate	0.012	J	0.59	L	MG/KG	IS11SS250001	8/51	0.37 - 1.2	0.59	N/A	156 N	240000	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.018	J	0.59	J	MG/KG	IS11SS310001 IS11SS250001	23/51	0.37 - 1.2	0.59	N/A	0.0875 C	139	SSL	YES	ASL
132-64-9	Dibenzofuran	0.009	J	0.13	J	MG/KG	IS11SS310001	7/51	0.37 - 1.2	0.13	N/A	16 N	0.77	SSL	NO	BSL
84-66-2	Diethylphthalate	0.018	J	0.37	J	MG/KG	IS11SB510002	10/51	0.37 - 1.2	0.37	N/A	6,257 N	45	SSL	NO	BSL
131-11-3	Dimethyl phthalate	0.38	J	0.38	J	MG/KG	IS11SS440001	1/51	0.37 - 1.2	0.38	N/A	78,214 N	N/A		NO	BSL
206-44-0	Fluoranthene	0.009	J	6.8		MG/KG	IS11SS100001	39/51	0.37 - 1.2	6.8	N/A	313 N	625	SSL	NO	BSL

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 11 Soil*

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
86-73-7	Fluorene	0.013	J	0.59		MG/KG	IS11SS250001	11/51	0.37 - 1.2	0.59	N/A	313 N	N/A		NO	BSL
118-74-1	Hexachlorobenzene	0.59		0.59		MG/KG	IS11SS250001	1/51	0.37 - 1.2	0.59	N/A	0.399 C	0.052	SSL	YES	ASL
87-68-3	Hexachlorobutadiene	0.59		0.59		MG/KG	IS11SS250001	1/51	0.37 - 1.2	0.59	N/A	8.2 C	8.2	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.018	J	0.99	J	MG/KG	IS11SS310001	32/51	0.37 - 1.2	0.99	N/A	0.875 C	12.7	SSL	YES	ASL
91-20-3	Naphthalene	0.012	J	0.065	J	MG/KG	IS11SS230001	8/51	0.37 - 1.2	0.065	N/A	156 N	0.015	SSL	NO	BSL
85-01-8	Phenanthrene	0.016	J	3.1		MG/KG	IS11SS100001	33/51	0.37 - 1.2	3.1	N/A	235 N	N/A		NO	BSL
108-95-2	Phenol	0.12	J	0.16	J	MG/KG	IS11SS210001	2/51	0.37 - 1.2	0.16	N/A	2,300 N	13	SSL	NO	BSL
129-00-0	Pyrene	0.027	J	2.4		MG/KG	IS11SS100001	34/51	0.37 - 1.2	2.4	N/A	235 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.047	J	4.5	D	MG/KG	IS11SB520406	21/51	0.37 - 1.2	4.5	N/A	45.6 C	2890	SSL	NO	BSL
86-30-6	n-Nitrosodiphenylamine	0.066	J	0.13	J	MG/KG	IS11SS290001	3/51	0.37 - 1.2	0.13	N/A	130 C	0.76	SSL	NO	BSL
99-65-0	1,3-Dinitrobenzene	0.033	J	0.033	J	MG/KG	IS11SB120103	1/51	0.25 - 1	0.033	N/A	0.782 N	0.0037	SSL	NO	BSL
118-96-7	2,4,6-Trinitrotoluene	0.36		0.36		MG/KG	IS11SS260001	1/51	0.25 - 1	0.36	N/A	2.10E+01 C	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	0.15	J	0.15	J	MG/KG	IS11SS100001	1/51	0.25 - 1	0.15	N/A	15.6 N	0.057	SSL	NO	BSL
606-20-2	2,6-Dinitrotoluene	0.09	J	0.098	J	MG/KG	IS11SS270001P	2/51	0.25 - 1	0.098	N/A	7.82 N	0.025	SSL	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	0.13	J	0.13	J	MG/KG	IS11SS260001	1/51	0.25 - 1	0.13	N/A	0.47 N	N/A		NO	BSL
88-72-2	2-Nitrotoluene	0.17	J	0.17	J	MG/KG	IS11SS250001	1/51	0.25 - 1	0.17	N/A	78.2 N	N/A		NO	BSL
19406-51-0	4-Amino-2,6-dinitrotoluene	0.17	J	0.17	J	MG/KG	IS11SS260001	1/51	0.25 - 1.2	0.17	N/A	0.47 N	N/A		NO	BSL
2691-41-0	HMX	0.22	J	3.7		MG/KG	IS11SS260001	3/51	0.5 - 1	3.7	N/A	391 N	N/A		NO	BSL
55-63-0	Nitroglycerin	27		27		MG/KG	IS11SS440001P	1/51	1.1 - 10	27	N/A	45.6 C	N/A		NO	BSL
14797-73-0	Perchlorate	0.11		480		MG/KG	IS11SS260001	4/51	0.0046 - 0.16	480	N/A	21 N	N/A		YES	ASL
121-82-4	RDX	0.19	J	0.86		MG/KG	IS11SS270001P	4/51	0.5 - 1	0.86	N/A	5.81 C	N/A		NO	BSL
7429-90-5	Aluminum	2,410		25,600		MG/KG	IS11SS260001	51/51	4.2 - 80.808	25600	N/A	7,821 N	N/A		YES	ASL
7440-36-0	Antimony	0.39	L	18.9	L	MG/KG	IS11SS170001 IS11SS310001	28/49	0.96 - 24.242	18.9	N/A	3.13 N	1.32	SSL	YES	ASL
7440-38-2	Arsenic	1.7	J	42.7	L	MG/KG	IS11SS260001	50/51	0.81 - 4.04	42.7	N/A	0.426 C	0.0261	SSL	YES	ASL
7440-39-3	Barium	7.9	J	367		MG/KG	IS11SS160001	51/51	0.09 - 80.808	367	N/A	548 N	211	SSL	NO	BSL
7440-41-7	Beryllium	0.049		0.83	J	MG/KG	IS11SB500608	22/51	0.045 - 2.02	0.83	N/A	15.6 N	120	SSL	NO	BSL
7440-43-9	Cadmium	0.11	J	147	J	MG/KG	IS11SS270001	43/51	0.09 - 2.02	147	N/A	3.91 N	5.5	SSL	YES	ASL
7440-70-2	Calcium	168	J	184,000	J	MG/KG	IS11SS340001	48/51	1.8 - 2020.2	184000	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	3.6	L	156	L	MG/KG	IS11SS260001	51/51	0.45 - 4.04	156	N/A	23.5 N	4.2	SSL	YES	ASL
7440-48-4	Cobalt	2.6	J	28.2	L	MG/KG	IS11SS060001	49/51	0.49 - 20.202	28.2	N/A	160 N	N/A		NO	BSL
7440-50-8	Copper	2.1	J	4,960	J	MG/KG	IS11SS240001	51/51	0.43 - 10.101	4960	N/A	313 N	1050	SSL	YES	ASL
57-12-5	Cyanide	0.09	J	0.52	J	MG/KG	IS11SS260001	11/31	0.56 - 2.8	0.52	N/A	156 N	14.7	SSL	NO	BSL
7439-89-6	Iron	5,770		263,000		MG/KG	IS11SS100001	51/51	6.1 - 46.62	263000	N/A	2,300 N	N/A		YES	ASL
7439-92-1	Lead	2.6	J	132,000		MG/KG	IS11SS220001	51/51	0.29 - 29.2	132000	N/A	400	N/A		YES	ASL
7439-95-4	Magnesium	188	J	11,500		MG/KG	IS11SS270001	51/51	3 - 2020.2	11500	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	19.1	J	1,330		MG/KG	IS11SS100001	51/51	0.09 - 6.061	1330	N/A	156 N	95.2	SSL	YES	ASL
7439-97-6	Mercury	0.066	UL	42	L	MG/KG	IS11SS150001	38/51	0.056 - 0.65	42	N/A	2.35 N	N/A		YES	ASL

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 11 Soil*

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-02-0	Nickel	1.2	J	189		MG/KG	IS11SS150001	50/51	0.43 - 16.162	189	N/A	156 N	N/A		YES	ASL
7440-09-7	Potassium	95.7	J	1,290	J	MG/KG	IS11SS260001	50/51	11.7 - 2020.2	1290	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	0.86	J	5.7		MG/KG	IS11SS510001	20/51	0.96 - 3.2	5.7	N/A	39.1 N	1.9	SSL	NO	BSL
7440-22-4	Silver	0.21	J	62.5		MG/KG	IS11SS310001	36/51	0.69 - 4.04	62.5	N/A	39.1 N	3.1	SSL	YES	ASL
7440-23-5	Sodium	120	J	3,430		MG/KG	IS11SS480001	28/51	98.3 - 2020.2	3430	N/A	N/A	N/A		NO	NUT
7440-28-0	Thallium	1.3	J	5.5		MG/KG	IS11SS220001	5/37	1.2 - 4.04	5.5	N/A	0.548 N	0.364	SSL	YES	ASL
7440-62-2	Vanadium	3.7	J	60.2		MG/KG	IS11SS310001	51/51	0.31 - 20.202	60.2	N/A	2.3 N	511	SSL	YES	ASL
7440-66-6	Zinc	12.4	J	10,000	J	MG/KG	IS11SS100001	51/51	0.13 - 8.081	10000	N/A	2,346 N	1360	SSL	YES	ASL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentration.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for residential soil, April 25, 2003, U.S. EPA Region III, Jennifer Hubbard.
Residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,I)perylene.
RBC value for mercuric chloride used for mercury.
RBC value for naphthalene used for acenaphthylene.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
Perchlorate screening toxicity value calculated using provisional RfD (see text).

[6] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic

N = Noncarcinogenic
SSL = Region III Soil Screening Level, for groundwater migration, DAF 20
Cancer benchmark value = 1E-06, adjusted HQ=0.1
(EPA Region III RBC Table)

Table 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
78-93-3	2-Butanone	1.1E-07	J	1.1E-07	J	MG/M3	IS11SB040608	1/51	0.011 - 0.064	1.1E-07	N/A	1.0E-01 N	0.79	SSL	NO	BSL
67-64-1	Acetone	1.6E-07	J	4.0E-06	J	MG/M3	IS11SS340001	11/51	0.011 - 0.064	4.0E-06	N/A	3.3E-01 N	0.25	SSL	NO	BSL
74-83-9	Bromomethane	1.5E-12	J	1.5E-12	J	MG/M3	IS11SB530002 IS11SS510001	5/51	0.011 - 0.064	1.5E-12	N/A	5.1E-04 N	0.0001	SSL	NO	BSL
75-15-0	Carbon disulfide	6.47E-07	J	6.47E-07	J	MG/M3	IS11SB490002P	1/51	0.011 - 0.064	6.5E-07	N/A	7.3E-02 N	1.9	SSL	NO	BSL
74-87-3	Chloromethane	4.65E-07	J	5.42E-07	J	MG/M3	IS11SS500001	2/51	0.011 - 0.064	5.4E-07	N/A	9.5E-02 C	0.001	SSL	NO	BSL
110-82-7	Cyclohexane	3.4E-07	J	1.9E-06	J	MG/M3	IS11SB120103	4/51	0.011 - 0.064	1.9E-06	N/A	N/A	N/A		NO	NTX
79-20-9	Methyl acetate	1.1E-12		1.8E-11	J	MG/M3	IS11SS180001	11/51	0.011 - 0.064	1.8E-11	N/A	3.7E-01 N	2.5	SSL	NO	BSL
75-09-2	Methylene chloride	5.47E-07	J	2.05E-06	J	MG/M3	IS11SB440002	9/51	0.011 - 0.064	2.1E-06	N/A	3.8E-03 C	0.0019	SSL	NO	BSL
100-42-5	Styrene	1.3E-06	J	1.8E-06	J	MG/M3	IS11SS170001	2/51	0.011 - 0.064	1.8E-06	N/A	1.0E-01 N	5.7	SSL	NO	BSL
108-88-3	Toluene	3.1E-07		3.1E-07		MG/M3	IS11SS280001	1/51	0.011 - 0.064	3.1E-07	N/A	4.2E-02 N	0.879	SSL	NO	BSL
79-01-6	Trichloroethene	2.1E-07	J	2.3E-06	J	MG/M3	IS11SS330001P	4/51	0.011 - 0.064	2.3E-06	N/A	1.6E-05 C	0.000026	SSL	NO	BSL
1330-20-7	Xylene, total	2.4E-07	J	2.4E-07	J	MG/M3	IS11SB120103	1/51	0.011 - 0.064	2.4E-07	N/A	7.3E-01 N	17	SSL	NO	BSL
10061-01-5	cis-1,3-Dichloropropene	1.4E-11	UJ	1.4E-11	UJ	MG/M3	IS11SS250001 IS11SS350001	1/51	0.011 - 0.064	1.4E-11	N/A	N/A	N/A		NO	NTX
10061-02-6	trans-1,3-Dichloropropene	7.5E-06	UJ	7.5E-06	UJ	MG/M3	IS11SS250001 IS11SS350001	1/51	0.011 - 0.064	7.5E-06	N/A	N/A	0.003	SSL	NO	NTX
91-57-6	2-Methylnaphthalene	1.6E-07	J	1.7E-06	J	MG/M3	IS11SS310001	9/51	0.37 - 1.2	1.7E-06	N/A	7.3E-03 N	2.2	SSL	NO	BSL
99-99-0	4-Nitrotoluene	9.1E-11	J	1.9E-10		MG/M3	IS11SS140001	2/13	0.25 - 0.25	1.9E-10	N/A	3.7E-03 N	N/A		NO	BSL
83-32-9	Acenaphthene	6.0E-08	J	8.8E-07	J	MG/M3	IS11SS310001	9/51	0.37 - 1.2	8.8E-07	N/A	2.2E-02 N	10	SSL	NO	BSL
208-96-8	Acenaphthylene	1.5E-07	J	4.3E-06	J	MG/M3	IS11SB440002	9/51	0.37 - 1.2	4.3E-06	N/A	0.329 N	N/A		NO	BSL
98-86-2	Acetophenone	3.6E-11	J	5.8E-10		MG/M3	IS11SS140001	17/51	0.37 - 1.2	5.8E-10	N/A	3.7E-02 N	0.0000218	SSL	NO	BSL
120-12-7	Anthracene	1.1E-08	J	6.5E-07	J	MG/M3	IS11SS100001	22/51	0.37 - 1.2	6.5E-07	N/A	1.1E-01 N	47	SSL	NO	BSL
100-52-7	Benzaldehyde	0.0E+00	J	0.0E+00	J	MG/M3	IS11SS210001	29/51	0.37 - 1.2	0.0E+00	N/A	3.7E-02 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	1.6E-11	J	2.5E-09		MG/M3	IS11SS100001	34/51	0.37 - 1.2	2.5E-09	N/A	8.6E-06 C	1.46	SSL	NO	BSL
50-32-8	Benzo(a)pyrene	1.6E-11	J	8.3E-10		MG/M3	IS11SB440002	30/51	0.37 - 1.2	8.3E-10	N/A	2.0E-06 C	0.374	SSL	NO	BSL
205-99-2	Benzo(b)fluoranthene	1.4E-11	J	3.3E-09		MG/M3	IS11SS310001	35/51	0.37 - 1.2	3.3E-09	N/A	8.6E-06 C	4.51	SSL	NO	BSL
191-24-2	Benzo(g,h,i)perylene	1.2E-08	J	1.2E-07		MG/M3	IS11SB440002	10/51	0.37 - 1.2	1.2E-07	N/A	11.0 N	N/A			
207-08-9	Benzo(k)fluoranthene	1.7E-11	J	1.7E-09		MG/M3	IS11SS100001	32/51	0.37 - 1.2	1.7E-09	N/A	8.6E-05 C	45.1	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	8.3E-12	J	7.3E-11	J	MG/M3	IS11SS230001	3/51	0.37 - 1.2	7.3E-11	N/A	7.3E-02 N	1700	SSL	NO	BSL
86-74-8	Carbazole	9.8E-12	J	1.6E-10	J	MG/M3	IS11SS310001	12/51	0.37 - 1.2	1.6E-10	N/A	3.1E-04 C	0.47	SSL	NO	BSL
218-01-9	Chrysene	2.3E-11	J	2.7E-09		MG/M3	IS11SS100001	34/51	0.37 - 1.2	2.7E-09	N/A	8.6E-04 C	146	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	2.7E-11	J	2.2E-10	J	MG/M3	IS11SS220001	6/51	0.37 - 1.2	2.2E-10	N/A	3.7E-02 N	496	SSL	NO	BSL
117-84-0	Di-n-octylphthalate	9.1E-12	J	4.5E-10	L	MG/M3	IS11SS250001	8/51	0.37 - 1.2	4.5E-10	N/A	7.3E-03 N	240000	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.4E-11	J	4.5E-10	J	MG/M3	IS11SS310001 IS11SS250001	23/51	0.37 - 1.2	4.5E-10	N/A	8.6E-07 C	139	SSL	NO	BSL
132-64-9	Dibenzofuran	3.5E-08	J	5.0E-07	J	MG/M3	IS11SS310001	7/51	0.37 - 1.2	5.0E-07	N/A	7.3E-04 N	0.77	SSL	NO	BSL
84-66-2	Diethylphthalate	1.4E-11	J	2.8E-10	J	MG/M3	IS11SB510002	10/51	0.37 - 1.2	2.8E-10	N/A	2.9E-01 N	45	SSL	NO	BSL
131-11-3	Dimethyl phthalate	2.9E-10	J	2.9E-10	J	MG/M3	IS11SS440001	1/51	0.37 - 1.2	2.9E-10	N/A	3.7E+00 N	N/A			
206-44-0	Fluoranthene	6.8E-12	J	5.2E-09		MG/M3	IS11SS100001	39/51	0.37 - 1.2	5.2E-09	N/A	1.5E-02 N	625	SSL	NO	BSL

Table 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
86-73-7	Fluorene	2.0E-08	J	8.9E-07		MG/M3	IS11SS250001	11/51	0.37 - 1.2	8.9E-07	N/A	1.5E-02 N	N/A		NO	BSL
118-74-1	Hexachlorobenzene	4.5E-10		4.5E-10		MG/M3	IS11SS250001	1/51	0.37 - 1.2	4.5E-10	N/A	3.9E-06 C	0.052	SSL	NO	BSL
87-68-3	Hexachlorobutadiene	4.5E-10		4.5E-10		MG/M3	IS11SS250001	1/51	0.37 - 1.2	4.5E-10	N/A	8.0E-05 C	8.2	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.4E-11	J	7.5E-10	J	MG/M3	IS11SS310001	32/51	0.37 - 1.2	7.5E-10	N/A	8.6E-06 C	12.7	SSL	NO	BSL
91-20-3	Naphthalene	1.7E-07	J	9.0E-07	J	MG/M3	IS11SS230001	8/51	0.37 - 1.2	9.0E-07	N/A	3.3E-04 N	0.015	SSL	NO	BSL
85-01-8	Phenanthrene	1.2E-11	J	2.3E-09		MG/M3	IS11SS100001	33/51	0.37 - 1.2	2.3E-09	N/A	1.1E-02 N	N/A		NO	BSL
108-95-2	Phenol	9.1E-11	J	1.2E-10	J	MG/M3	IS11SS210001	2/51	0.37 - 1.2	1.2E-10	N/A	1.1E-01 N	13	SSL	NO	BSL
129-00-0	Pyrene	5.5E-09	J	4.9E-07		MG/M3	IS11SS100001	34/51	0.37 - 1.2	4.9E-07	N/A	1.1E-02 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	3.6E-11	J	3.4E-09	D	MG/M3	IS11SB520406	21/51	0.37 - 1.2	3.4E-09	N/A	4.5E-04 C	2890	SSL	NO	BSL
86-30-6	n-Nitrosodiphenylamine	5.0E-11	J	9.8E-11	J	MG/M3	IS11SS290001	3/51	0.37 - 1.2	9.8E-11	N/A	1.3E-03 C	0.76	SSL	NO	BSL
99-65-0	1,3-Dinitrobenzene	2.5E-11	J	2.5E-11	J	MG/M3	IS11SB120103	1/51	0.25 - 1	2.5E-11	N/A	3.7E-05 N	0.00037	SSL	NO	BSL
118-96-7	2,4,6-Trinitrotoluene	2.7E-10		2.7E-10		MG/M3	IS11SS260001	1/51	0.25 - 1	2.7E-10	N/A	2.1E-04 C	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	1.1E-10	J	1.1E-10	J	MG/M3	IS11SS100001	1/51	0.25 - 1	1.1E-10	N/A	7.3E-04 N	0.057	SSL	NO	BSL
606-20-2	2,6-Dinitrotoluene	6.8E-11	J	7.4E-11	J	MG/M3	IS11SS270001P	2/51	0.25 - 1	7.4E-11	N/A	3.7E-04 N	0.025	SSL	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	9.8E-11	J	9.8E-11	J	MG/M3	IS11SS260001	1/51	0.25 - 1	9.8E-11	N/A	N/A	N/A		NO	NTX
88-72-2	2-Nitrotoluene	1.3E-10	J	1.3E-10	J	MG/M3	IS11SS250001	1/51	0.25 - 1	1.3E-10	N/A	3.7E-03 N	N/A		NO	BSL
19406-51-0	4-Amino-2,6-dinitrotoluene	1.3E-10	J	1.3E-10	J	MG/M3	IS11SS260001	1/51	0.25 - 1.2	1.3E-10	N/A	N/A	N/A		NO	NTX
2691-41-0	HMX	1.7E-10	J	2.8E-09		MG/M3	IS11SS260001	3/51	0.5 - 1	2.8E-09	N/A	1.8E-02	N/A		NO	BSL
55-63-0	Nitroglycerin	2.0E-08		2.0E-08		MG/M3	IS11SS440001P	1/51	1.1 - 10	2.0E-08	N/A	4.5E-04 N	N/A		NO	BSL
14797-73-0	Perchlorate	8.3E-11		3.6E-07		MG/M3	IS11SS260001	4/51	0.0046 - 0.16	3.6E-07	N/A	N/A	N/A		NO	NTX
121-82-4	RDX	1.4E-10	J	6.5E-10		MG/M3	IS11SS270001P	4/51	0.5 - 1	6.5E-10	N/A	5.7E-05 C	N/A		NO	BSL
7429-90-5	Aluminum	1.8E-06		1.9E-05		MG/M3	IS11SS260001	51/51	4.2 - 80.808	1.9E-05	N/A	3.7E-04 N	N/A		NO	BSL
7440-36-0	Antimony	3.0E-10	L	1.4E-08	L	MG/M3	IS11SS170001 IS11SS310001	28/49	0.96 - 24.242	1.4E-08	N/A	1.5E-04 N	1.32	SSL	NO	BSL
7440-38-2	Arsenic	1.3E-09	J	3.2E-08	L	MG/M3	IS11SS260001	50/51	0.81 - 4.04	3.2E-08	N/A	4.1E-07 C	0.0261	SSL	NO	BSL
7440-39-3	Barium	6.0E-09	J	2.8E-07		MG/M3	IS11SS160001	51/51	0.09 - 80.808	2.8E-07	N/A	5.1E-05 N	211	SSL	NO	BSL
7440-41-7	Beryllium	3.7E-11		6.3E-10	J	MG/M3	IS11SB500608	22/51	0.045 - 2.02	6.3E-10	N/A	7.5E-07 C	120	SSL	NO	BSL
7440-43-9	Cadmium	8.3E-11	J	1.1E-07	J	MG/M3	IS11SS270001	43/51	0.09 - 2.02	1.1E-07	N/A	9.9E-07 C	5.5	SSL	NO	BSL
7440-70-2	Calcium	1.3E-07	J	1.4E-04	J	MG/M3	IS11SS340001	48/51	1.8 - 2020.2	1.4E-04	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	2.7E-09	L	1.2E-07	L	MG/M3	IS11SS260001	51/51	0.45 - 4.04	1.2E-07	N/A	1.5E-07 C	4.2	SSL	NO	BSL
7440-48-4	Cobalt	2.0E-09	J	2.1E-08	L	MG/M3	IS11SS060001	49/51	0.49 - 20.202	2.1E-08	N/A	6.4E-08 N	N/A		NO	BSL
7440-50-8	Copper	1.6E-09	J	3.8E-06	J	MG/M3	IS11SS240001	51/51	0.43 - 10.101	3.8E-06	N/A	1.5E-02 N	1050	SSL	NO	BSL
57-12-5	Cyanide	6.8E-11	J	3.9E-10	J	MG/M3	IS11SS260001	11/31	0.56 - 2.8	3.9E-10	N/A	7.3E-03 N	14.7	SSL	NO	BSL
7439-89-6	Iron	4.4E-06		2.0E-04		MG/M3	IS11SS100001	51/51	6.1 - 46.62	2.0E-04	N/A	1.1E-01 N	N/A		NO	BSL
7439-92-1	Lead	2.0E-09	J	1.0E-04		MG/M3	IS11SS220001	51/51	0.29 - 29.2	1.0E-04	N/A	N/A	N/A		NO	NTX
7439-95-4	Magnesium	1.4E-07	J	8.7E-06		MG/M3	IS11SS270001	51/51	3 - 2020.2	8.7E-06	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	1.4E-08	J	1.0E-06		MG/M3	IS11SS100001	51/51	0.09 - 6.061	1.0E-06	N/A	5.2E-06 N	95.2	SSL	NO	BSL
7439-97-6	Mercury	5.0E-11	UL	3.2E-08	L	MG/M3	IS11SS150001	38/51	0.056 - 0.65	3.2E-08	N/A	3.1E-05 N	N/A		NO	BSL

Table 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-02-0	Nickel	9.1E-10	J	1.4E-07		MG/M3	IS11SS150001	50/51	0.43 - 16.162	1.4E-07	N/A	7.3E-03 N	N/A		NO	BSL
7440-09-7	Potassium	7.3E-08	J	9.8E-07	J	MG/M3	IS11SS260001	50/51	11.7 - 2020.2	9.8E-07	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	6.5E-10	J	4.3E-09		MG/M3	IS11SS510001	20/51	0.96 - 3.2	4.3E-09	N/A	1.8E-03	1.9	SSL	NO	BSL
7440-22-4	Silver	1.6E-10	J	4.7E-08		MG/M3	IS11SS310001	36/51	0.69 - 4.04	4.7E-08	N/A	1.8E-03 N	3.1	SSL	NO	BSL
7440-23-5	Sodium	9.1E-08	J	2.6E-06		MG/M3	IS11SS480001	28/51	98.3 - 2020.2	2.6E-06	N/A	N/A	N/A		NO	NUT
7440-28-0	Thallium	9.8E-10	J	4.2E-09		MG/M3	IS11SS220001	5/37	1.2 - 4.04	4.2E-09	N/A	2.6E-05 N	0.364	SSL	NO	BSL
7440-62-2	Vanadium	2.8E-09	J	4.6E-08		MG/M3	IS11SS310001	51/51	0.31 - 20.202	4.6E-08	N/A	1.1E-04 N	511	SSL	NO	BSL
7440-66-6	Zinc	9.4E-09	J	7.6E-06	J	MG/M3	IS11SS100001	51/51	0.13 - 8.081	7.6E-06	N/A	1.1E-01 N	1360	SSL	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.2.A.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Ambient Air, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,I)perylene.
RBC value for mercuric chloride used for mercury.
RBC value for naphthalene used for acenaphthylene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.9.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 11, NDWIH

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
2-Butanone	9.03E-02	4.30E-04	3.84E-05	4.50E+00	2.70E-02	2.39E+05	
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	
Bromomethane	N/A	N/A	N/A	N/A	N/A	N/A	
Carbon Disulfide	1.04E-01	1.24E+00	1.00E-05	4.57E+01	2.74E-01	1.19E+03	
Chloromethane	1.10E-01	1.80E+00	1.05E-05	3.50E+01	2.10E-01	6.50E+03	
Cyclohexane	8.39E-02	7.84E+00	9.10E-06	9.63E+02	5.78E+00	5.50E+01	
Methyl acetate	N/A	N/A	N/A	N/A	N/A	N/A	
Methylene Chloride	8.98E-02	1.17E-05	1.17E01	9.63E+02	5.78E+00	1.30E04	
Styrene	7.10E-02	1.13E-01	8.00E-06	7.76E+02	4.66E+00	3.10E+02	
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E00	5.26E+02	
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	
Xylene, total	7.80E-02	2.76E-01	8.75E-06	3.86E+02	2.32E00	1.75E+02	
cis-1,3-Dichloropropene	N/A	N/A	N/A	N/A	N/A	N/A	
trans-1,3-Dichloropropene	6.26E-02	7.26E-01	1.00E-05	4.57E+01	2.74E-01	2.80E+03	
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E01	2.54E+01	
4-Nitrotoluene	N/A	5.77E-06	N/A	1.51E+01	9.08E-02	1.60E+03	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E01	4.24E+00	
Acetophenone	N/A	4.99E-04	N/A	4.68E+01	2.81E-01	1.66E+03	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Dibenzofuran	6.19E-02	3.98E-03	5.01E-06	5.48E+03	3.29E+01	5.65E+00	
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	MG/KG	0.473	0.670	3.30		MG/KG	0.606	95% UCL-T	W-Test (4)	0.265	Mean-T	W-Test (4)
Benzo(a)pyrene	MG/KG	0.231	0.277	0.860	J	MG/KG	0.298	95% UCL-T	W-Test (1)	0.181	Mean-T	W-Test (1)
Benzo(b)fluoranthene	MG/KG	0.640	0.897	4.30		MG/KG	0.867	95% UCL-T	W-Test (1)	0.361	Mean-T	W-Test (1)
Dibenz(a,h)anthracene	MG/KG	0.196	0.231	0.590	J	MG/KG	0.287	95% UCL-T	W-Test (4)	0.148	Mean-T	W-Test (4)
Hexachlorobenzene	MG/KG	0.271	0.302	0.590		MG/KG	0.296	95% UCL-T	W-Test (4)	0.252	Mean-T	W-Test (4)
Indeno(1,2,3-cd)pyrene	MG/KG	0.215	0.263	0.990	J	MG/KG	0.274	95% UCL-T	W-Test (1)	0.215	Mean-T	W-Test (1)
Perchlorate	MG/KG	12.4	33.2	480.000		MG/KG	0.587	95% UCL-T	W-Test (4)	0.085	Mean-T	W-Test (4)
Aluminum	MG/KG	9,706	11,196	25,600		MG/KG	11,496	95% UCL-T	W-Test (1)	9706	Mean-T	W-Test (1)
Antimony	MG/KG	4.33	5.84	18.9	L	MG/KG	9.76	95% UCL-T	W-Test (4)	1.84	Mean-T	W-Test (4)
Arsenic	MG/KG	10.9	13.6	42.7	L	MG/KG	18.32	95% UCL-T	W-Test (1)	10.93	Mean-T	W-Test (1)
Cadmium	MG/KG	19.3	28.7	147	J	MG/KG	147	Max	W-Test (2)	3.2	Mean-T	W-Test (4)
Chromium	MG/KG	36.0	46.8	156	L	MG/KG	52.3	95% UCL-T	W-Test (1)	22.2	Mean-T	W-Test (1)
Copper	MG/KG	525	813	4,960	J	MG/KG	2,975	95% UCL-T	W-Test (1)	96	Mean-T	W-Test (1)
Iron	MG/KG	45,003	60,315	263,000		MG/KG	61,677	95% UCL-T	W-Test (1)	27,174	Mean-T	W-Test (1)
Lead	MG/KG	4,020	9,709	132,000		MG/KG	9,067	95% UCL-T	W-Test (1)	215	Mean-T	W-Test (1)
Manganese	MG/KG	342	417	1,330		MG/KG	587.5	95% UCL-T	W-Test (4)	228.1	Mean-T	W-Test (4)
Mercury	MG/KG	1.83	3.66	42.0	L	MG/KG	3.38	95% UCL-T	W-Test (1)	0.298	Mean-T	W-Test (1)
Nickel	MG/KG	32.8	44.0	189		MG/KG	62.6	95% UCL-T	W-Test (1)	17.1	Mean-T	W-Test (1)
Silver	MG/KG	8.76	12.2	62.5		MG/KG	42.13	95% UCL-T	W-Test (1)	2.64	Mean-T	W-Test (1)
Thallium	MG/KG	1.13	1.46	5.50		MG/KG	1.33	95% UCL-T	W-Test (4)	0.88	Mean-T	W-Test (4)
Vanadium	MG/KG	24.6	27.4	60.2		MG/KG	27.39	95% UCL-N	W-Test (4)	24.6	Mean-N	W-Test (4)
Zinc	MG/KG	1,223	1,824	10,000	J	MG/KG	5,291	95% UCL-T	W-Test (1)	292.9	Mean-T	W-Test (1)

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

Table 3.2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman and Unnamed Creeks

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Antimony	UG/L	5.49	11.7	35.8	J	UG/L	9.90	95% UCL-T	W-Test (4)	2.80	Mean-T	W-Test (4)
Arsenic	UG/L	2.30	3.47	8.00	J	UG/L	3.3	95% UCL-T	W-Test (4)	1.93	Mean-T	W-Test (4)
Lead	UG/L	7.51	13.97	38.4		UG/L	19.1	95% UCL-T	W-Test (1)	4.31	Mean-T	W-Test (1)
Thallium	UG/L	3.61	5.22	11.5		UG/L	11.5	95% UCL-T	W-Test (4)	3.16	Mean-N	W-Test (4)
Vanadium	UG/L	5.21	10.71	32.1		UG/L	11.5	95% UCL-T	W-Test (4)	2.66	Mean-T	W-Test (4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

(5) Maximum detected concentration used because sample size is less than 5.

(6) Mean value used because sample size is less than 5.

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	UG/L	4.43	5.54	1.000	J	UG/L	1.0	Max	W-Test (2)	1.0	Max	W-Test (2)
Bromomethane	UG/L	4.57	5.40	2.00	J	UG/L	2	Max	W-Test (2)	2	Max	W-Test (2)
Chloroethane	UG/L	4.83	5.16	3.80	J	UG/L	3.8	Max	W-Test (2)	3.8	Max	W-Test (2)
4-Methylphenol	UG/L	7.30	13.8	23.0		UG/L	23	Max	W-Test (2)	4.76	Mean-T	W-Test (1)
Aluminum	UG/L	5,378	13,822	31,400		UG/L	31400	Max	W-Test (2)	953.4	Mean-T	W-Test (1)
Antimony	UG/L	2.35	3.28	4.20		UG/L	4.7	95% UCL-T	W-Test (4)	2.03	Mean-T	W-Test (4)
Arsenic	UG/L	3.27	5.19	8.20		UG/L	8.2	Max	W-Test (2)	2.44	Mean-T	W-Test (4)
Barium	UG/L	487	897	1,680		UG/L	1680	Max	W-Test (2)	323.8	Mean-T	W-Test (1)
Chromium	UG/L	12.7	28.1	59.6		UG/L	59.6	Max	W-Test (2)	5.64	Mean-T	W-Test (1)
Iron	UG/L	32,784	44,497	51,000	L	UG/L	44,497	95% UCL-N	W-Test (4)	32,784	Mean-N	W-Test (4)
Lead	UG/L	23	43	79		UG/L	232	95% UCL-T	W-Test (1)	13.46	Mean-T	W-Test (1)
Manganese	UG/L	1,874	2,637	3,020		UG/L	2,637	95% UCL-N	W-Test (3)	1,873	Mean-N	W-Test (3)
Nickel	UG/L	19.4	48.8	110		UG/L	110	Max	W-Test (4)	6.23	Mean-T	W-Test (4)
Vanadium	UG/L	10.3	24.9	55.4	J	UG/L	55.4	Max	W-Test (2)	3.46	Mean-T	W-Test (4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

(5) Maximum detected concentration used because sample size is less than 5.

(6) Mean value used because sample size is less than 5.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water at Excavation Pit

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	UG/L	4.43	5.54	1.000	J	UG/L	1.0	Max	W-Test (2)	1.0	Max	W-Test (2)
Bromomethane	UG/L	4.57	5.40	2.00	J	UG/L	2	Max	W-Test (2)	2	Max	W-Test (2)
Chloroethane	UG/L	4.83	5.16	3.80	J	UG/L	3.8	Max	W-Test (2)	3.8	Max	W-Test (2)
4-Methylphenol	UG/L	7.30	13.8	23.0		UG/L	23	Max	W-Test (2)	4.76	Mean-T	W-Test (1)
Aluminum	UG/L	5,378	13,822	31,400		UG/L	31400	Max	W-Test (2)	953.4	Mean-T	W-Test (1)
Antimony	UG/L	2.35	3.28	4.20		UG/L	4.7	95% UCL-T	W-Test (4)	2.03	Mean-T	W-Test (4)
Arsenic	UG/L	3.27	5.19	8.20		UG/L	8.2	Max	W-Test (2)	2.44	Mean-T	W-Test (4)
Barium	UG/L	487	897	1,680		UG/L	1680	Max	W-Test (2)	323.8	Mean-T	W-Test (1)
Chromium	UG/L	12.7	28.1	59.6		UG/L	59.6	Max	W-Test (2)	5.64	Mean-T	W-Test (1)
Iron	UG/L	32,784	44,497	51,000	L	UG/L	44,497	95% UCL-N	W-Test (4)	32,784	Mean-N	W-Test (4)
Lead	UG/L	23	43	79		UG/L	232	95% UCL-T	W-Test (1)	13.46	Mean-T	W-Test (1)
Manganese	UG/L	1,874	2,637	3,020		UG/L	2,637	95% UCL-N	W-Test (3)	1,873	Mean-N	W-Test (3)
Nickel	UG/L	19.4	48.8	110		UG/L	110	Max	W-Test (4)	6.23	Mean-T	W-Test (4)
Vanadium	UG/L	10.3	24.9	55.4	J	UG/L	55.4	Max	W-Test (2)	3.46	Mean-T	W-Test (4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water at Excavation Pit

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

(5) Maximum detected concentration used because sample size is less than 5.

(6) Mean value used because sample size is less than 5.

Table 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	UG/L	4.43	5.54	1.000	J	UG/L	1.0	Max	W-Test (2)	1.0	Max	W-Test (2)
Bromomethane	UG/L	4.57	5.40	2.00	J	UG/L	2	Max	W-Test (2)	2	Max	W-Test (2)
Chloroethane	UG/L	4.83	5.16	3.80	J	UG/L	3.80	Max	W-Test (2)	3.80	Max	W-Test (2)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

Table 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Excavation Pit

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	UG/L	4.43	5.54	1.000	J	UG/L	1.0	Max	W-Test (2)	1.0	Max	W-Test (2)
Bromomethane	UG/L	4.57	5.40	2.00	J	UG/L	2	Max	W-Test (2)	2	Max	W-Test (2)
Chloroethane	UG/L	4.83	5.16	3.80	J	UG/L	3.80	Max	W-Test (2)	3.80	Max	W-Test (2)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

Table 3.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 11 Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	MG/KG	0.422	0.579	3.30		MG/KG	0.521	95% UCL-T	W-Test (4)	0.235	Mean-T	W-Test (4)
Benzo(a)pyrene	MG/KG	0.235	0.281	1.10		MG/KG	0.297	95% UCL-T	W-Test (4)	0.181	Mean-T	W-Test (4)
Benzo(b)fluoranthene	MG/KG	0.555	0.758	4.30		MG/KG	0.764	95% UCL-T	W-Test (4)	0.296	Mean-T	W-Test (4)
Dibenz(a,h)anthracene	MG/KG	0.189	0.218	0.590	J	MG/KG	0.260	95% UCL-T	W-Test (4)	0.145	Mean-T	W-Test (4)
Hexachlorobenzene	MG/KG	0.256	0.281	0.590		MG/KG	0.274	95% UCL-T	W-Test (4)	0.242	Mean-T	W-Test (4)
Indeno(1,2,3-cd)pyrene	MG/KG	0.212	0.254	0.990	J	MG/KG	0.268	95% UCL-T	W-Test (1)	0.161	Mean-T	W-Test (1)
Perchlorate	MG/KG	9.50	25.280	480		MG/KG	0.317	95% UCL-T	W-Test (4)	0.076	Mean-T	W-Test (4)
Aluminum	MG/KG	9,389	10,577	25,600		MG/KG	10,721	95% UCL-T	W-Test (1)	8267	Mean-T	W-Test (1)
Antimony	MG/KG	3.67	4.88	18.9	L	MG/KG	7.57	95% UCL-T	W-Test (4)	1.43	Mean-T	W-Test (4)
Arsenic	MG/KG	10.0	12.2	42.7	L	MG/KG	15.0	95% UCL-T	W-Test (1)	6.62	Mean-T	W-Test (1)
Cadmium	MG/KG	15.3	22.6	147	J	MG/KG	145.2	95% UCL-T	W-Test (4)	2.10	Mean-T	W-Test (4)
Chromium	MG/KG	31.6	40.1	156	L	MG/KG	40.7	95% UCL-T	W-Test (1)	20.3	Mean-T	W-Test (1)
Copper	MG/KG	433	656	4,960	J	MG/KG	1,669	95% UCL-T	W-Test (1)	74.4	Mean-T	W-Test (1)
Iron	MG/KG	38,199	50,187	263,000		MG/KG	46,666	95% UCL-T	W-Test (1)	23624	Mean-T	W-Test (1)
Lead	MG/KG	3,123	7,452	132,000		MG/KG	4,782	95% UCL-T	W-Test (1)	157.6	Mean-T	W-Test (1)
Manganese	MG/KG	303	364	1,330		MG/KG	486.2	95% UCL-T	W-Test (1)	198.3	Mean-T	W-Test (1)
Mercury	MG/KG	1.43	2.82	42.0	L	MG/KG	1.822	95% UCL-T	W-Test (1)	0.22	Mean-T	W-Test (1)
Nickel	MG/KG	27.8	36.5	189		MG/KG	42.78	95% UCL-T	W-Test (1)	14.9	Mean-T	W-Test (1)
Silver	MG/KG	7.19	9.93	62.5		MG/KG	28.7	95% UCL-T	W-Test (1)	1.92	Mean-T	W-Test (1)
Thallium	MG/KG	1.09	1.40	5.50		MG/KG	1.259	95% UCL-T	W-Test (4)	0.86	Mean-T	W-Test (4)
Vanadium	MG/KG	24.1	26.3	60.2		MG/KG	26.3	95% UCL-N	W-Test (4)	24.08	Mean-N	W-Test (4)
Zinc	MG/KG	998	1,465	10,000	J	MG/KG	2,986	95% UCL-T	W-Test (1)	225.9	Mean-T	W-Test (1)

Table 3.7

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 11 Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale

* Surface soil & subsurface soil combined.

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997, (4)	3,700	EPA, 1997, (4)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (5)	0.11	EPA, 1997, (5)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) Surface area is 25% of total surface area for 12-15 year old male. 95th percentile for total surface area is 1.85 m^2, 50th percentile for total surface area is 1.49 m^2.

(5) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (2)	5,700	EPA, 1997, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area is based on trespasser wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.

(3) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997, (2)	0.32	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) SSAF based on maximum adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman and Unnamed Creeks
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.2	- -	see Table 3.2	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	l/hour	0.08	EPA, 1989	0.08	EPA, 1989	CSW x IR-SW x ET x EF x ED x CF1 x
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	EPA, 1989	1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.2	- -	see Table 3.2	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	20,000	EPA, 1992, (2)	18,000	EPA, 1997b, (2)	CSW x SA x PC x CF1 x ET x EF x ED x CF2 x 1/BW x 1/AT
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	EPA, 1989	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1991	
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm2, with a mean of 20,000 cm2; the mean is used.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman and Unnamed Creeks
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.2	- -	see Table 3.2	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	l/hour	0.08	EPA, 1989	0.08	EPA, 1989	CSW x IR-SW x ET x EF x ED x CF1 x
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	EPA, 1989	1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.2	- -	see Table 3.2	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	7,930	EPA, 1997, (2)	6,980	EPA, 1997, (2)	CSW x SA x PC x CF1 x ET x EF x ED x
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	CF2 x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	EPA, 1989	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area based on the total body surface area for the male child aged 5-6 years for the RME. The CT is based on the average surface area between the 2-3 (6030) and 5-6 (7930) year old male child.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.3	…	see Table 3.3	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.3	…	see Table 3.3	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	20,000	EPA, 1992, (1)	18,000	EPA, 1997b, (1)	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	x CF1 x CF2
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm2, with a mean of 20,000 cm2; the mean is used.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.3	…	see Table 3.3	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	1	EPA, 1997a	1	EPA, 1997a	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.3	…	see Table 3.3	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	x CF1 x CF2
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.3	…	see Table 3.3	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W-A	Ingestion Rate of Water, Adult	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
	IR-W-C	Ingestion Rate of Water, Child	liters/day	1	EPA, 1997a	1	EPA, 1997a	
	IR-W-Adj	Ingestion Rate of Water, Age-adjusted	liter-year/kg-day	1.09	calculated	0.58	calculated	IR-W-Adj (liter-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-W-C / BW-C) + (ED-A x IR-W-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.3	…	see Table 3.3	see Table …	CDI (mg/kg-day) =
	DAevent-A	Dermally Absorbed Dose per Event, Adult	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x EF x 1/AT
	DAevent-C	Dermally Absorbed Dose per Event, Child	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	
	DA-Adj	Dermally Absorbed Dose, Age-adjusted	mg-year/event-kg	calculated		calculated		DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics:
	ET-A	Exposure Time, Adult	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	DAevent-A (mg/cm2-event) =
	ET-C	Exposure Time, Child	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET-A x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	DAevent-C (mg/cm2-event) =
	SA-A	Skin Surface Area, Adult	cm^2	20,000	EPA, 1992	18,000	EPA, 1997b	PC x CW x ET-C x CF1 x CF2
	SA-C	Skin Surface Area, Child	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	Organics:
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	DAevent-A (mg/cm2-event) =
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	2 x PC x CW x (sqrt((6 x t x ET-A)/3.1415)) x CF1 x CF2
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	DAevent-C (mg/cm2-event) =
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	2 x PC x CW x (sqrt((6 x t x ET-C)/3.1415)) x CF1 x CF2

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.4		see Table 3.4	chem. specific	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-day	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-day) =
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	PC x CW x ET x CF1 x CF2
	t*	Time to Reach Steady-state	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	B	Ratio of Permeability of Stratum Corneum to Epidermis	dimensionless	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Organics :
	ET	Exposure Time	hr/day	8	(1)	4	(1)	ET<t*: DAevent (mg/cm2-day) =
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (2)	2,000	EPA, 1992, (2)	x CF1 x CF2
	EF	Exposure Frequency	days/year	42	(3)	42	(3)	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	ET>t*: DAevent (mg/cm2-day) =
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	x CF1 x CF2
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgment based on construction activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(3) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Air

Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

Receptor Population: Resident

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	InhExp	Inhalation Exposure per Shower	mg/kg-shower	see Table 3.5	--	see Table 3.5	--	Foster & Chrostowski Shower Inhalation Model for InhExp
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	InhExp x EF x ED x 1/AT
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA. 1989	3,285	EPA. 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3	see Table 3.6	--	see Table 3.6	--	Two-Film Volatilization Model for CA
	IN	Inhalation Rate	$m^3/hour$	1.7	EPA, 1997	1.7	EPA, 1997	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	
	EF	Exposure Frequency	days/year	42	(2)	42	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1993	CA x IN x ET x EF x ED x 1/BW x 1/AT
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA. 1989	365	EPA. 1989	

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (1)	5,700	EPA, 1997, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997, (2)	0.2	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil
(1) Surface area based on resident wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is based on maximum adherence factor for gardeners.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,400	EPA, 1997, (1)	2,900	EPA, 1997, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (2)	0.11	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

* Surface and subsurface soil
(1) Surface area based on resident wearing shorts and short sleeve shirt. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S-Adj x EF x CF3 x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	EPA, 1993	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	114.29	calculated	46.43	calculated	IR-S-Adj (mg-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	see Table 3	CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, Adult	cm^2	6,600	EPA, 1997a	5,700	EPA, 1997a	CS x DA-Adj x DABS x CF3 x EF x 1/AT
	SA-C	Skin Surface Area Available for Contact, Child	cm^2	3,400	EPA, 1997b	2,900	EPA, 1997b	
	SSAF-A	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997a	0.2	EPA, 1992	DA-Adj (mg-year/kg-day) =
	SSAF-C	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997a	0.11	EPA, 1997a	[(ED-C x SA-C x SSAF-C / BW-C) +
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	602	calculated	274	calculated	(ED-A x SA-A x SSAF-A / BW-A)]
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

* Surface and subsurface soil

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.15

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	480	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.24	EPA, 1997, (2)	0.24	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

* Surface and subsurface soil
(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.
(2) Soil to skin adherence factor is based on maximum adherence factor for construction workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.20

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997, (2)	0.32	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	

* Surface and subsurface soil

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) SSAF based on maximum adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.21

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997, (4)	3,700	EPA, 1997, (4)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (5)	0.11	EPA, 1997, (5)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) Surface area is 25% of total surface area for 12-15 year old male. 95th percentile for total surface area is 1.85 m^2, 50th percentile for total surface area is 1.49 m^2.

(5) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.22

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (2)	5,700	EPA, 1997, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area is based on trespasser wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.

(3) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
1,1-Dichloroethene	Chronic	5.0E-02	mg/kg-day	1	5.0E-02	mg/kg-day	Liver	1000	IRIS	03/12/2001
	Subchronic	5.0E-02	mg/kg-day	1	5.0E-02	mg/kg-day	Liver	1000	HEAST	07/01/1997
4-Methylphenol	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	CNS, RESP & Whole Body	1000	HEAST	07/01/1997
	Subchronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	CNS, RESP & Whole Body	1000	HEAST	07/01/1997
Acetophenone	Chronic	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	NOAEL	3000	IRIS	06/02/2002
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	CNS	100	NCEA	08/26/1996
	Subchronic	N/A								
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Whole body/Blood	1000/1	IRIS	03/15/2001
	Subchronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Whole body/Blood	1000/1	HEAST	07/01/1997
Arsenic	Chronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin/vascular	3/1	IRIS	03/15/2001
	Subchronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin/vascular	3/1	HEAST	07/01/1997
Barium	Chronic	7.0E-02	mg/kg-day	0.07	4.9E-03	mg/kg-day	Cardiovascular	3	IRIS	03/12/2001
	Subchronic	7.0E-02	mg/kg-day	0.07	4.9E-03	mg/kg-day	Cardiovascular	3	HEAST	07/01/1997
Benzene	Chronic	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Blood	3000	NCEA	07/02/1996
Benzo(a)anthracene	Chronic	N/A								
Benzo(a)pyrene	Chronic	N/A								
Benzo(b)fluoranthene	Chronic	N/A								
Bromomethane	Chronic	1.4E-03	mg/kg-day	1	1.4E-03	mg/kg-day	NOAEL	1000	IRIS	06/02/2002
Cadmium (water) (for water)	Chronic	5.0E-04	mg/kg-day	0.025	1.3E-05	mg/kg-day	Kidney	10/1	IRIS	03/08/2001
	Subchronic	N/A								
Cadmium (food) (for soil)	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	03/08/2001
	Subchronic	N/A								
Chloroethane	Chronic	4.0E-01	mg/kg-day	1	4.0E-01	mg/kg-day	Fetus	10	NCEA	08/30/1996
	Subchronic	N/A								
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	NOAEL	300/3	IRIS	03/15/2001
	Subchronic	2.0E-02	mg/kg-day	0.025	5.0E-04	mg/kg-day	NOAEL	100	HEAST	07/01/1997
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal		HEAST	07/01/1997
	Subchronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal		HEAST	07/01/1997
Dibenzo(a,h)anthracene	Chronic	N/A								
Ethylbenzene	Chronic	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Liver/Kidney	1000	IRIS	06/02/2002
Hexachlorobenzene	Chronic	8.0E-04	mg/kg-day	1	8.0E-04	mg/kg-day	Liver	100	IRIS	03/15/2001
	Subchronic	N/A								
Indeno(1,2,3-cd)pyrene	Chronic	N/A								
Iron	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Gastrointestinal	1	NCEA	07/23/1996
Lead	Chronic	N/A								
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								
Manganese (food)	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Mercury	Chronic	N/A								
	Chronic	3.0E-04	mg/kg-day	0.07	2.1E-05	mg/kg-day	Kidney	1000	IRIS	03/12/2001
Mercuric chloride	Subchronic	3.0E-04	mg/kg-day	0.07	2.1E-05	mg/kg-day	Kidney	1000	HEAST	07/01/1997
	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Whole body	300	IRIS	03/12/2001
Nickel	Subchronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Whole body	300	HEAST	07/01/1997
	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Thyroid		NCEA	12/01/1998
Perchlorate	Subchronic									
	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3	IRIS	03/12/2001
Silver	Subchronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3	HEAST	07/01/1997
	Chronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin/vascular	3	EPA Region III	10/05/2000
Thallium	Subchronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin	3	HEAST	07/01/1997
	Chronic	1.0E-03	mg/kg-day	0.026	2.6E-05	mg/kg-day	Kidney	100	NCEA	05/01/2000
Vanadium	Subchronic	N/A								
	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Blood	3	IRIS	03/15/2001
Zinc	Subchronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Blood	3	HEAST	07/01/1997

N/A = Not Applicable or Not Available.

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

RESP = Respiratory System

CNS = Central Nervous System

NOAEL = No adverse effect level

TABLE 5.2

Site 11, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
1,1-Dichloroethene	Chronic	2.10E-01	mg/m3	6.0E-02	mg/kg-day	Liver	30/1	IRIS	10/13/2003
4-Methylphenol	Chronic	N/A							
Acetophenone	Chronic	N/A	mg/m3		mg/kg-day	NOAEL	3000	IRIS	06/21/2002
Aluminum	Chronic	3.50E-03	mg/m^3	1.00E-03	mg/kg-day	CNS	300	RBC	10/05/2000
	Subchronic	N/A							
Antimony	Chronic	N/A							
Arsenic	Chronic	N/A							
Barium	Chronic	4.90E-04	mg/m^3	1.40E-04	mg/kg-day	Cardiovascular		ATSDR	
	Subchronic	N/A							
Benzene	Chronic	3.0E-02	mg/m3	8.6E-03	mg/kg-day	Blood	N/A	NA:Reg. III RBC:N/A	N/A
	Subchronic	6.0E-02	mg/m3	1.7E-02	mg/kg-day	Blood	100	NCEA	07/02/1996
Benzo(a)anthracene	Chronic	N/A							
Benzo(a)pyrene	Chronic	N/A							
Benzo(b)fluoranthene	Chronic	N/A							
Bromomethane	Chronic	4.90E-03	mg/m3	1.4E-03	mg/kg-day	LOAEL	100	IRIS	06/06/2002
Cadmium	Chronic	2.00E-04	mg/m^3	5.70E-05	mg/kg-day	Kidney	10	NCEA	06/17/1998
	Subchronic	N/A							
Chloroethane	Chronic	1.00E+01	mg/m^3	2.90E+00	mg/kg-day	Fetus	300/1	IRIS	03/12/2001
	Subchronic	N/A							
Chromium (VI)	Chronic	1.1E-04	mg/m^3	3.0E-05	mg/kg-day	Respiratory	300	IRIS	03/12/2001
	Subchronic	1.05E-03	mg/m^3	3.00E-04	mg/kg-day	NOAEL	100	NCEA	11/18/1997
Copper	Chronic	N/A							
Dibenzo(a,h)anthracene	Chronic	N/A							
Ethylbenzene		1.02E+00	mg/m3	2.90E-01	mg/kg-day	NOAEL	300	IRIS	06/06/2002
Hexachlorobenzene	Chronic	N/A							
Indeno(1,2,3-cd)pyrene	Chronic	N/A							
Iron	Chronic	N/A							
Lead	Chronic	N/A							
	Chronic	5.01E-05	mg/m^3	1.43E-05	mg/kg-day	CNS	1000	IRIS	03/15/2001
Manganese	Subchronic	N/A							
Mercury	Chronic	3.01E-04	mg/m^3	8.6E-05	mg/kg-day	CNS	30	IRIS	03/15/2001
	Subchronic	3.0E-04	mg/m3	8.6E-05	mg/kg-day	CNS	30	HEAST	07/01/1997
Nickel	Chronic	N/A							
Perchlorate	Chronic	N/A							
Silver	Chronic	N/A							
Thallium	Chronic	N/A							
Vanadium	Chronic	N/A							
Zinc	Chronic	N/A							

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

TABLE 5.2

Site 11, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

NCEA = National Center for Environmental Assessment

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11, NDWIH

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
1,1-Dichloroethene	N/A						
4-Methylphenol	N/A						
Acetophenone	N/A				D	IRIS	06/06/2002
Aluminum	N/A					NCEA	08/26/1996
Antimony	N/A						
Arsenic	1.5E+00	1	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/2001
Barium	N/A				D	IRIS	03/08/2001
Benzene	5.5E-02	1	5.5E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	06/06/2002
Benzo(a)anthracene	7.3E-01	0.89	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Benzo(a)pyrene	7.3E+00	0.89	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/08/2001
Benzo(b)fluoranthene	7.3E-01	0.89	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Bromomethane	N/A				D	IRIS	06/06/2002
Cadmium	N/A				B1	IRIS	03/08/2001
Chloroethane	2.9E-03	1	2.9E-03	$(mg/kg\text{-}day)^{-1}$		NCEA	
Chromium (hexavalent)	N/A				D	IRIS	03/08/2001
Copper	N/A						
Dibenz(a,h)anthracene	7.3E+00	0.89	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Ethylbenzene	N/A				D	IRIS	06/06/2002
Hexachlorobenzene	1.6E+00	1	1.6E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/08/2001
Indeno(1,2,3-cd)pyrene	7.3E-01	0.89	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Iron	N/A					NCEA	07/23/1996
Lead	N/A						
Manganese	N/A				D	IRIS	03/08/2001
Mercury	N/A						
Nickel	N/A						
Perchlorate	N/A						
Silver	N/A				D	IRIS	03/08/2001
Thallium	N/A						
Vanadium	N/A						
Zinc	N/A						

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

(2) See Risk Assessment text for derivation of the "Absorbed Cancer Slope Factor for Dermal".

* USEPA recommends that the adjustment for dermal toxicity is not performed for this constituent (USEPA 2001).

De NA = Not Available

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

USEPA R3 = Region 3 Risk-Based Concentration Table

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 11, NDWIH

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
1,1-Dichloroethene	N/A							
4-Methylphenol	N/A							
Acetophenone	N/A					D	IRIS	06/06/2002
Aluminum	N/A						NCEA	08/26/1996
Antimony	N/A							
Arsenic	4.3E-03	(ug/m3) $^{-1}$	3500	1.5E+01	(mg/kg-day) $^{-1}$	A	IRIS	03/08/2001
Barium	N/A						IRIS	03/08/2001
Benzene	7.7E-06	(ug/m3) $^{-1}$	3500	2.7E-02	(mg/kg-day) $^{-1}$	A	IRIS	06/06/2002
Benzo(a)anthracene	N/A					B2	IRIS	03/08/2001
Benzo(a)pyrene	8.9E-04	(ug/m3) $^{-1}$	3500	3.1E+00	(mg/kg-day) $^{-1}$	B2	NCEA	11/18/1994
Benzo(b)fluoranthene	N/A					B2	IRIS	03/08/2001
Bromomethane	N/A					D	IRIS	06/06/2002
Cadmium	1.8E-03	(ug/m3) $^{-1}$	3500	6.3E+00	(mg/kg-day) $^{-1}$	B1	IRIS	03/08/2001
Chloroethane	N/A							
Chromium (hexavalent)	1.2E-02	(ug/m3) $^{-1}$	3500	4.1E+01	(mg/kg-day) $^{-1}$	A	IRIS	03/08/2001
Copper	N/A							
Dibenz(a,h)anthracene	N/A					B2	IRIS	03/08/2001
Ethylbenzene	N/A					D	IRIS	06/06/2002
Hexachlorobenzene	4.6E-04	(ug/m3) $^{-1}$	3500	1.6E+00	(mg/kg-day) $^{-1}$	B2	IRIS	03/08/2001
Indeno(1,2,3-cd)pyrene	N/A							
Iron	N/A						NCEA	07/23/1996
Lead	N/A							
Manganese	N/A					D	IRIS	03/08/2001
Mercury	N/A							
Nickel	N/A							
Perchlorate	N/A							
Silver	N/A					D	IRIS	03/08/2001
Thallium	N/A						RBC	10/05/2000
Vanadium	N/A						HEAST	07/01/1997
Zinc	N/A							

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

N/A = Not Available

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

D - Not classifiable as a human carcinogen

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched. For HEAST values, provide the date of HEAST.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 11, NDWIH

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)

For NCEA values, provide the date of the article provided by NCEA.

For RBC values, provide the date of last change in the Tables.

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	1.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	8.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	2.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	8.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	8.3E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.0E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	7.7E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	1.6E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	1.6E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	3.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.2E-03
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	2.7E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	6.8E-03
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	5.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.7E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	4.1E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.1E-02
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	1.5E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	4.9E-03
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	8.3E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	2.1E-02
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	1.7E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.7E-02
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	2.5E-03	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	1.6E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.2E-03
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	9.4E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.1E-03
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	1.7E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.7E-04
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	1.2E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.4E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	3.7E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.3E-03
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	7.7E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	7.7E-03
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	1.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.9E-03
	(Total)												1.9E-01

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	5.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	1.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	5.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	4.2E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.2E-05
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	8.3E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	8.3E-04
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.6E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.6E-04
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	1.4E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.3E-03
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	7.8E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.6E-03
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.1E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	8.3E-03
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	7.4E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	9.9E-03
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	4.2E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.1E-03
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	8.7E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.9E-03
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	1.3E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	8.3E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	4.8E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	2.3E-03
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	8.8E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.1E-03
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	6.0E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.0E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.9E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.7E-04
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	3.9E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.5E-02
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	7.5E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.5E-04
	(Total)												6.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.5E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	6.1E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	1.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	5.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	6.0E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.5E-05
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	1.2E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.3E-03
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	2.0E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	5.0E-03
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	3.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	3.0E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.0E-02
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.5E-03
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	6.1E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	1.3E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.2E-02
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	1.8E-03	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.0E-03
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	6.9E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.3E-03
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	1.3E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.4E-04
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	8.6E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.7E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.7E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.9E-03
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	5.6E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.6E-03
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	1.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.6E-03
	(Total)												1.4E-01

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	5.7E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	1.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	5.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	4.4E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.5E-05
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	8.7E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	8.7E-04
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.7E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E-04
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	1.4E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.4E-03
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	8.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.7E-03
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.2E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	8.7E-03
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	7.7E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.0E-02
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	4.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.2E-03
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	9.1E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.0E-03
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	1.3E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	8.7E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	5.0E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	2.4E-03
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	9.2E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	6.2E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.1E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.0E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.8E-04
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	4.0E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.6E-02
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	7.8E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.6E-04
	(Total)												6.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.0E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	5.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	8.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.9E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.6E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	2.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	5.7E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	5.7E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.1E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-02
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	9.5E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.4E-02
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	1.8E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.0E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	1.4E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.4E-01
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	5.1E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.7E-02
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	2.9E-03	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	7.3E-02
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	6.0E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.0E-01
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	8.9E-03	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	5.7E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.9E-02
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	3.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	6.1E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	4.1E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	8.2E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.3E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.9E-02
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	2.7E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.7E-02
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	5.2E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.7E-02
	(Total)												6.5E-01

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	6.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	1.9E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	6.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	4.9E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	6.1E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	9.7E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	9.7E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.9E-03
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	1.6E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.7E-02
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	9.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.0E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.4E-06	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	9.8E-02
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	8.7E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.2E-01
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	4.9E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.5E-02
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	1.0E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.4E-02
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	1.5E-03	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	9.7E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.2E-01
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	5.6E-07	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	2.7E-02
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	1.0E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.3E-02
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	7.0E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.5E-02
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.2E-03
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	4.5E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.7E-01
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	8.8E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.9E-03
	(Total)												7.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 7.4.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman and Unnamed Creeks
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Antimony	9.9E+00	mg/kg	9.9E+00	mg/kg	M	4.2E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Arsenic	3.3E+00	mg/kg	3.3E+00	mg/kg	M	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.7E-03
	Lead	1.9E+01	mg/kg	1.9E+01	mg/kg	M	8.1E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Thallium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	4.9E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	6.9E-02
	Vanadium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	4.9E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.9E-03
	(Total)												8.9E-02
Dermal Absorption	Antimony	9.9E+00	mg/kg	9.9E+00	mg/kg	M	1.0E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.7E-02
	Arsenic	3.3E+00	mg/kg	3.3E+00	mg/kg	M	3.5E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Lead	1.9E+01	mg/kg	1.9E+01	mg/kg	M	2.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Thallium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	1.2E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.7E-02
	Vanadium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	1.2E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	4.7E-02
	(Total)												8.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.

Table 7.4a RME Supplement
Calculation of DAevent (Adult)
Surface Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Coefficient (Kp) cm/hr	Lag Time (τ) hours	Event Time (t_{event}) hr/day	DAevent mg/cm^2-event	t* hours	B (dimensionless)	Eq
Antimony	9.90E+00	µg/l	1.0E-03	NA	2.6E+00	2.57E-08	N/A	N/A	1
Arsenic	3.30E+00	µg/l	1.0E-03	NA	2.6E+00	8.58E-09	N/A	N/A	1
Lead	1.91E+01	µg/l	1.0E-03	NA	2.6E+00	4.96E-08	N/A	N/A	1
Thallium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08	N/A	N/A	1
Vanadium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x t_{event} x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

tevent<t*: DAevent (mg/cm2-event) =
2 x Kp x CW x (sqrt((6 x t x t_{event})/3.1415))
x CF1 x CF2 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
NA - not applicable

TABLE 7.5.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman and Unnamed Creeks
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Antimony	9.9E+00	mg/kg	9.9E+00	mg/kg	M	2.0E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	4.9E-02
	Arsenic	3.3E+00	mg/kg	3.3E+00	mg/kg	M	6.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.2E-02
	Lead	1.9E+01	mg/kg	1.9E+01	mg/kg	M	3.8E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Thallium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	2.3E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.2E-01
	Vanadium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	2.3E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.3E-02
	(Total)												4.2E-01
Dermal Absorption	Antimony	9.9E+00	mg/kg	9.9E+00	mg/kg	M	1.9E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	3.2E-02
	Arsenic	3.3E+00	mg/kg	3.3E+00	mg/kg	M	6.5E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.2E-03
	Lead	1.9E+01	mg/kg	1.9E+01	mg/kg	M	3.7E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Thallium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	2.2E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.2E-02
	Vanadium	1.1E+01	mg/kg	1.1E+01	mg/kg	M	2.2E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	8.6E-02
	(Total)												1.5E-01
												Total Hazard Index Across All Exposure Routes/Pathways	5.7E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.

Table 7.5a RME Supplement
Calculation of DAevent (Child)
Surface Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Coefficient (Kp) cm/hr	Lag Time (τ) hours	Event Time (t_{event}) hr/day	DAevent mg/cm^2-event	t* hours	B (dimensionless)	Eq
Antimony	9.90E+00	µg/l	1.0E-03	NA	2.6E+00	2.57E-08	N/A	N/A	1
Arsenic	3.30E+00	µg/l	1.0E-03	NA	2.6E+00	8.58E-09	N/A	N/A	1
Lead	1.91E+01	µg/l	1.0E-03	NA	2.6E+00	4.96E-08	N/A	N/A	1
Thallium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08	N/A	N/A	1
Vanadium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x t_{event} x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

tevent<t*: DAevent (mg/cm2-event) =
2 x Kp x CW x (sqrt((6 x t x t_{event})/3.1415))
x CF1 x CF2 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
NA - not applicable

TABLE 7.6.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	2.7E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	6.8E-03
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	5.5E-05	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	3.9E-02
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	1.0E-04	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	2.6E-04
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	6.3E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.3E-01
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	8.6E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	8.6E-01
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	1.3E-04	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	3.2E-01
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	2.2E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.5E-01
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	4.6E-02	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	6.6E-01
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	1.6E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.4E-01
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	1.2E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.1E+00
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	6.4E-03	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	7.2E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.6E+00
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	3.0E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-01
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	1.5E-03	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.5E+00
	(Total)												1.3E+01
Dermal Absorption	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	3.6E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	9.1E-04
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	1.4E-06	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	9.7E-04
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	4.8E-06	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	1.2E-05
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	4.9E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	9.9E-03
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	1.7E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E-03
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	2.6E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	4.3E-03
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	4.5E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-03
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	9.2E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	1.9E-02
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	3.3E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	4.4E-02
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	2.4E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.1E-03
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	1.3E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	1.4E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.8E-02
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	6.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.5E-03
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	3.0E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.2E-01
	(Total)												2.3E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 7.6.RME Supplement
N/A - not available or not applicable.

Table 7.6.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.00E+00	µg/l	2.1E-02	2.6E-01	0.2	1.3E-08
Bromomethane	2.00E+00	µg/l	3.5E-03	3.3E-01	0.2	5.0E-09
Chloroethane	3.80E+00	µg/l	8.0E-03	2.2E-01	0.2	1.8E-08
4-Methylphenol	2.30E+01	µg/l	1.0E-02	4.0E-01	0.2	1.8E-07
Aluminum	3.14E+04	µg/l	1.0E-03	N/A	0.2	6.3E-06
Antimony	4.70E+00	µg/l	1.0E-03	N/A	0.2	9.4E-10
Arsenic	8.20E+00	µg/l	1.0E-03	N/A	0.2	1.6E-09
Barium	1.68E+03	µg/l	1.0E-03	N/A	0.2	3.4E-07
Chromium	5.96E+01	µg/l	1.0E-03	N/A	0.2	1.2E-08
Iron	4.45E+04	µg/l	1.0E-03	N/A	0.2	8.9E-06
Lead	2.32E+02	µg/l	1.0E-03	N/A	0.2	4.6E-08
Manganese	2.64E+03	µg/l	1.0E-04	N/A	0.2	5.3E-08
Nickel	1.10E+02	µg/l	1.0E-03	N/A	0.2	2.2E-08
Vanadium	5.54E+01	µg/l	1.0E-03	N/A	0.2	1.1E-08

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	6.4E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	1.6E-02
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	1.3E-04	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	9.1E-02
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	2.4E-04	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	6.1E-04
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	1.5E-03	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.9E-01
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	2.0E+00	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.0E+00
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	3.0E-04	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	7.5E-01
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	5.2E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.7E+00
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	1.1E-01	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.5E+00
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	3.8E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.3E+00
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	2.8E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.5E+00
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	1.5E-02	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	1.7E-01	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.4E+00
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	7.0E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.5E-01
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	3.5E-03	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.5E+00
	(Total)												3.0E+01
Dermal Absorption	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	8.2E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	2.0E-03
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	3.1E-06	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	2.2E-03
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	1.1E-05	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	2.7E-05
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	1.1E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.2E-02
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	5.0E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.0E-03
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	7.4E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.2E-02
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.3E-03
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	2.7E-04	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	5.4E-02
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	9.4E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.3E-01
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	7.0E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.3E-02
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	3.7E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	4.2E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.2E-02
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	1.7E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.2E-02
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	8.8E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	3.4E-01
	(Total)												6.6E-01
												Total Hazard Index Across All Exposure Routes/Pathways	3.0E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.9.RME Supplement
N/A - not available or not applicable.

Table 7.7.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.00E+00	µg/l	2.1E-02	2.6E-01	0.33	1.7E-08
Bromomethane	2.00E+00	µg/l	3.5E-03	3.3E-01	0.33	6.4E-09
Chloroethane	3.80E+00	µg/l	8.0E-03	2.2E-01	0.33	2.3E-08
4-Methylphenol	2.30E+01	µg/l	1.0E-02	4.0E-01	0.33	2.3E-07
Aluminum	3.14E+04	µg/l	1.0E-03	N/A	0.33	1.0E-05
Antimony	4.70E+00	µg/l	1.0E-03	N/A	0.33	1.6E-09
Arsenic	8.20E+00	µg/l	1.0E-03	N/A	0.33	2.7E-09
Barium	1.68E+03	µg/l	1.0E-03	N/A	0.33	5.5E-07
Chromium	5.96E+01	µg/l	1.0E-03	N/A	0.33	2.0E-08
Iron	4.45E+04	µg/l	1.0E-03	N/A	0.33	1.5E-05
Lead	2.32E+02	µg/l	1.0E-03	N/A	0.33	7.7E-08
Manganese	2.64E+03	µg/l	1.0E-04	N/A	0.33	8.7E-08
Nickel	1.10E+02	µg/l	1.0E-03	N/A	0.33	3.6E-08
Vanadium	5.54E+01	µg/l	1.0E-03	N/A	0.33	1.8E-08

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.8.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	1.5E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	3.9E-04
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	5.3E-07	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	3.8E-04
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	2.2E-06	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	5.6E-06
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	1.8E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	3.5E-03
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	2.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-03
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	3.3E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	5.5E-03
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	5.7E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.9E-03
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	1.2E-04	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	2.4E-02
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	4.2E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	8.3E-03
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	3.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.0E-02
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	1.6E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	1.8E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.3E-02
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	7.7E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	9.6E-03
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	3.9E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.5E-01
	(Total)												2.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Subchronic value used if available. Chronic value used if no subchronic value available.

Dermal absorption per event calculated in Table 7.8.RME Supplement

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values (all of the COPCs).

Table 7.8.RME Supplement
Calculation of DAevent
Shallow Aquifer - Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
Benzene	1.0E+00	µg/l	2.1E-02	2.6E-01	8	1.77E-07	6.3E-01	1.3E-02	3
Bromomethane	2.0E+00	µg/l	3.5E-03	3.3E-01	8	6.05E-08	8.0E-01	1.5E-03	3
Chloroethane	3.8E+00	µg/l	8.0E-03	2.2E-01	8	2.56E-07	5.2E-01	2.7E-03	3
4-Methylphenol	2.3E+01	µg/l	1.0E-02	4.0E-01	8	2.01E-06	9.6E-01	8.7E-03	3
Aluminum	3.1E+04	µg/l	1.0E-03	N/A	8	2.51E-04	N/A	N/A	1
Antimony	4.7E+00	µg/l	1.0E-03	N/A	8	3.76E-08	N/A	N/A	1
Arsenic	8.2E+00	µg/l	1.0E-03	N/A	8	6.56E-08	N/A	N/A	1
Barium	1.7E+03	µg/l	1.0E-03	N/A	8	1.34E-05	N/A	N/A	1
Chromium	6.0E+01	µg/l	1.0E-03	N/A	8	4.77E-07	N/A	N/A	1
Iron	4.4E+04	µg/l	1.0E-03	N/A	8	3.56E-04	N/A	N/A	1
Lead	2.3E+02	µg/l	1.0E-03	N/A	8	1.86E-06	N/A	N/A	1
Manganese	2.6E+03	µg/l	1.0E-04	N/A	8	2.11E-06	N/A	N/A	1
Nickel	1.1E+02	µg/l	1.0E-03	N/A	8	8.80E-07	N/A	N/A	1
Vanadium	5.5E+01	µg/l	1.0E-03	N/A	8	4.43E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
ET<t*: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B)) x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.9.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzene	1.0E+00	µg/l	6.5E-05	mg/kg/shower	R	6.2E-05	mg/kg-day	8.6E-03	mg/kg-day	3.0E-02	mg/m^3	7.2E-03
	Bromomethane	2.0E+00	µg/l	1.2E-04	mg/kg/shower	R	1.2E-04	mg/kg-day	1.4E-03	mg/kg-day	4.9E-03	mg/m^3	8.3E-02
	Chloroethane	3.8E+00	µg/l	2.7E-04	mg/kg/shower	R	2.6E-04	mg/kg-day	2.9E+00	mg/kg-day	1.0E+01	mg/m^4	8.8E-05
	(Total)												9.0E-02
												Total Hazard Index Across All Exposure Routes/Pathways	9.0E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic Inhalation.
Route EPC value calculations shown on Table 7.9.RME Supplement.

Table 7.9.RME Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 11, NDWIH

Site 11, NDWIH	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law dimensionless	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Benzene	1.0E+00	7.8E+01	2.3E-01	5.6E-03	1.44E+03	1.50E+01	1.44E+01	1.94E+01	4.77E-01	3.18E+00	6.48E-05
Bromomethane	2.0E+00	9.5E+01	2.5E-01	6.2E-03	1.31E+03	1.36E+01	1.31E+01	1.77E+01	8.90E-01	5.94E+00	1.21E-04
Chloroethane	3.8E+00	6.5E+01	3.7E-01	1.1E-02	1.58E+03	1.65E+01	1.61E+01	2.18E+01	1.96E+00	1.31E+01	2.67E-04

Variables	Units	Exposure Assumptions	Source
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1	NA
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2	NA
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3	NA
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4	NA
Tl = Calibration temp. of water	K (20C +273)	293	F&C
Ts = Shower water temperature	k (45C)	318	F&C
Us = water viscosity at Ts	centipoise	0.596	F&C
Ul = water viscosity at Tl	cp	1.002	F&C
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5	NA
sdt = shower droplet drop time	sec	2	F&C
d = shower droplet diameter	mm	1	F&C
FR = shower water flow rate	l/min	20	F&C
SV = shower room air volume	m^3	3	F&C
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6	NA
VR = ventilation rate	l/min	13.8	JSEPA, 1991
BW = body weight	kg	70	JSEPA, 1991
Ds = duration of shower	min	12	JSEPA, 1989
Dt = total duration in shower room	min	15	
R = air exchange rate	min^{-1}	0.0083	F&C
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7	NA
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8	NA

Equation 1:	Kg(VOC) =	3000 * (18 / HH)$^{0.5}$	
Equation 2:	Kl(VOC) =	20 * (44 / HH)$^{0.5}$	
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$	
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	**Einh =**	**If t>Ds**	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 7.10.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzene	1.0E+00	µg/l	2.8E-04	mg/m^3	R	6.2E-06	mg/kg-day	1.7E-02	mg/kg-day	2.5E+00	mg/m^3	3.6E-04
	Bromomethane	2.0E+00	µg/l	5.3E-04	mg/m^3	R	1.2E-05	mg/kg-day	1.4E-03	mg/kg-day	4.9E-03	mg/m^3	8.4E-03
	Chloroethane	3.8E+00	µg/l	1.1E-03	mg/m^4	R	2.5E-05	mg/kg-day	2.9E+00	mg/kg-day	1.0E+01	mg/m^4	8.5E-06
	(Total)												8.8E-03
												Total Hazard Index Across All Exposure Routes/Pathways	8.8E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
N/A - Not applicable.
Route EPC value calculations shown on Table 7.10.RME Supplement.

Table 7.10.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Scenario
Site 11, NDWIH

Chemical	Cw	MW	K_H	k_l	k_g	K_v	ER	ERa	Ca
	(μg/L)	(mol/gram)	(unitless)	(cm/hr)	(cm/hr)	(cm/hr)	(mg/hr-cm^2)	(g/sec-m^2)	(mg/m^3)
Benzene	1.00E+00	7.8E+01	2.28E-01	3.52E+00	2.13E+03	3.50E+00	3.50E-06	9.71E-09	2.76E-04
Bromomethane	2.00E+00	9.5E+01	2.50E-01	3.35E+00	2.03E+03	3.33E+00	6.66E-06	1.85E-08	5.25E-04
Chloroethane	3.80E+00	6.5E+01	3.70E-01	3.69E+00	2.24E+03	3.68E+00	1.40E-05	3.88E-08	1.10E-03

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 $ER = Kv * Cw * L/1000\ cm^3 * mg/1000\ \mu g$

Equation 5 $ERa = ER * g/1000\ mg * hr/60\ min * min/60\ sec * 10000\ cm^2/m^2$

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch) Length = 20 m, Width = 3 m	(m^2)	60
ERa = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	7.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	4.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	3.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	3.8E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.7E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	3.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	4.3E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	4.3E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.5E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.5E-02
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.0E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.6E-02
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.9E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.0E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.0E-01
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.6E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.9E-02
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	2.3E-03	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	5.7E-02
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	6.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.1E-01
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	6.6E-03	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	6.7E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.3E-02
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	2.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.3E-03
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	5.9E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.9E-03
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	3.9E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	7.9E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.7E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.5E-02
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.6E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.6E-02
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	4.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.4E-02
													7.3E-01

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	7.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.8E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	6.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.0E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	6.2E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	6.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.7E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	5.7E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.9E-03
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.4E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.3E-02
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	8.2E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.7E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.6E-06	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.1E-01
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	7.4E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	9.8E-02
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	3.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	8.4E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.8E-02
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	8.6E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	8.8E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.1E-01
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	3.3E-07	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.6E-02
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	7.7E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	9.7E-03
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	5.2E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.6E-02
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.3E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.3E-03
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.8E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.8E-01
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	5.4E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.8E-03
	(Total)												6.5E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	6.7E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	3.8E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	9.8E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	3.3E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	3.5E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.4E-03
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	3.4E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	4.1E-06	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	4.1E-02
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.4E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.4E-01
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	9.7E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.4E-01
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.9E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.4E-01
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	1.9E-03	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.9E+00
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.2E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.7E-01
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	2.1E-02	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	5.3E-01
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	6.0E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.0E+00
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	6.1E-02	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	6.2E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-01
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	2.3E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.8E-02
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	5.5E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.7E-02
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	3.7E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	7.3E-02
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.6E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.3E-01
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.4E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.4E-01
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	3.8E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-01
	(Total)												6.8E+00

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	9.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	2.4E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	8.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	6.6E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	8.2E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	8.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	7.6E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	7.6E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.6E-03
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.8E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	3.0E-02
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.6E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	3.5E-06	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.4E-01
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	9.7E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.3E-01
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	4.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.0E-02
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	1.1E-02	mg/kg-day	3.0E-01	N/A	N/A	N/A	3.7E-02
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	1.1E-03	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	1.2E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.5E-01
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	4.4E-07	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	2.1E-02
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	1.0E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.3E-02
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	6.9E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.4E-02
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	3.0E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.3E-03
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	6.3E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.4E-01
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	7.1E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.4E-03
	(Total)												8.6E-01
												Total Hazard Index Across All Exposure Routes/Pathways	7.7E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.13.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	2.4E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	3.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.3E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.6E-03
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.5E-06	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	5.0E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.0E-02
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	3.6E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.9E-02
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	7.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.4E-01
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	6.8E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.8E-01
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.9E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	9.6E-03
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	7.8E-03	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	2.0E-01
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	2.2E-01	mg/kg-day	3.0E-01	N/A	N/A	N/A	7.3E-01
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	2.2E-02	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	2.3E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.1E-01
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	8.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.9E-02
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	2.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.0E-02
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	1.3E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.7E-02
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	5.9E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	8.4E-02
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.2E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.2E-01
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.7E-02
	(Total)												2.4E+00

TABLE 7.13.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	8.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	4.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	4.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	3.4E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.3E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	4.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	3.9E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.9E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-03
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	9.4E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.6E-02
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	5.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.9E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	1.8E-06	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	7.2E-02
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.1E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	2.1E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.0E-02
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	5.8E-03	mg/kg-day	3.0E-01	N/A	N/A	N/A	1.9E-02
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	6.0E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	6.1E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.6E-02
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	2.3E-07	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.1E-02
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	5.3E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	6.7E-03
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	3.6E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	1.8E-02
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.6E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.2E-03
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.3E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.3E-01
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	3.7E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.2E-03
	(Total)												3.9E-01

Total Hazard Index Across All Exposure Routes/Pathways 2.8E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.14.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	5.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	7.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	2.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	2.7E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.4E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	3.1E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.1E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.0E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.0E-02
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	7.4E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.9E-02
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.9E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	1.4E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.4E-01
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	4.0E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.3E-02
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	1.6E-03	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	4.1E-02
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	4.6E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E-01
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	4.7E-03	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	4.8E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.4E-02
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.9E-03
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	4.2E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.1E-03
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	2.8E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	5.6E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.2E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.8E-02
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	2.6E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.6E-02
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	2.9E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.7E-03
	(Total)												5.2E-01

TABLE 7.14.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	6.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	5.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	4.6E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.7E-04
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.3E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	5.3E-03
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.8E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.8E-03
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.3E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.1E-02
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	7.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.5E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.4E-06	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	9.6E-02
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	6.8E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	9.0E-02
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	2.8E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.4E-02
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	7.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.6E-02
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	7.9E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	8.1E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.0E-01
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	3.0E-07	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.4E-02
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	7.1E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	8.9E-03
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	4.8E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.4E-02
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.1E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.0E-03
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.4E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.7E-01
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	5.0E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.7E-03
	(Total)												6.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.1E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.15.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	8.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	7.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	7.7E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	9.6E-05
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	7.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	8.9E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	8.9E-04
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	3.0E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.0E-03
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	2.1E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	5.3E-03
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	4.2E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.4E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	4.1E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.1E-02
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.1E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.8E-03
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	4.7E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.2E-02
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	1.3E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.3E-02
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	1.3E-03	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	1.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.8E-03
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	5.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.7E-03
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	1.2E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.0E-04
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	8.0E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.6E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	3.5E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.0E-03
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	7.3E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	7.3E-03
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	8.3E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.8E-03
	(Total)												1.5E-01

TABLE 7.15.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	9.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	5.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	4.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	3.9E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.8E-05
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	4.9E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	4.5E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	4.5E-04
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.5E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.5E-04
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.1E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.8E-03
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.4E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-03
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.1E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	8.2E-03
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.8E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	7.7E-03
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	2.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E-03
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	6.6E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.2E-03
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	6.8E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	6.9E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	8.6E-03
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	2.6E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.2E-03
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	6.0E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.6E-04
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	4.1E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.0E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.8E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.5E-04
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.7E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.4E-02
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	4.2E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.4E-04
	(Total)												5.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.0E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.16.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	6.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	5.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.6E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.0E-05
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	6.5E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	6.5E-04
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-03
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.5E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	3.9E-03
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	3.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	3.0E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.0E-02
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	8.3E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.8E-03
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	3.4E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	8.5E-03
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	9.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.2E-02
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	9.7E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	9.9E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.9E-03
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	3.7E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	8.7E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.4E-04
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	5.8E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.2E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.6E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.7E-03
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	5.4E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.4E-03
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	6.1E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.0E-03
	(Total)												1.1E-01

TABLE 7.16.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	7.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	2.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	6.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.6E-08	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.0E-05
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	7.1E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	6.4E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	6.4E-04
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.2E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-04
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.5E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.6E-03
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	9.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.1E-03
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.9E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.2E-02
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	8.3E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.1E-02
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	3.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.7E-03
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	9.5E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.2E-03
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	9.7E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	9.9E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.2E-02
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	3.7E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.8E-03
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	8.7E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.1E-03
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	5.8E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.9E-03
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.6E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.6E-04
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	5.3E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.1E-02
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	6.1E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.0E-04
	(Total)												7.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.8E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.17.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	7.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.6E-01	mg/kg	3.6E-01	mg/kg	M	1.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	6.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.5E-01	mg/kg	2.5E-01	mg/kg	M	1.1E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.4E-04
	Indeno(1,2,3-cd)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.2E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	8.5E-02	mg/kg	8.5E-02	mg/kg	M	3.7E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.7E-04
	Aluminum	9.7E+03	mg/kg	9.7E+03	mg/kg	M	4.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.2E-03
	Antimony	1.8E+00	mg/kg	1.8E+00	mg/kg	M	7.9E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.0E-03
	Arsenic	1.1E+01	mg/kg	1.1E+01	mg/kg	M	4.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.6E-02
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.4E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.4E-03
	Chromium	2.2E+01	mg/kg	2.2E+01	mg/kg	M	9.5E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.2E-03
	Copper	9.6E+01	mg/kg	9.6E+01	mg/kg	M	4.1E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.0E-03
	Iron	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.2E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.9E-02
	Lead	2.1E+02	mg/kg	2.1E+02	mg/kg	M	9.2E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.3E+02	mg/kg	2.3E+02	mg/kg	M	9.8E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.9E-03
	Mercury	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.3E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.3E-04
	Nickel	1.7E+01	mg/kg	1.7E+01	mg/kg	M	7.3E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.7E-04
	Silver	2.6E+00	mg/kg	2.6E+00	mg/kg	M	1.1E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.3E-04
	Thallium	8.8E-01	mg/kg	8.8E-01	mg/kg	M	3.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.4E-03
	Vanadium	2.5E+01	mg/kg	2.5E+01	mg/kg	M	1.1E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.1E-02
	Zinc	2.9E+02	mg/kg	2.9E+02	mg/kg	M	1.3E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.2E-04
	(Total)												8.9E-02

TABLE 7.17.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.6E-01	mg/kg	3.6E-01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.5E-01	mg/kg	2.5E-01	mg/kg	M	1.4E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.7E-04
	Indeno(1,2,3-cd)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	8.5E-02	mg/kg	8.5E-02	mg/kg	M	4.7E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	4.7E-04
	Aluminum	9.7E+03	mg/kg	9.7E+03	mg/kg	M	5.3E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.3E-04
	Antimony	1.8E+00	mg/kg	1.8E+00	mg/kg	M	1.0E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.7E-03
	Arsenic	1.1E+01	mg/kg	1.1E+01	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.0E-03
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.8E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	7.1E-04
	Chromium	2.2E+01	mg/kg	2.2E+01	mg/kg	M	1.2E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.6E-02
	Copper	9.6E+01	mg/kg	9.6E+01	mg/kg	M	5.2E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.6E-04
	Iron	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.0E-03
	Lead	2.1E+02	mg/kg	2.1E+02	mg/kg	M	1.2E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.3E+02	mg/kg	2.3E+02	mg/kg	M	1.3E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.6E-02
	Mercury	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.6E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	7.8E-04
	Nickel	1.7E+01	mg/kg	1.7E+01	mg/kg	M	9.4E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Silver	2.6E+00	mg/kg	2.6E+00	mg/kg	M	1.4E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	7.2E-04
	Thallium	8.8E-01	mg/kg	8.8E-01	mg/kg	M	4.8E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	6.9E-04
	Vanadium	2.5E+01	mg/kg	2.5E+01	mg/kg	M	1.4E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	5.2E-02
	Zinc	2.9E+02	mg/kg	2.9E+02	mg/kg	M	1.6E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.4E-05
	(Total)												1.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.9E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic, with the excpetion of chromium.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 7.18.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	1.3E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	3.2E-03
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	2.6E-05	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	1.8E-02
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	4.9E-05	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	1.2E-04
	4-Methylphenol	4.8E+00	µg/l	4.8E+00	µg/l	M	6.1E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.2E-02
	Aluminum	9.5E+02	µg/l	9.5E+02	µg/l	M	1.2E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.2E-02
	Antimony	2.0E+00	µg/l	2.0E+00	µg/l	M	2.6E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	6.5E-02
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	3.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-01
	Barium	3.2E+02	µg/l	3.2E+02	µg/l	M	4.2E-03	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	5.9E-02
	Chromium	5.6E+00	µg/l	5.6E+00	µg/l	M	7.2E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.4E-02
	Iron	3.3E+04	µg/l	3.3E+04	µg/l	M	4.2E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.4E+00
	Lead	1.3E+01	µg/l	1.3E+01	µg/l	M	1.7E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	1.9E+03	µg/l	1.9E+03	µg/l	M	2.4E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E+00
	Nickel	6.2E+00	µg/l	6.2E+00	µg/l	M	8.0E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.0E-03
	Vanadium	3.5E+00	µg/l	3.5E+00	µg/l	M	4.4E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.4E-02
	(Total)												2.9E+00
Dermal Absorption	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	2.2E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	5.5E-04
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	8.2E-07	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	5.9E-04
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	2.9E-06	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	7.3E-06
	4-Methylphenol	4.8E+00	µg/l	4.8E+00	µg/l	M	6.1E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.2E-03
	Aluminum	9.5E+02	µg/l	9.5E+02	µg/l	M	3.1E-05	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.1E-05
	Antimony	2.0E+00	µg/l	2.0E+00	µg/l	M	6.7E-08	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.1E-03
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	8.0E-08	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.7E-04
	Barium	3.2E+02	µg/l	3.2E+02	µg/l	M	1.1E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	2.2E-03
	Chromium	5.6E+00	µg/l	5.6E+00	µg/l	M	1.9E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	2.5E-03
	Iron	3.3E+04	µg/l	3.3E+04	µg/l	M	1.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.6E-03
	Lead	1.3E+01	µg/l	1.3E+01	µg/l	M	4.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	1.9E+03	µg/l	1.9E+03	µg/l	M	6.2E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.7E-03
	Nickel	6.2E+00	µg/l	6.2E+00	µg/l	M	2.1E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.6E-04
	Vanadium	3.5E+00	µg/l	3.5E+00	µg/l	M	1.1E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	4.4E-03
	(Total)												2.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.18.CT Supplement
N/A - not applicable.

Table 7.18.CT Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.00E+00	µg/l	2.1E-02	2.6E-01	0.2	1.3E-08
Bromomethane	2.00E+00	µg/l	3.5E-03	3.3E-01	0.2	5.0E-09
Chloroethane	3.80E+00	µg/l	8.0E-03	2.2E-01	0.2	1.8E-08
4-Methylphenol	4.76E+00	µg/l	1.0E-02	4.0E-01	0.2	3.7E-08
Aluminum	9.53E+02	µg/l	1.0E-03	N/A	0.2	1.9E-07
Antimony	2.03E+00	µg/l	1.0E-03	N/A	0.2	4.1E-10
Arsenic	2.44E+00	µg/l	1.0E-03	N/A	0.2	4.9E-10
Barium	3.24E+02	µg/l	1.0E-03	N/A	0.2	6.5E-08
Chromium	5.64E+00	µg/l	1.0E-03	N/A	0.2	1.1E-09
Iron	3.28E+04	µg/l	1.0E-03	N/A	0.2	6.6E-06
Lead	1.35E+01	µg/l	1.0E-03	N/A	0.2	2.7E-09
Manganese	1.87E+03	µg/l	1.0E-04	N/A	0.2	3.7E-08
Nickel	6.23E+00	µg/l	1.0E-03	N/A	0.2	1.2E-09
Vanadium	3.46E+00	µg/l	1.0E-03	N/A	0.2	6.9E-10

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.19.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	4.3E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	1.1E-02
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	8.5E-05	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	6.1E-02
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	1.6E-04	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	4.1E-04
	4-Methylphenol	4.8E+00	µg/l	4.8E+00	µg/l	M	2.0E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	4.1E-02
	Aluminum	9.5E+02	µg/l	9.5E+02	µg/l	M	4.1E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.1E-02
	Antimony	2.0E+00	µg/l	2.0E+00	µg/l	M	8.7E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.2E-01
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.5E-01
	Barium	3.2E+02	µg/l	3.2E+02	µg/l	M	1.4E-02	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	2.0E-01
	Chromium	5.6E+00	µg/l	5.6E+00	µg/l	M	2.4E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	8.0E-02
	Iron	3.3E+04	µg/l	3.3E+04	µg/l	M	1.4E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.7E+00
	Lead	1.3E+01	µg/l	1.3E+01	µg/l	M	5.8E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	1.9E+03	µg/l	1.9E+03	µg/l	M	8.0E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.0E+00
	Nickel	6.2E+00	µg/l	6.2E+00	µg/l	M	2.7E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.3E-02
	Vanadium	3.5E+00	µg/l	3.5E+00	µg/l	M	1.5E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.5E-01
	(Total)												9.8E+00
Dermal Absorption	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	4.7E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	1.2E-03
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	1.8E-06	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	1.3E-03
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	6.3E-06	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	1.6E-05
	4-Methylphenol	4.8E+00	µg/l	4.8E+00	µg/l	M	1.3E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.7E-03
	Aluminum	9.5E+02	µg/l	9.5E+02	µg/l	M	8.7E-05	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	8.7E-05
	Antimony	2.0E+00	µg/l	2.0E+00	µg/l	M	1.9E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	3.1E-03
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	2.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.4E-04
	Barium	3.2E+02	µg/l	3.2E+02	µg/l	M	3.0E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	6.1E-03
	Chromium	5.6E+00	µg/l	5.6E+00	µg/l	M	5.2E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	6.9E-03
	Iron	3.3E+04	µg/l	3.3E+04	µg/l	M	3.0E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.0E-02
	Lead	1.3E+01	µg/l	1.3E+01	µg/l	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	1.9E+03	µg/l	1.9E+03	µg/l	M	1.7E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.1E-02
	Nickel	6.2E+00	µg/l	6.2E+00	µg/l	M	5.7E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.1E-04
	Vanadium	3.5E+00	µg/l	3.5E+00	µg/l	M	3.2E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.2E-02
	(Total)												6.6E-02
												Total Hazard Index Across All Exposure Routes/Pathways	9.9E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.19.CT Supplement.
N/A - not applicable.

Table 7.19.CT Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.00E+00	µg/l	2.1E-02	2.6E-01	0.33	1.7E-08
Bromomethane	2.00E+00	µg/l	3.5E-03	3.3E-01	0.33	6.4E-09
Chloroethane	3.80E+00	µg/l	8.0E-03	2.2E-01	0.33	2.3E-08
4-Methylphenol	4.76E+00	µg/l	1.0E-02	4.0E-01	0.33	4.8E-08
Aluminum	9.53E+02	µg/l	1.0E-03	N/A	0.33	3.1E-07
Antimony	2.03E+00	µg/l	1.0E-03	N/A	0.33	6.7E-10
Arsenic	2.44E+00	µg/l	1.0E-03	N/A	0.33	8.0E-10
Barium	3.24E+02	µg/l	1.0E-03	N/A	0.33	1.1E-07
Chromium	5.64E+00	µg/l	1.0E-03	N/A	0.33	1.9E-09
Iron	3.28E+04	µg/l	1.0E-03	N/A	0.33	1.1E-05
Lead	1.35E+01	µg/l	1.0E-03	N/A	0.33	4.4E-09
Manganese	1.87E+03	µg/l	1.0E-04	N/A	0.33	6.2E-08
Nickel	6.23E+00	µg/l	1.0E-03	N/A	0.33	2.1E-09
Vanadium	3.46E+00	µg/l	1.0E-03	N/A	0.33	1.1E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.20.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	8.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	6.7E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.1E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.4E-04
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	7.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	3.5E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.5E-04
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	3.8E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.8E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.6E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.6E-03
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	3.0E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	9.6E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.6E-04
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	9.3E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.1E-03
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	3.4E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	8.5E-04
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	1.1E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.6E-02
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	7.2E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	9.1E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.5E-03
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.0E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.4E-04
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.8E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.4E-04
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	8.8E-07	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.8E-04
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	3.9E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.6E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.1E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.1E-02
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	1.0E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.4E-04
	(Total)												7.9E-02

TABLE 7.20.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	3.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	2.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	4.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	2.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	2.5E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.2E-04
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	7.9E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	7.9E-04
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	8.6E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	8.6E-04
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.5E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.5E-03
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.9E-03
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	2.2E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	8.8E-04
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.1E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	2.8E-02
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	7.8E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.9E-04
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	2.5E-03	mg/kg-day	3.0E-01	N/A	N/A	N/A	8.2E-03
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	1.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	2.1E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.6E-02
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	2.3E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.1E-03
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.6E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.9E-03
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	2.0E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	1.0E-03
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	9.0E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.3E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	2.5E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	9.7E-02
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	2.4E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.9E-05
	(Total)												1.8E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.6E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.21.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	7.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	6.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.3E-03
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	6.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	3.2E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.2E-03
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	3.5E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.5E-02
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.1E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.4E-02
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	9.0E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.0E-03
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	8.7E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.9E-02
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	3.2E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	8.0E-03
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	1.0E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.4E-01
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	6.7E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	8.5E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.2E-02
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.4E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.1E-03
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.2E-03
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	8.2E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.6E-03
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	3.7E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.3E-02
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.0E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.0E-01
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	9.7E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.2E-03
	(Total)												7.4E-01

TABLE 7.21.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	4.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	3.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	5.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	3.3E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.1E-04
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	2.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	1.0E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	1.0E-03
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	1.1E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.0E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	3.3E-03
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	2.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.0E-03
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	2.9E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.1E-03
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.8E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.7E-02
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	1.0E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.1E-04
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	3.2E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.1E-02
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	2.1E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	2.7E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.4E-02
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	3.0E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.4E-03
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	2.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.5E-03
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	2.6E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	1.3E-03
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	1.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.7E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.3E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.3E-01
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	3.1E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.0E-04
	(Total)												2.3E-01
												Total Hazard Index Across All Exposure Routes/Pathways	9.7E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.22.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	9.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	7.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	6.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	6.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Ammonium perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	3.1E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.1E-03
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	3.4E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.4E-02
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	5.9E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	2.7E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.1E-02
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	8.6E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	8.6E-03
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	8.3E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.2E-03
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	3.1E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	7.7E-03
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	9.7E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.2E-01
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	6.5E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	8.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.1E-02
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.0E-03
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.1E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	7.9E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.6E-03
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	3.5E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.1E-02
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	9.9E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.9E-02
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	9.3E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.1E-03
	(Total)												6.9E-01

TABLE 7.22.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	9.7E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	7.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.0E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.2E-04
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	8.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Ammonium perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	3.1E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.1E-04
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	3.4E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.4E-04
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	5.9E-08	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	9.8E-04
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	8.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.7E-03
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	8.6E-09	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	3.4E-04
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	8.3E-07	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.7E-03
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	3.1E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-04
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	9.7E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.2E-03
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	6.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	8.2E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.1E-09	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	4.3E-04
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.1E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.7E-04
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	7.9E-08	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.9E-04
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	3.5E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.1E-04
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	9.9E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	3.8E-02
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	9.3E-06	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.1E-05
	(Total)												6.0E-02

Total Hazard Index Across All Exposure Routes/Pathways 7.5E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.23.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	7.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	6.2E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.0E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.3E-04
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	6.9E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	3.2E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.2E-04
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	3.5E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.5E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.1E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.5E-03
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.5E-03
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	9.0E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.0E-04
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	8.7E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.9E-03
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	3.2E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	8.0E-04
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	1.0E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.4E-02
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	6.8E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	8.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.3E-03
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.5E-08	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.2E-04
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.4E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.2E-04
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	8.2E-07	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.6E-04
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	3.7E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.3E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.0E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.0E-02
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	9.7E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.2E-04
	(Total)												7.4E-02

TABLE 7.23.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	1.8E-01	mg/kg	1.8E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5E-01	mg/kg	1.5E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Hexachlorobenzene	2.4E-01	mg/kg	2.4E-01	mg/kg	M	1.3E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.7E-04
	Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.6E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Perchlorate	7.6E-02	mg/kg	7.6E-02	mg/kg	M	4.2E-08	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	4.2E-04
	Aluminum	8.3E+03	mg/kg	8.3E+03	mg/kg	M	4.5E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.5E-04
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	7.9E-08	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.3E-03
	Arsenic	6.6E+00	mg/kg	6.6E+00	mg/kg	M	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.6E-03
	Cadmium	2.1E+00	mg/kg	2.1E+00	mg/kg	M	1.1E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	4.6E-04
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	1.1E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.5E-02
	Copper	7.4E+01	mg/kg	7.4E+01	mg/kg	M	4.1E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.0E-04
	Iron	2.4E+04	mg/kg	2.4E+04	mg/kg	M	1.3E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.3E-03
	Lead	1.6E+02	mg/kg	1.6E+02	mg/kg	M	8.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.0E+02	mg/kg	2.0E+02	mg/kg	M	1.1E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.4E-02
	Mercury	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.2E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	5.8E-04
	Nickel	1.5E+01	mg/kg	1.5E+01	mg/kg	M	8.2E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.0E-03
	Silver	1.9E+00	mg/kg	1.9E+00	mg/kg	M	1.1E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	5.3E-04
	Thallium	8.6E-01	mg/kg	8.6E-01	mg/kg	M	4.7E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	6.7E-04
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.3E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	5.1E-02
	Zinc	2.3E+02	mg/kg	2.3E+02	mg/kg	M	1.2E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.1E-05
	(Total)												9.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic. RfD for mercuric chloride used for mercury.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	2.2E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.6E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.1E-08	mg/kg-day	7.3E+00	1/mg/kg/day	7.8E-08
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	3.1E-08	mg/kg-day	7.3E-01	1/mg/kg/day	2.3E-08
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.0E-08	mg/kg-day	7.3E+00	1/mg/kg/day	7.5E-08
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.1E-08	mg/kg-day	1.6E+00	1/mg/kg/day	1.7E-08
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	9.8E-09	mg/kg-day	7.3E-01	1/mg/kg/day	7.2E-09
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	2.1E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	4.1E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	3.5E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	6.6E-07	mg/kg-day	1.5E+00	1/mg/kg/day	9.9E-07
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	5.3E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	1.9E-06	mg/kg-day	N/A	N/A	N/A
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	2.2E-03	mg/kg-day	N/A	N/A	N/A
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	3.3E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	2.1E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	2.2E-06	mg/kg-day	N/A	N/A	N/A
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	4.8E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	9.8E-07	mg/kg-day	N/A	N/A	N/A
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	1.9E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										1.2E-06

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption											
	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.0E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	7.0E-09	mg/kg-day	7.3E+00	1/mg/kg/day	5.1E-08
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	2.0E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.5E-08
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	6.8E-09	mg/kg-day	7.3E+00	1/mg/kg/day	4.9E-08
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	5.4E-09	mg/kg-day	1.6E+00	1/mg/kg/day	8.6E-09
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	6.5E-09	mg/kg-day	7.3E-01	1/mg/kg/day	4.7E-09
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	1.1E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.1E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	1.8E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	1.0E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.5E-07
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.7E-08	mg/kg-day	N/A	N/A	N/A
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	9.5E-08	mg/kg-day	N/A	N/A	N/A
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	5.4E-06	mg/kg-day	N/A	N/A	N/A
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	1.6E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	6.1E-09	mg/kg-day	N/A	N/A	N/A
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	7.7E-08	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.4E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	0.0E+00	mg/kg-day	N/A	N/A	N/A
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	0.0E+00	mg/kg-day	N/A	N/A	N/A
	(Total)										2.9E-07
										Total Risk Across All Exposure Routes/Pathways	1.5E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	4.2E-08	mg/kg-day	7.3E-01	1/mg/kg/day	3.1E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.1E-08	mg/kg-day	7.3E+00	1/mg/kg/day	1.5E-07
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	6.0E-08	mg/kg-day	7.3E-01	1/mg/kg/day	4.4E-08
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.0E-08	mg/kg-day	7.3E+00	1/mg/kg/day	1.5E-07
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.1E-08	mg/kg-day	1.6E+00	1/mg/kg/day	3.3E-08
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.9E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.4E-08
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	4.1E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	8.0E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	6.8E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	1.3E-06	mg/kg-day	1.5E+00	1/mg/kg/day	1.9E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	1.0E-05	mg/kg-day	N/A	N/A	N/A
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	3.6E-06	mg/kg-day	N/A	N/A	N/A
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	2.1E-04	mg/kg-day	N/A	N/A	N/A
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	4.3E-03	mg/kg-day	N/A	N/A	N/A
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	6.3E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	4.1E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	2.4E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	4.4E-06	mg/kg-day	N/A	N/A	N/A
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	2.9E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	9.3E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	1.9E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	3.7E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										2.3E-06

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption											
	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	3.1E-08	mg/kg-day	7.3E-01	1/mg/kg/day	2.2E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	1/mg/kg/day	1.1E-07
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	4.4E-08	mg/kg-day	7.3E-01	1/mg/kg/day	3.2E-08
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	1/mg/kg/day	1.1E-07
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.5E-08	mg/kg-day	1.6E+00	1/mg/kg/day	2.4E-08
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.0E-08
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	3.0E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	5.8E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	4.9E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	3.0E-07	mg/kg-day	1.5E+00	1/mg/kg/day	4.5E-07
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	7.4E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	3.1E-04	mg/kg-day	N/A	N/A	N/A
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	4.6E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	3.0E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	1.7E-08	mg/kg-day	N/A	N/A	N/A
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	3.2E-07	mg/kg-day	N/A	N/A	N/A
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	6.7E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	1.4E-07	mg/kg-day	N/A	N/A	N/A
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	2.7E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										7.5E-07
										Total Risk Across All Exposure Routes/Pathways	3.1E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	2.1E-07	mg/kg-day	7.3E-01	1/mg/kg/day	1.5E-07
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.0E-07	mg/kg-day	7.3E+00	1/mg/kg/day	7.6E-07
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	3.0E-07	mg/kg-day	7.3E-01	1/mg/kg/day	2.2E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.0E-07	mg/kg-day	7.3E+00	1/mg/kg/day	7.3E-07
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.0E-07	mg/kg-day	1.6E+00	1/mg/kg/day	1.7E-07
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	9.6E-08	mg/kg-day	7.3E-01	1/mg/kg/day	7.0E-08
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	4.0E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	3.4E-06	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	6.4E-06	mg/kg-day	1.5E+00	1/mg/kg/day	9.6E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	5.1E-05	mg/kg-day	N/A	N/A	N/A
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	1.8E-05	mg/kg-day	N/A	N/A	N/A
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.0E-03	mg/kg-day	N/A	N/A	N/A
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	2.2E-02	mg/kg-day	N/A	N/A	N/A
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	3.2E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	2.1E-04	mg/kg-day	N/A	N/A	N/A
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	2.2E-05	mg/kg-day	N/A	N/A	N/A
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	4.6E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	9.6E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	1.8E-03	mg/kg-day	N/A	N/A	N/A
	(Total)										1.2E-05

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 11 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption											
	Benzo(a)anthracene	6.1E-01	mg/kg	6.1E-01	mg/kg	M	3.6E-07	mg/kg-day	7.3E-01	1/mg/kg/day	2.6E-07
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.8E-07	mg/kg-day	7.3E+00	1/mg/kg/day	1.3E-06
	Benzo(b)fluoranthene	8.7E-01	mg/kg	8.7E-01	mg/kg	M	5.1E-07	mg/kg-day	7.3E-01	1/mg/kg/day	3.8E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.7E-07	mg/kg-day	7.3E+00	1/mg/kg/day	1.2E-06
	Hexachlorobenzene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.8E-07	mg/kg-day	1.6E+00	1/mg/kg/day	2.8E-07
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.6E-07	mg/kg-day	7.3E-01	1/mg/kg/day	1.2E-07
	Perchlorate	5.9E-01	mg/kg	5.9E-01	mg/kg	M	3.5E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	6.8E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	9.8E+00	mg/kg	9.8E+00	mg/kg	M	5.8E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.8E+01	mg/kg	1.8E+01	mg/kg	M	3.5E-06	mg/kg-day	1.5E+00	1/mg/kg/day	5.2E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	8.7E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	5.2E+01	mg/kg	5.2E+01	mg/kg	M	3.1E-06	mg/kg-day	N/A	N/A	N/A
	Copper	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.8E-04	mg/kg-day	N/A	N/A	N/A
	Iron	6.2E+04	mg/kg	6.2E+04	mg/kg	M	3.7E-03	mg/kg-day	N/A	N/A	N/A
	Lead	9.1E+03	mg/kg	9.1E+03	mg/kg	M	5.4E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	5.9E+02	mg/kg	5.9E+02	mg/kg	M	3.5E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	3.4E+00	mg/kg	3.4E+00	mg/kg	M	2.0E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	6.3E+01	mg/kg	6.3E+01	mg/kg	M	3.7E-06	mg/kg-day	N/A	N/A	N/A
	Silver	4.2E+01	mg/kg	4.2E+01	mg/kg	M	2.5E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	7.9E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.7E+01	mg/kg	2.7E+01	mg/kg	M	0.0E+00	mg/kg-day	N/A	N/A	N/A
	Zinc	5.3E+03	mg/kg	5.3E+03	mg/kg	M	0.0E+00	mg/kg-day	N/A	N/A	N/A
	(Total)										8.8E-06
										Total Risk Across All Exposure Routes/Pathways	2.0E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman & Unnamed Creeks
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Antimony	9.9E+00	µg/l	9.9E+00	µg/l	M	1.4E-06	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.3E+00	µg/l	3.3E+00	µg/l	M	4.8E-07	mg/kg-day	1.5E+00	1/mg/kg/day	7.2E-07
	Lead	1.9E+01	µg/l	1.9E+01	µg/l	M	2.8E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+01	µg/l	1.1E+01	µg/l	M	1.7E-06	mg/kg-day	N/A	N/A	N/A
	Vanadium	1.1E+01	µg/l	1.1E+01	µg/l	M	1.7E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										7.2E-07
Dermal Absorption											
	Antimony	9.9E+00	µg/l	9.9E+00	µg/l	M	3.6E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.3E+00	µg/l	3.3E+00	µg/l	M	1.2E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.8E-07
	Lead	1.9E+01	µg/l	1.9E+01	µg/l	M	6.9E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+01	µg/l	1.1E+01	µg/l	M	4.2E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	1.1E+01	µg/l	1.1E+01	µg/l	M	4.2E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										1.8E-07
										Total Risk Across All Exposure Routes/Pathways	9.0E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.4a.RME Supplement.
N/A - not available

Table 8.4a RME Supplement
Calculation of DAevent (Adult)
Surface Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Coefficient (Kp) cm/hr	Lag Time (τ) hours	Event Time (t_{event}) hr/day	DAevent mg/cm^2-event
Antimony	9.90E+00	µg/l	1.0E-03	NA	2.6E+00	2.57E-08
Arsenic	3.30E+00	µg/l	1.0E-03	NA	2.6E+00	8.58E-09
Lead	1.91E+01	µg/l	1.0E-03	NA	2.6E+00	4.96E-08
Thallium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08
Vanadium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x t_{event} x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

tevent<t*: DAevent (mg/cm2-event) =
2 x Kp x CW x (sqrt((6 x t x t_{event})/3.1415))
x CF1 x CF2 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3xB)/(1+B))

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman & Unnamed Creeks
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Antimony	9.9E+00	µg/l	9.9E+00	µg/l	M	1.7E-06	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.3E+00	µg/l	3.3E+00	µg/l	M	5.6E-07	mg/kg-day	1.5E+00	1/mg/kg/day	8.4E-07
	Lead	1.9E+01	µg/l	1.9E+01	µg/l	M	3.2E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+01	µg/l	1.1E+01	µg/l	M	1.9E-06	mg/kg-day	N/A	N/A	N/A
	Vanadium	1.1E+01	µg/l	1.1E+01	µg/l	M	1.9E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										8.4E-07
Dermal Absorption											
	Antimony	9.9E+00	µg/l	9.9E+00	µg/l	M	1.7E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.3E+00	µg/l	3.3E+00	µg/l	M	5.5E-08	mg/kg-day	1.5E+00	1/mg/kg/day	8.3E-08
	Lead	1.9E+01	µg/l	1.9E+01	µg/l	M	3.2E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+01	µg/l	1.1E+01	µg/l	M	1.9E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	1.1E+01	µg/l	1.1E+01	µg/l	M	1.9E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										8.3E-08
										Total Risk Across All Exposure Routes/Pathways	9.2E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.5a.RME Supplement.
N/A - not available

Table 8.5a RME Supplement
Calculation of DAevent (Adult)
Surface Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Coefficient (Kp) cm/hr	Lag Time (τ) hours	Event Time (t_{event}) hr/day	DAevent mg/cm^2-event
Antimony	9.90E+00	µg/l	1.0E-03	NA	2.6E+00	2.57E-08
Arsenic	3.30E+00	µg/l	1.0E-03	NA	2.6E+00	8.58E-09
Lead	1.91E+01	µg/l	1.0E-03	NA	2.6E+00	4.96E-08
Thallium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08
Vanadium	1.15E+01	µg/l	1.0E-03	NA	2.6E+00	2.98E-08

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x t_{event} x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

tevent<t*: DAevent (mg/cm2-event) =
2 x Kp x CW x (sqrt((6 x t x t_{event})/3.1415))
x CF1 x CF2 (eq 2)

tevent>t*: DAevent (mg/cm2-event) =
Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3xB)/(1+B))

TABLE 8.6.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	1.5E-05	mg/kg-day	5.5E-02	1/mg/kg/day	8.2E-07
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	3.0E-05	mg/kg-day	N/A	1/mg/kg/day	N/A
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	5.7E-05	mg/kg-day	2.9E-03	1/mg/kg/day	1.6E-07
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	3.4E-04	mg/kg-day	N/A	N/A	N/A
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	4.7E-01	mg/kg-day	N/A	N/A	N/A
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	7.0E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	1.2E-04	mg/kg-day	1.5E+00	1/mg/kg/day	1.8E-04
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	2.5E-02	mg/kg-day	N/A	N/A	N/A
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	8.9E-04	mg/kg-day	N/A	N/A	N/A
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	6.6E-01	mg/kg-day	N/A	N/A	N/A
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	3.5E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	3.9E-02	mg/kg-day	N/A	N/A	N/A
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	1.6E-03	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	8.3E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										1.8E-04
Dermal Absorption											
	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	1.9E-06	mg/kg-day	5.5E-02	1/mg/kg/day	1.1E-07
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	7.3E-07	mg/kg-day	N/A	1/mg/kg/day	N/A
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	2.6E-06	mg/kg-day	2.9E-03	1/mg/kg/day	7.5E-09
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	2.6E-05	mg/kg-day	N/A	N/A	N/A
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	1.0E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	1.5E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	2.7E-07	mg/kg-day	1.5E+00	1/mg/kg/day	4.0E-07
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	5.4E-05	mg/kg-day	N/A	N/A	N/A
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	1.9E-06	mg/kg-day	N/A	N/A	N/A
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	1.4E-03	mg/kg-day	N/A	N/A	N/A
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	7.5E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	8.5E-06	mg/kg-day	N/A	N/A	N/A
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	3.6E-06	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	1.8E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										5.1E-07
										Total Risk Across All Exposure Routes/Pathways	1.9E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.6a.RME Supplement and Table 8.8b.RME Supplement.
N/A - not available

Table 8.6a.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.0E+00	µg/l	2.1E-02	2.6E-01	0.2	1.32E-08
Bromomethane	2.0E+00	µg/l	3.5E-03	3.3E-01	0.2	4.97E-09
Chloroethane	3.8E+00	µg/l	8.0E-03	2.2E-01	0.2	1.76E-08
4-Methylphenol	2.3E+01	µg/l	1.0E-02	4.0E-01	0.2	1.80E-07
Aluminum	3.1E+04	µg/l	1.0E-03	N/A	0.2	6.28E-06
Antimony	4.7E+00	µg/l	1.0E-03	N/A	0.2	9.40E-10
Arsenic	8.2E+00	µg/l	1.0E-03	N/A	0.2	1.64E-09
Barium	1.7E+03	µg/l	1.0E-03	N/A	0.2	3.36E-07
Chromium	6.0E+01	µg/l	1.0E-03	N/A	0.2	1.19E-08
Iron	4.4E+04	µg/l	1.0E-03	N/A	0.2	8.90E-06
Lead	2.3E+02	µg/l	1.0E-03	N/A	0.2	4.65E-08
Manganese	2.6E+03	µg/l	1.0E-04	N/A	0.2	5.27E-08
Nickel	1.1E+02	µg/l	1.0E-03	N/A	0.2	2.20E-08
Vanadium	5.5E+01	µg/l	1.0E-03	N/A	0.2	1.11E-08

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

Table 8.6b.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.0E+00	µg/l	2.1E-02	2.6E-01	0.33	1.70E-08
Bromomethane	2.0E+00	µg/l	3.5E-03	3.3E-01	0.33	6.38E-09
Chloroethane	3.8E+00	µg/l	8.0E-03	2.2E-01	0.33	2.26E-08
4-Methylphenol	2.3E+01	µg/l	1.0E-02	4.0E-01	0.33	2.31E-07
Aluminum	3.1E+04	µg/l	1.0E-03	N/A	0.33	1.04E-05
Antimony	4.7E+00	µg/l	1.0E-03	N/A	0.33	1.55E-09
Arsenic	8.2E+00	µg/l	1.0E-03	N/A	0.33	2.71E-09
Barium	1.7E+03	µg/l	1.0E-03	N/A	0.33	5.54E-07
Chromium	6.0E+01	µg/l	1.0E-03	N/A	0.33	1.97E-08
Iron	4.4E+04	µg/l	1.0E-03	N/A	0.33	1.47E-05
Lead	2.3E+02	µg/l	1.0E-03	N/A	0.33	7.67E-08
Manganese	2.6E+03	µg/l	1.0E-04	N/A	0.33	8.70E-08
Nickel	1.1E+02	µg/l	1.0E-03	N/A	0.33	3.63E-08
Vanadium	5.5E+01	µg/l	1.0E-03	N/A	0.33	1.83E-08

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	2.2E-08	mg/kg-day	5.5E-02	1/mg/kg/day	1.2E-09
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	7.5E-09	mg/kg-day	N/A	N/A	N/A
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	3.2E-08	mg/kg-day	2.9E-03	1/mg/kg/day	9.2E-11
	4-Methylphenol	2.3E+01	µg/l	2.3E+01	µg/l	M	2.5E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	3.1E+04	µg/l	3.1E+04	µg/l	M	3.1E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	4.7E+00	µg/l	4.7E+00	µg/l	M	4.7E-09	mg/kg-day	N/A	N/A	N/A
	Arsenic	8.2E+00	µg/l	8.2E+00	µg/l	M	8.2E-09	mg/kg-day	1.5E+00	1/mg/kg/day	1.2E-08
	Barium	1.7E+03	µg/l	1.7E+03	µg/l	M	1.7E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	6.0E+01	µg/l	6.0E+01	µg/l	M	5.9E-08	mg/kg-day	N/A	N/A	N/A
	Iron	4.4E+04	µg/l	4.4E+04	µg/l	M	4.4E-05	mg/kg-day	N/A	N/A	N/A
	Lead	2.3E+02	µg/l	2.3E+02	µg/l	M	2.3E-07	mg/kg-day	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	2.6E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	1.1E+02	µg/l	1.1E+02	µg/l	M	1.1E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.5E+01	µg/l	5.5E+01	µg/l	M	5.5E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										1.4E-08
							Total Risk Across All Exposure Routes/Pathways				1.4E-08

N/A - not applicable.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Dermal absorption per event calculated in Table 8.7.RME Supplement.

N/A - not available

Table 8.7.RME Supplement
Calculation of DAevent
Shallow Aquifer - Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
Benzene	1.0E+00	µg/l	2.1E-02	2.6E-01	8	1.77E-07	6.3E-01	1.3E-02	3
Bromomethane	2.0E+00	µg/l	3.5E-03	3.3E-01	8	6.05E-08	8.0E-01	1.5E-03	3
Chloroethane	3.8E+00	µg/l	8.0E-03	2.2E-01	8	2.56E-07	5.2E-01	2.7E-03	3
4-Methylphenol	2.3E+01	µg/l	1.0E-02	4.0E-01	8	2.01E-06	9.6E-01	8.7E-03	3
Aluminum	3.1E+04	µg/l	1.0E-03	N/A	8	2.51E-04	N/A	N/A	1
Antimony	4.7E+00	µg/l	1.0E-03	N/A	8	3.76E-08	N/A	N/A	1
Arsenic	8.2E+00	µg/l	1.0E-03	N/A	8	6.56E-08	N/A	N/A	1
Barium	1.7E+03	µg/l	1.0E-03	N/A	8	1.34E-05	N/A	N/A	1
Chromium	6.0E+01	µg/l	1.0E-03	N/A	8	4.77E-07	N/A	N/A	1
Iron	4.4E+04	µg/l	1.0E-03	N/A	8	3.56E-04	N/A	N/A	1
Lead	2.3E+02	µg/l	1.0E-03	N/A	8	1.86E-06	N/A	N/A	1
Manganese	2.6E+03	µg/l	1.0E-04	N/A	8	2.11E-06	N/A	N/A	1
Nickel	1.1E+02	µg/l	1.0E-03	N/A	8	8.80E-07	N/A	N/A	1
Vanadium	5.5E+01	µg/l	1.0E-03	N/A	8	4.43E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B)) x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 8.8.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Benzene	1.0E+00	µg/l	6.5E-05	mg/kg/shower	R	2.1E-05	mg/kg-day	2.7E-02	1/mg/kg/day	5.8E-07
	Bromomethane	2.0E+00	µg/l	1.2E-04	mg/kg/shower	R	4.0E-05	mg/kg-day	N/A	N/A	N/A
	Chloroethane	3.8E+00	µg/l	2.7E-04	mg/kg/shower	R	8.8E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										5.8E-07
										Total Risk Across All Exposure Routes/Pathways	5.8E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - Not applicable.
Route EPC value calculations shown on Table 8.8.RME Supplement.

Table 8.8.RME Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 11, NDWIH

Site 11, NDWIH	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law dimensionless	Henry's Law Constant (H) (atm-m3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m3 -min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Benzene	1.0E+00	7.8E+01	2.3E-01	5.6E-03	1.44E+03	1.50E+01	1.44E+01	1.94E+01	4.77E-01	3.18E+00	6.48E-05
Bromomethane	2.0E+00	9.5E+01	2.5E-01	6.2E-03	1.31E+03	1.36E+01	1.31E+01	1.77E+01	8.90E-01	5.94E+00	1.21E-04
Chloroethane	3.8E+00	6.5E+01	3.7E-01	1.1E-02	1.58E+03	1.65E+01	1.61E+01	2.18E+01	1.96E+00	1.31E+01	2.67E-04

Variables	Units	Exposure Assumptions	Source
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1	NA
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2	NA
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3	NA
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4	NA
Tl = Calibration temp. of water	K (20C +273)	293	F&C
Ts = Shower water temperature	k (45C)	318	F&C
Us = water viscosity at Ts	centipoise	0.596	F&C
Ul = water viscosity at Tl	cp	1.002	F&C
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5	NA
sdt = shower droplet drop time	sec	2	F&C
d = shower droplet diameter	mm	1	F&C
FR = shower water flow rate	l/min	20	F&C
SV = shower room air volume	m^3	3	F&C
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6	NA
VR = ventilation rate	l/min	13.8	USEPA, 1991
BW = body weight	kg	70	USEPA, 1991
Ds = duration of shower	min	12	USEPA, 1989
Dt = total duration in shower room	min	15	
R = air exchange rate	min^{-1}	0.0083	F&C
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7	NA
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8	NA

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	see time series example on Table I-GW-5	
Equation 8:	**Einh =**	**If t>Ds** (((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 8.9.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Benzene	1.0E+00	µg/l	2.8E-04	mg/m^3	R	8.8E-08	mg/kg-day	2.7E-02	1/mg/kg/day	2.4E-09
	Bromomethane	2.0E+00	µg/l	5.3E-04	mg/m^3	R	1.7E-07	mg/kg-day	N/A	N/A	NA
	Chloroethane	3.8E+00	µg/l	1.1E-03	mg/m^4	R	3.5E-07	mg/kg-day	N/A	N/A	NA
	(Total)										2.4E-09
										Total Risk Across All Exposure Routes/Pathways	2.4E-09

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - Not applicable.
Route EPC value calculations shown on Table 8.9.RME Supplement.

Table 8.9.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Senario
Site 11, NDWIH

Chemical	Cw (μg/L)	MW (mol/gram)	K_H (unitless)	k_l (cm/hr)	k_g (cm/hr)	K_v (cm/hr)	ER (mg/hr)	ERa (g/sec-m^2)	Ca (mg/m^3)
Benzene	1.0E+00	7.8E+01	2.28E-01	3.52E+00	2.13E+03	3.50E+00	3.50E-06	9.71E-09	2.76E-04
Bromomethane	2.0E+00	9.5E+01	2.50E-01	3.35E+00	2.03E+03	3.33E+00	6.66E-06	1.85E-08	5.25E-04
Chloroethane	3.8E+00	6.5E+01	3.70E-01	3.69E+00	2.24E+03	3.68E+00	1.40E-05	3.88E-08	1.10E-03

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 $ER = Kv * Cw * L/1000\ cm^3 * mg/1000\ \mu g$

Equation 5 $ERa = ER * g/1000\ mg * hr/60\ min * min/60\ sec * 10000\ cm^2/m^2$

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch) Length = 20 m, Width = 3 m	(m^2)	60
Era = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	8.2E-07	mg/kg-day	7.3E-01	mg/kg-day	6.0E-07
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	4.6E-07	mg/kg-day	7.3E+00	mg/kg-day	3.4E-06
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.2E-06	mg/kg-day	7.3E-01	mg/kg-day	8.7E-07
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	4.1E-07	mg/kg-day	7.3E+00	mg/kg-day	3.0E-06
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	4.3E-07	mg/kg-day	1.6E+00	mg/kg-day	6.9E-07
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	4.2E-07	mg/kg-day	7.3E-01	mg/kg-day	3.1E-07
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.0E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.7E-02	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.2E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	2.4E-05	mg/kg-day	1.5E+00	mg/kg-day	3.5E-05
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.3E-04	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	6.4E-05	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	2.6E-03	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	7.3E-02	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	7.5E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	7.6E-04	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	2.9E-06	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	6.7E-05	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	4.5E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.0E-06	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.1E-05	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	4.7E-03	mg/kg-day	N/A	N/A	N/A
											4.4E-05

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	5.6E-07	mg/kg-day	7.3E-01	mg/kg-day	4.1E-07
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	3.2E-07	mg/kg-day	7.3E+00	mg/kg-day	2.3E-06
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	8.2E-07	mg/kg-day	7.3E-01	mg/kg-day	6.0E-07
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	2.8E-07	mg/kg-day	7.3E+00	mg/kg-day	2.0E-06
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	2.3E-07	mg/kg-day	1.6E+00	mg/kg-day	3.6E-07
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	2.9E-07	mg/kg-day	7.3E-01	mg/kg-day	2.1E-07
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	2.6E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	8.8E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	6.2E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	3.7E-06	mg/kg-day	1.5E+00	mg/kg-day	5.6E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	3.4E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	1.4E-04	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	3.8E-03	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	3.9E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	4.0E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	1.5E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	3.5E-06	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	2.4E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	2.2E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	2.5E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										1.2E-05
										Total Risk Across All Exposure Routes/Pathways	5.6E-05

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk

N/A - not applicable.

TABLE 8.11.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	3.5E-08	mg/kg-day	7.3E-01	mg/kg-day	2.6E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.0E-08	mg/kg-day	7.3E+00	mg/kg-day	1.5E-07
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	5.1E-08	mg/kg-day	7.3E-01	mg/kg-day	3.7E-08
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	1.7E-08	mg/kg-day	7.3E+00	mg/kg-day	1.3E-07
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.8E-08	mg/kg-day	1.6E+00	mg/kg-day	2.9E-08
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.8E-08	mg/kg-day	7.3E-01	mg/kg-day	1.3E-08
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	2.1E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	7.2E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	5.1E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.0E-06	mg/kg-day	1.5E+00	mg/kg-day	1.5E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	9.7E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.7E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	3.1E-03	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	3.2E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	3.3E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	2.9E-06	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	1.9E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	8.4E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.8E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	2.0E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										1.9E-06

TABLE 8.11.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.205E-08	mg/kg-day	7.3E-01	mg/kg-day	8.8E-09
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	6.9E-09	mg/kg-day	7.3E+00	mg/kg-day	5.0E-08
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.8E-08	mg/kg-day	7.3E-01	mg/kg-day	1.3E-08
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	6.0E-09	mg/kg-day	7.3E+00	mg/kg-day	4.4E-08
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	4.9E-09	mg/kg-day	1.6E+00	mg/kg-day	7.8E-09
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	6.2E-09	mg/kg-day	7.3E-01	mg/kg-day	4.5E-09
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.6E-10	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.9E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.3E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	8.0E-08	mg/kg-day	1.5E+00	mg/kg-day	1.2E-07
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.6E-08	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	7.2E-08	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	3.0E-06	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	8.3E-05	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	8.5E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	8.6E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	3.2E-09	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	7.6E-08	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	5.1E-08	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.2E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.7E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	5.3E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										2.5E-07
										Total Risk Across All Exposure Routes/Pathways	2.1E-06

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.12.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.8E-07	mg/kg-day	7.3E-01	mg/kg-day	1.3E-07
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.0E-07	mg/kg-day	7.3E+00	mg/kg-day	7.6E-07
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	2.7E-07	mg/kg-day	7.3E-01	mg/kg-day	1.9E-07
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	9.1E-08	mg/kg-day	7.3E+00	mg/kg-day	6.6E-07
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	9.6E-08	mg/kg-day	1.6E+00	mg/kg-day	1.5E-07
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	9.4E-08	mg/kg-day	7.3E-01	mg/kg-day	6.8E-08
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	3.7E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	2.6E-06	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	5.3E-06	mg/kg-day	1.5E+00	mg/kg-day	7.9E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	5.1E-05	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.4E-05	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	5.8E-04	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	1.6E-02	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	1.7E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	1.7E-04	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	6.4E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	1.0E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	4.4E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	9.2E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.0E-03	mg/kg-day	N/A	N/A	N/A
	(Total)										9.9E-06

TABLE 8.12.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	4.0E-07	mg/kg-day	7.3E-01	mg/kg-day	2.9E-07
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.3E-07	mg/kg-day	7.3E+00	mg/kg-day	1.7E-06
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	5.9E-07	mg/kg-day	7.3E-01	mg/kg-day	4.3E-07
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	2.0E-07	mg/kg-day	7.3E+00	mg/kg-day	1.5E-06
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.6E-07	mg/kg-day	1.6E+00	mg/kg-day	2.6E-07
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	2.1E-07	mg/kg-day	7.3E-01	mg/kg-day	1.5E-07
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.9E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	6.4E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	4.5E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	2.7E-06	mg/kg-day	1.5E+00	mg/kg-day	4.0E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	8.6E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.4E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	9.9E-05	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	2.8E-03	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	2.8E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	2.9E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	2.5E-06	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	7.5E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.8E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										8.3E-06
										Total Risk Across All Exposure Routes/Pathways	1.8E-05

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.13.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.9E-08	mg/kg-day	7.3E-01	mg/kg-day	1.4E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.1E-08	mg/kg-day	7.3E+00	mg/kg-day	7.8E-08
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	2.7E-08	mg/kg-day	7.3E-01	mg/kg-day	2.0E-08
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	9.3E-09	mg/kg-day	7.3E+00	mg/kg-day	6.8E-08
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	9.8E-09	mg/kg-day	1.6E+00	mg/kg-day	1.6E-08
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	9.6E-09	mg/kg-day	7.3E-01	mg/kg-day	7.0E-09
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.1E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	3.9E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	2.7E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	5.4E-07	mg/kg-day	1.5E+00	mg/kg-day	8.1E-07
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	5.2E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	6.0E-05	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	1.7E-03	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	1.7E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	1.7E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	6.5E-08	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	4.5E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	9.4E-07	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										1.0E-06

TABLE 8.13.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	1.2E-08	mg/kg-day	7.3E-01	mg/kg-day	9.0E-09
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	7.0E-09	mg/kg-day	7.3E+00	mg/kg-day	5.1E-08
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	1.8E-08	mg/kg-day	7.3E-01	mg/kg-day	1.3E-08
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	6.1E-09	mg/kg-day	7.3E+00	mg/kg-day	4.5E-08
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	5.0E-09	mg/kg-day	1.6E+00	mg/kg-day	8.0E-09
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	6.3E-09	mg/kg-day	7.3E-01	mg/kg-day	4.6E-09
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.8E-10	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.9E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	1.4E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	8.2E-08	mg/kg-day	1.5E+00	mg/kg-day	1.2E-07
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.6E-08	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	7.4E-08	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	3.0E-06	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	8.5E-05	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	8.7E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	8.8E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	3.3E-09	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	7.8E-08	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	5.2E-08	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	2.3E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.8E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	5.4E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										2.5E-07
										Total Risk Across All Exposure Routes/Pathways	1.3E-06

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

TABLE 8.13.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk

N/A - not applicable.

TABLE 8.14.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	3.6E-08	mg/kg-day	7.3E-01	mg/kg-day	2.7E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.1E-08	mg/kg-day	7.3E+00	mg/kg-day	1.5E-07
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	5.3E-08	mg/kg-day	7.3E-01	mg/kg-day	3.9E-08
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	1.8E-08	mg/kg-day	7.3E+00	mg/kg-day	1.3E-07
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.9E-08	mg/kg-day	1.6E+00	mg/kg-day	3.1E-08
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.9E-08	mg/kg-day	7.3E-01	mg/kg-day	1.4E-08
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	2.2E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	7.5E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	5.3E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.0E-06	mg/kg-day	1.5E+00	mg/kg-day	1.6E-06
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	1.0E-05	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.8E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	1.2E-04	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	3.3E-03	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	3.3E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	3.4E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	3.0E-06	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	2.0E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	8.8E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.8E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	2.1E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										2.0E-06

TABLE 8.14.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	5.2E-01	mg/kg	5.2E-01	mg/kg	M	3.4E-08	mg/kg-day	7.3E-01	mg/kg-day	2.5E-08
	Benzo(a)pyrene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.0E-08	mg/kg-day	7.3E+00	mg/kg-day	1.4E-07
	Benzo(b)fluoranthene	7.6E-01	mg/kg	7.6E-01	mg/kg	M	5.0E-08	mg/kg-day	7.3E-01	mg/kg-day	3.7E-08
	Dibenz(a,h)anthracene	2.6E-01	mg/kg	2.6E-01	mg/kg	M	1.7E-08	mg/kg-day	7.3E+00	mg/kg-day	1.2E-07
	Hexachlorobenzene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.4E-08	mg/kg-day	1.6E+00	mg/kg-day	2.2E-08
	Indeno(1,2,3-cd)pyrene	2.7E-01	mg/kg	2.7E-01	mg/kg	M	1.8E-08	mg/kg-day	7.3E-01	mg/kg-day	1.3E-08
	Perchlorate	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.6E-09	mg/kg-day	N/A	N/A	N/A
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	5.4E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	7.6E+00	mg/kg	7.6E+00	mg/kg	M	3.8E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.5E+01	mg/kg	1.5E+01	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	mg/kg-day	3.4E-07
	Cadmium	1.5E+02	mg/kg	1.5E+02	mg/kg	M	7.4E-08	mg/kg-day	N/A	N/A	N/A
	Chromium	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A
	Copper	1.7E+03	mg/kg	1.7E+03	mg/kg	M	8.5E-06	mg/kg-day	N/A	N/A	N/A
	Iron	4.7E+04	mg/kg	4.7E+04	mg/kg	M	2.4E-04	mg/kg-day	N/A	N/A	N/A
	Lead	4.8E+03	mg/kg	4.8E+03	mg/kg	M	2.4E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	4.9E+02	mg/kg	4.9E+02	mg/kg	M	2.5E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	1.8E+00	mg/kg	1.8E+00	mg/kg	M	9.2E-09	mg/kg-day	N/A	N/A	N/A
	Nickel	4.3E+01	mg/kg	4.3E+01	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A
	Silver	2.9E+01	mg/kg	2.9E+01	mg/kg	M	1.5E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	1.3E+00	mg/kg	1.3E+00	mg/kg	M	6.4E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Zinc	3.0E+03	mg/kg	3.0E+03	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										7.1E-07
										Total Risk Across All Exposure Routes/Pathways	2.7E-06

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

TABLE 8.14.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 11 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk

N/A - not applicable.

TABLE 8.15.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	5.3E-06	mg/kg-day	5.5E-02	1/mg/kg/day	2.9E-07
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	1.1E-05	mg/kg-day	N/A	1/mg/kg/day	N/A
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	2.0E-05	mg/kg-day	2.9E-03	1/mg/kg/day	5.9E-08
	4-Methylphenol	4.8E+00	µg/l	4.8E+00	µg/l	M	2.5E-05	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.5E+02	µg/l	9.5E+02	µg/l	M	5.1E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	2.0E+00	µg/l	2.0E+00	µg/l	M	1.1E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	1.3E-05	mg/kg-day	1.5E+00	1/mg/kg/day	1.9E-05
	Barium	3.2E+02	µg/l	3.2E+02	µg/l	M	1.7E-03	mg/kg-day	N/A	N/A	N/A
	Chromium	5.6E+00	µg/l	5.6E+00	µg/l	M	3.0E-05	mg/kg-day	N/A	N/A	N/A
	Iron	3.3E+04	µg/l	3.3E+04	µg/l	M	1.7E-01	mg/kg-day	N/A	N/A	N/A
	Lead	1.3E+01	µg/l	1.3E+01	µg/l	M	7.2E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	1.9E+03	µg/l	1.9E+03	µg/l	M	1.0E-02	mg/kg-day	N/A	N/A	N/A
	Nickel	6.2E+00	µg/l	6.2E+00	µg/l	M	3.3E-05	mg/kg-day	N/A	N/A	N/A
	Vanadium	3.5E+00	µg/l	3.5E+00	µg/l	M	1.8E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										2.0E-05
Dermal Absorption											
	Benzene	1.0E+00	µg/l	1.0E+00	µg/l	M	6.9E-07	mg/kg-day	5.5E-02	1/mg/kg/day	3.8E-08
	Bromomethane	2.0E+00	µg/l	2.0E+00	µg/l	M	2.6E-07	mg/kg-day	N/A	N/A	N/A
	Chloroethane	3.8E+00	µg/l	3.8E+00	µg/l	M	9.1E-07	mg/kg-day	2.9E-03	1/mg/kg/day	2.6E-09
	4-Methylphenol	4.8E+00	µg/l	4.8E+00	µg/l	M	1.9E-06	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.5E+02	µg/l	9.5E+02	µg/l	M	1.2E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	2.0E+00	µg/l	2.0E+00	µg/l	M	2.5E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	2.9E-08	mg/kg-day	1.5E+00	1/mg/kg/day	4.4E-08
	Barium	3.2E+02	µg/l	3.2E+02	µg/l	M	3.9E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	5.6E+00	µg/l	5.6E+00	µg/l	M	6.8E-08	mg/kg-day	N/A	N/A	N/A
	Iron	3.3E+04	µg/l	3.3E+04	µg/l	M	4.0E-04	mg/kg-day	N/A	N/A	N/A
	Lead	1.3E+01	µg/l	1.3E+01	µg/l	M	1.6E-07	mg/kg-day	N/A	N/A	N/A
	Manganese	1.9E+03	µg/l	1.9E+03	µg/l	M	2.3E-06	mg/kg-day	N/A	N/A	N/A
	Nickel	6.2E+00	µg/l	6.2E+00	µg/l	M	7.5E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	3.5E+00	µg/l	3.5E+00	µg/l	M	4.2E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										8.5E-08
										Total Risk Across All Exposure Routes/Pathways	2.0E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.16a.RME Supplement and 8.16b.RME Supplement.
N/A - not available

Table 8.15a.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.0E+00	µg/l	2.1E-02	2.6E-01	0.2	1.32E-08
Bromomethane	2.0E+00	µg/l	3.5E-03	3.3E-01	0.2	4.97E-09
Chloroethane	3.8E+00	µg/l	8.0E-03	2.2E-01	0.2	1.76E-08
4-Methylphenol	4.8E+00	µg/l	1.0E-02	4.0E-01	0.2	3.72E-08
Aluminum	9.5E+02	µg/l	1.0E-03	N/A	0.2	1.91E-07
Antimony	2.0E+00	µg/l	1.0E-03	N/A	0.2	4.07E-10
Arsenic	2.4E+00	µg/l	1.0E-03	N/A	0.2	4.87E-10
Barium	3.2E+02	µg/l	1.0E-03	N/A	0.2	6.48E-08
Chromium	5.6E+00	µg/l	1.0E-03	N/A	0.2	1.13E-09
Iron	3.3E+04	µg/l	1.0E-03	N/A	0.2	6.56E-06
Lead	1.3E+01	µg/l	1.0E-03	N/A	0.2	2.69E-09
Manganese	1.9E+03	µg/l	1.0E-04	N/A	0.2	3.75E-08
Nickel	6.2E+00	µg/l	1.0E-03	N/A	0.2	1.25E-09
Vanadium	3.5E+00	µg/l	1.0E-03	N/A	0.2	6.91E-10

Inorganics: DAevent (mg/cn Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2 Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x E 2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

Table 8.15b.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 11, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Benzene	1.0E+00	µg/l	2.1E-02	2.6E-01	0.33	1.70E-08
Bromomethane	2.0E+00	µg/l	3.5E-03	3.3E-01	0.33	6.38E-09
Chloroethane	3.8E+00	µg/l	8.0E-03	2.2E-01	0.33	2.26E-08
4-Methylphenol	4.8E+00	µg/l	1.0E-02	4.0E-01	0.33	4.78E-08
Aluminum	9.5E+02	µg/l	1.0E-03	N/A	0.33	3.15E-07
Antimony	2.0E+00	µg/l	1.0E-03	N/A	0.33	6.71E-10
Arsenic	2.4E+00	µg/l	1.0E-03	N/A	0.33	8.04E-10
Barium	3.2E+02	µg/l	1.0E-03	N/A	0.33	1.07E-07
Chromium	5.6E+00	µg/l	1.0E-03	N/A	0.33	1.86E-09
Iron	3.3E+04	µg/l	1.0E-03	N/A	0.33	1.08E-05
Lead	1.3E+01	µg/l	1.0E-03	N/A	0.33	4.44E-09
Manganese	1.9E+03	µg/l	1.0E-04	N/A	0.33	6.18E-08
Nickel	6.2E+00	µg/l	1.0E-03	N/A	0.33	2.06E-09
Vanadium	3.5E+00	µg/l	1.0E-03	N/A	0.33	1.14E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Current
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 11 Surface Soil											
			Benzo(a)anthracene	1.6E-08	--	1.0E-08	2.6E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
			Benzo(a)pyrene	7.8E-08	--	5.1E-08	1.3E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
			Benzo(b)fluoranthene	2.3E-08	--	1.5E-08	3.8E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
			Dibenz(a,h)anthracene	7.5E-08	--	4.9E-08	1.2E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
			Hexachlorobenzene	1.7E-08	--	8.6E-09	2.6E-08	Hexachlorobenzene	Liver	1.0E-04	--	5.2E-05	1.6E-04
			Indeno(1,2,3-cd)pyrene	7.2E-09	--	4.7E-09	1.2E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
			Perchlorate	N/A	--	N/A	0.0E+00	Perchlorate	Thyroid	1.6E-03	--	8.3E-04	2.5E-03
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	3.2E-03	--	1.6E-04	3.4E-03
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	6.8E-03	--	2.3E-03	9.1E-03
			Arsenic	9.9E-07	--	1.5E-07	1.1E-06	Arsenic	Skin/vascular	1.7E-02	--	2.6E-03	2.0E-02
			Cadmium	N/A	--	N/A	0.0E+00	Cadmium	Kidney	4.1E-02	--	8.3E-03	4.9E-02
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	4.9E-03	--	9.9E-03	1.5E-02
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	2.1E-02	--	2.1E-03	2.3E-02
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	5.7E-02	--	2.9E-03	6.0E-02
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	8.2E-03	--	1.0E-02	1.9E-02
			Mercury	N/A	--	N/A	0.0E+00	Mercury	N/A	3.1E-03	--	2.3E-03	5.4E-03
			Nickel	N/A	--	N/A	0.0E+00	Nickel	Whole body	8.7E-04	--	1.1E-03	2.0E-03
			Silver	N/A	--	N/A	0.0E+00	Silver	Skin	2.4E-03	--	3.0E-03	5.3E-03
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	5.3E-03	--	2.7E-04	5.6E-03
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	7.7E-03	--	1.5E-02	2.3E-02
			Zinc	N/A	--	N/A	0.0E+00	Zinc	Blood	4.9E-03	--	2.5E-04	5.2E-03
			(Total)	1.2E-06	--	2.9E-07	1.5E-06	(Total)		1.9E-01	--	6.1E-02	2.5E-01
			Total Risk Across Surface Soil				1.5E-06	Total Hazard Index Across Surface Soil					2.5E-01
			Total Risk Across All Media and All Exposure Routes				1.5E-06	Total Hazard Index Across All Media and All Exposure Routes					2.5E-01

Total Liver HI =	1.6E-04
Total Thyroid HI =	2.5E-03
Total CNS HI =	2.2E-02
Total Blood HI =	1.4E-02
Total Skin HI =	3.1E-02
Total Vascular HI =	2.5E-02
Total Kidney HI =	7.2E-02
Total NOAEL HI =	1.5E-02
Total Gastrointestinal HI =	8.3E-02
Total Whole Body HI =	1.1E-02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Current
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 11 Surface Soil											
			Benzo(a)anthracene	3.1E-08	--	2.2E-08	5.3E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
			Benzo(a)pyrene	1.5E-07	--	1.1E-07	2.6E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
			Benzo(b)fluoranthene	4.4E-08	--	3.2E-08	7.6E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
			Dibenz(a,h)anthracene	1.5E-07	--	1.1E-07	2.5E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
			Hexachlorobenzene	3.3E-08	--	2.4E-08	5.7E-08	Hexachlorobenzene	Liver	7.5E-05	--	5.5E-05	1.3E-04
			Indeno(1,2,3-cd)pyrene	1.4E-08	--	1.0E-08	2.4E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
			Perchlorate	N/A		N/A	0.0E+00	Perchlorate	Thyroid	1.2E-03	--	8.7E-04	2.1E-03
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	2.3E-03	--	1.7E-04	2.5E-03
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	5.0E-03	--	2.4E-03	7.4E-03
			Arsenic	1.9E-06	--	4.5E-07	2.4E-06	Arsenic	Skin/vascular	1.2E-02	--	2.7E-03	1.5E-02
			Cadmium	N/A	--	N/A	0.0E+00	Cadmium	Kidney	3.0E-02	--	8.7E-03	3.9E-02
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	3.5E-03	--	1.0E-02	1.4E-02
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	1.5E-02	--	2.2E-03	1.7E-02
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	4.2E-02	--	3.0E-03	4.5E-02
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	6.0E-03	--	1.1E-02	1.7E-02
			Mercury	N/A	--	N/A	0.0E+00	Mercury	N/A	2.3E-03	--	2.4E-03	4.7E-03
			Nickel	N/A	--	N/A	0.0E+00	Nickel	Whole body	6.4E-04	--	1.2E-03	1.8E-03
			Silver	N/A	--	N/A	0.0E+00	Silver	Skin	1.7E-03	--	3.1E-03	4.8E-03
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	3.9E-03	--	2.8E-04	4.1E-03
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	5.6E-03	--	1.6E-02	2.1E-02
			Zinc	N/A	--	N/A	0.0E+00	Zinc	Blood	3.6E-03	--	2.6E-04	3.9E-03
			(Total)	2.3E-06	--	7.5E-07	3.1E-06	(Total)		1.4E-01	--	6.4E-02	2.0E-01
			Total Risk Across Surface Soil				3.1E-06	Total Hazard Index Across Surface Soil					2.0E-01
			Total Risk Across All Media and All Exposure Routes				3.1E-06	Total Hazard Index Across All Media and All Exposure Routes					2.0E-01

Total Liver HI =	1.3E-04
Total Thyroild HI =	2.1E-03
Total CNS HI =	1.9E-02
Total Blood HI =	1.1E-02
Total Skin HI =	2.4E-02
Total Vascular HI =	1.9E-02
Total Kidney HI =	6.0E-02
Total NOAEL HI =	1.4E-02
Total Gastrointestinal HI =	6.2E-02
Total Whole Body HI =	9.2E-03

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Current
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 11 Surface Soil											
			Benzo(a)anthracene	1.5E-07	--	2.6E-07	4.2E-07	Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
			Benzo(a)pyrene	7.6E-07	--	1.3E-06	2.0E-06	Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
			Benzo(b)fluoranthene	2.2E-07	--	3.8E-07	6.0E-07	Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
			Dibenz(a,h)anthracene	7.3E-07	--	1.2E-06	2.0E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
			Hexachlorobenzene	1.7E-07	--	2.8E-07	4.5E-07	Hexachlorobenzene	Liver	3.6E-04	--	6.1E-04	9.8E-04
			Indeno(1,2,3-cd)pyrene	7.0E-08	--	1.2E-07	1.9E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
			Perchlorate	N/A	--	N/A	0.0E+00	Perchlorate	Thyroid	5.7E-03	--	9.7E-03	1.5E-02
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	1.1E-02	--	1.9E-03	1.3E-02
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	2.4E-02	--	2.7E-02	5.1E-02
			Arsenic	9.6E-06	--	5.2E-06	1.5E-05	Arsenic	Skin/vascular	6.0E-02	--	3.0E-02	9.0E-02
			Cadmium	N/A	--	N/A	0.0E+00	Cadmium	Kidney	1.4E-01	--	9.8E-02	2.4E-01
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	1.7E-02	--	1.2E-01	1.3E-01
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	7.3E-02	--	2.5E-02	9.7E-02
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	2.0E-01	--	3.4E-02	2.4E-01
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	2.9E-02	--	1.2E-01	1.5E-01
			Mercury	N/A	--	N/A	0.0E+00	Mercury	N/A	1.1E-02	--	2.7E-02	3.8E-02
			Nickel	N/A	--	N/A	0.0E+00	Nickel	Whole body	3.1E-03	--	1.3E-02	1.6E-02
			Silver	N/A	--	N/A	0.0E+00	Silver	Skin	8.2E-03	--	3.5E-02	4.3E-02
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	1.9E-02	--	3.2E-03	2.2E-02
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	2.7E-02	--	1.7E-01	2.0E-01
			Zinc	N/A	--	N/A	0.0E+00	Zinc	Blood	1.7E-02	--	2.9E-03	2.0E-02
			(Total)	1.2E-05	--	8.8E-06	2.0E-05	(Total)		6.5E-01	--	7.2E-01	1.4E+00
			Total Risk Across Suface Soil				2.0E-05	Total Hazard Index Across Surface Soil					1.4E+00
			Total Risk Across All Media and All Exposure Routes				2.0E-05	Total Hazard Index Across All Media and All Exposure Routes					1.4E+00

Total Liver HI =	9.8E-04
Total Thyroid HI =	1.5E-02
Total CNS HI =	1.6E-01
Total Blood HI =	7.1E-02
Total Skin HI =	1.6E-01
Total Vascular HI =	1.1E-01
Total Kidney HI =	4.4E-01
Total NOAEL HI =	1.3E-01
Total Gastrointestinal HI =	3.3E-01
Total Whole Body HI =	6.7E-02

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Water	Surface Water	Mattawoman and Unnamed Creeks											
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	1.0E-02	--	1.7E-02	2.8E-02
			Arsenic	7.2E-07	--	1.8E-07	9.0E-07	Arsenic	Skin/vascular	4.7E-03	--	1.2E-03	5.8E-03
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	6.9E-02	--	1.7E-02	8.7E-02
			Vanadium	N/A		N/A	0.0E+00	Vanadium	Kidney	4.9E-03		4.7E-02	5.2E-02
			(Total)	7.2E-07	--	1.8E-07	9.0E-07	(Total)		8.9E-02		8.3E-02	1.7E-01
			Total Risk Across Surface Water				9.0E-07	Total Hazard Index Across Surface Water					1.7E-01
Total Risk Across All Media and All Exposure Routes							9.0E-07	Total Hazard Index Across All Media and All Exposure Routes					1.7E-01

Total Blood HI =	2.8E-02
Total Whole Body HI =	2.8E-02
Total Skin HI =	9.3E-02
Total Vascular HI =	9.3E-02
Total Kidney HI =	5.2E-02

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Wate	Surface Water	Mattawoman and Unnamed Creeks											
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	4.9E-02	--	3.2E-02	8.1E-02
			Arsenic	8.4E-07	--	8.3E-08	9.2E-07	Arsenic	Skin/vascular	2.2E-02	--	2.2E-03	2.4E-02
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	3.2E-01	--	3.2E-02	3.6E-01
			Vanadium	N/A		N/A	0.0E+00	Vanadium	Kidney	2.3E-02		8.6E-02	1.1E-01
			(Total)	8.4E-07	--	8.3E-08	9.2E-07	(Total)		4.2E-01		1.5E-01	5.7E-01
			Total Risk Across Surface Water				9.2E-07	Total Hazard Index Across Surface Water					5.7E-01
			Total Risk Across All Media and All Exposure Routes				9.2E-07	Total Hazard Index Across All Media and All Exposure Routes					5.7E-01

Total Blood HI =	8.1E-02
Total Whole Body HI =	8.1E-02
Total Skin HI =	3.8E-01
Total Vascular HI =	3.8E-01
Total Kidney HI =	1.1E-01

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
								Benzene	Blood	6.8E-03	--	9.1E-04	7.8E-03
								Bromomethane	NOAEL	3.9E-02	--	9.7E-04	4.0E-02
								Chloroethane	Fetus	2.6E-04	--	1.2E-05	2.7E-04
								4-Methylphenol	CNS, RESP & Whole Body	1.3E-01	--	9.9E-03	1.4E-01
								Aluminum	CNS	8.6E-01	--	1.7E-03	8.6E-01
								Antimony	Blood/Whole Body	3.2E-01	--	4.3E-03	3.3E-01
								Arsenic	Skin/vascular	7.5E-01	--	1.5E-03	7.5E-01
								Barium	Kidney	6.6E-01	--	1.9E-02	6.8E-01
								Chromium	NOAEL	5.4E-01	--	4.4E-02	5.9E-01
								Iron	Gastrointestinal	4.1E+00	--	8.1E-03	4.1E+00
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	N/A	3.6E+00	--	1.8E-02	3.6E+00
								Nickel	Whole body	1.5E-01	--	7.5E-03	1.6E-01
								Vanadium	Kidney	1.5E+00	--	1.2E-01	1.6E+00
								(Total)		1.3E+01	--	2.3E-01	1.3E+01
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					1.3E+01
Groundwater	Air	Shallow Aquifer -											
			Benzene	--	5.8E-07	--	5.8E-07	Benzene	Blood	--	7.2E-03	--	7.2E-03
			Bromomethane	--	N/A	--	0.0E+00	Bromomethane	LOAEL	--	8.3E-02	--	8.3E-02
			Chloroethane	--	N/A	--	0.0E+00	Chloroethane	Fetus	--	8.8E-05	--	8.8E-05
				--	5.8E-07	--	5.8E-07	(Total)		--	9.0E-02	--	9.0E-02
			Total Risk Across Air				5.8E-07	Total Hazard Index Across Air					9.0E-02

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
								Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
								Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
								Hexachlorobenzene	Liver	4.7E-04	--	6.2E-04	1.1E-03
								Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
								Perchlorate	Thyroid	4.3E-03	--	5.7E-03	1.0E-02
								Aluminum	CNS	1.5E-02	--	1.9E-03	1.7E-02
								Antimony	Blood/Whole Body	2.6E-02	--	2.3E-02	4.9E-02
								Arsenic	Skin/vascular	6.9E-02	--	2.7E-02	9.6E-02
								Cadmium	Kidney	2.0E-01	--	1.1E-01	3.0E-01
								Chromium	NOAEL	1.9E-02	--	9.8E-02	1.2E-01
								Copper	Gastrointestinal	5.7E-02	--	1.5E-02	7.2E-02
								Iron	Gastrointestinal	2.1E-01	--	2.8E-02	2.4E-01
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	CNS	3.3E-02	--	1.1E-01	1.4E-01
								Mercury	N/A	8.3E-03	--	1.6E-02	2.4E-02
								Nickel	Whole body	2.9E-03	--	9.7E-03	1.3E-02
								Silver	Skin	7.9E-03	--	2.6E-02	3.4E-02
								Thallium	Skin/vascular	2.5E-02	--	3.3E-03	2.8E-02
								Vanadium	Kidney	3.6E-02	--	1.8E-01	2.2E-01
								Zinc	Blood	1.4E-02	--	1.8E-03	1.5E-02
								(Total)		7.3E-01	--	6.5E-01	1.4E+00
						Total Risk Across Soil	0.0E+00					Total Hazard Index Across Soil	1.4E+00
						Total Risk Across All Media and All Exposure Routes	5.8E-07					Total Hazard Index Across All Media and All Exposure Routes	1.4E+01

Total Liver HI =	1.1E-03
Total Thyroid HI =	1.0E-02
Total Blood HI =	4.1E-01
Total NOAEL HI =	7.4E-01
Total Fetus HI =	2.7E-04
Total Kidney HI =	2.8E+00
Total CNS HI =	1.2E+00
Total Whole Body HI =	6.8E-01

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
												Total Skin HI =	8.7E-01
												Total Vascular HI =	8.7E-01
												Total Gastrointestinal HI =	4.4E+00
												Total LOAEL HI =	8.3E-02

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
								Benzene	Blood	1.6E-02	--	2.0E-03	1.8E-02
								Bromomethane	NOAEL	9.1E-02	--	2.2E-03	9.4E-02
								Chloroethane	Fetus	6.1E-04	--	2.7E-05	6.3E-04
								4-Methylphenol	CNS, RESP & Whole Body	2.9E-01	--	2.2E-02	3.2E-01
								Aluminum	CNS	2.0E+00	--	5.0E-03	2.0E+00
								Antimony	Blood/Whole Body	7.5E-01	--	1.2E-02	7.6E-01
								Arsenic	Skin/vascular	1.7E+00	--	4.3E-03	1.8E+00
								Barium	Kidney	1.5E+00	--	5.4E-02	1.6E+00
								Chromium	NOAEL	1.3E+00	--	1.3E-01	1.4E+00
								Iron	Gastrointestinal	9.5E+00	--	2.3E-02	9.5E+00
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	N/A	8.4E+00	--	5.2E-02	8.5E+00
								Nickel	Whole body	3.5E-01	--	2.2E-02	3.7E-01
								Vanadium	Kidney	3.5E+00	--	3.4E-01	3.9E+00
								(Total)		3.0E+01	--	6.6E-01	3.0E+01
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					3.0E+01
Soil*	Soil	Site 11 Soil											
								Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
								Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
								Hexachlorobenzene	Liver	4.4E-03	--	8.2E-04	5.2E-03
								Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
								Perchlorate	Thyroid	4.1E-02	--	7.6E-03	4.8E-02
								Aluminum	CNS	1.4E-01	--	2.6E-03	1.4E-01
								Antimony	Blood/Whole Body	2.4E-01	--	3.0E-02	2.7E-01

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil						Arsenic	Skin/vascular	6.4E-01	--	3.6E-02	6.8E-01
								Cadmium	Kidney	1.9E+00	--	1.4E-01	2.0E+00
								Chromium	NOAEL	1.7E-01	--	1.3E-01	3.0E-01
								Copper	Gastrointestinal	5.3E-01	--	2.0E-02	5.5E-01
								Iron	Gastrointestinal	2.0E+00	--	3.7E-02	2.0E+00
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	CNS	3.1E-01	--	1.5E-01	4.6E-01
								Mercury	N/A	7.8E-02	--	2.1E-02	9.8E-02
								Nickel	Whole body	2.7E-02	--	1.3E-02	4.0E-02
								Silver	Skin	7.3E-02	--	3.4E-02	1.1E-01
								Thallium	Skin/vascular	2.3E-01	--	4.3E-03	2.3E-01
								Vanadium	Kidney	3.4E-01	--	2.4E-01	5.8E-01
								Zinc	Blood	1.3E-01	--	2.4E-03	1.3E-01
								(Total)		6.8E+00	--	8.6E-01	7.7E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					7.7E+00
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.8E+01

Total Liver HI =	5.2E-03
Total Thyroid HI =	4.8E-02
Total Blood HI =	1.2E+00
Total NOAEL HI =	1.8E+00
Total Fetus HI =	6.3E-04
Total Kidney HI =	8.0E+00
Total CNS HI =	2.9E+00
Total Whole Body HI =	1.8E+00
Total Skin HI =	2.7E+00
Total Vascular HI =	2.7E+00
Total Gastrointestinal HI =	1.2E+01

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
			Benzene	8.2E-07	--	1.1E-07	9.3E-07						
			Bromomethane	N/A	--	N/A	0.0E+00						
			Chloroethane	1.6E-07	--	7.5E-09	1.7E-07						
			4-Methylphenol	N/A	--	N/A	0.0E+00						
			Aluminum	N/A	--	N/A	0.0E+00						
			Antimony	N/A	--	N/A	0.0E+00						
			Arsenic	1.8E-04	--	4.0E-07	1.8E-04						
			Barium	N/A	--	N/A	0.0E+00						
			Chromium	N/A	--	N/A	0.0E+00						
			Iron	N/A	--	N/A	0.0E+00						
			Lead	N/A	--	N/A	0.0E+00						
			Manganese	N/A	--	N/A	0.0E+00						
			Nickel	N/A	--	N/A	0.0E+00						
			Vanadium	N/A	--	N/A	0.0E+00						
				1.8E-04	--	5.1E-07	1.9E-04						
			Total Risk Across Groundwater				1.9E-04	Total Hazard Index Across Groundwater					0.0E+00
Groundwater	Air	Shallow Aquifer - Water Vapors at Showerhead											
			Benzene	--	5.8E-07	--	5.8E-07						
			Bromomethane	--	N/A	--	0.0E+00						
			Chloroethane	--	N/A	--	0.0E+00						
				--	5.8E-07	--	5.8E-07	(Total)					
			Total Risk Across Air				5.8E-07	Total Hazard Index Across Air					0.0E+00

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Residen
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
			Benzo(a)anthracene	6.0E-07	--	4.1E-07	1.0E-06						
			Benzo(a)pyrene	3.4E-06	--	2.3E-06	5.7E-06						
			Benzo(b)fluoranthene	8.7E-07	--	6.0E-07	1.5E-06						
			Dibenz(a,h)anthracene	3.0E-06	--	2.0E-06	5.0E-06						
			Hexachlorobenzene	6.9E-07	--	3.6E-07	1.0E-06						
			Indeno(1,2,3-cd)pyrene	3.1E-07	--	2.1E-07	5.2E-07						
			Perchlorate	N/A	--	N/A	0.0E+00						
			Aluminum	N/A	--	N/A	0.0E+00						
			Antimony	N/A	--	N/A	0.0E+00						
			Arsenic	3.5E-05	--	5.6E-06	4.1E-05						
			Cadmium	N/A	--	N/A	0.0E+00						
			Chromium	N/A	--	N/A	0.0E+00						
			Copper	N/A	--	N/A	0.0E+00						
			Iron	N/A	--	N/A	0.0E+00						
			Lead	N/A	--	N/A	0.0E+00						
			Manganese	N/A	--	N/A	0.0E+00						
			Mercury	N/A	--	N/A	0.0E+00						
			Nickel	N/A	--	N/A	0.0E+00						
			Silver	N/A	--	N/A	0.0E+00						
			Thallium	N/A	--	N/A	0.0E+00						
			Vanadium	N/A	--	N/A	0.0E+00						
			Zinc	N/A	--	N/A	0.0E+00						
				4.4E-05		1.2E-05	5.6E-05	(Total)					
			Total Risk Across Soil				5.6E-05	Total Hazard Index Across Soil					0.0E+00
			Total Risk Across All Media and All Exposure Routes				2.4E-04	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Water											
			Benzene	--	--	1.2E-09	1.2E-09	Benzene	Blood	--	--	3.9E-04	3.9E-04
			Bromomethane	--	--	N/A	0.0E+00	Bromomethane	NOAEL	--	--	3.8E-04	3.8E-04
			Chloroethane	--	--	9.2E-11	9.2E-11	Chloroethane	Fetus	--	--	5.6E-06	5.6E-06
			4-Methylphenol	--	--	N/A	0.0E+00	4-Methylphenol	CNS, RESP & Whole Body	--	--	3.5E-03	3.5E-03
			Aluminum	--	--	N/A	0.0E+00	Aluminum	CNS	--	--	2.2E-03	2.2E-03
			Antimony	--	--	N/A	0.0E+00	Antimony	Blood/Whole Body	--	--	5.5E-03	5.5E-03
			Arsenic	--	--	1.2E-08	1.2E-08	Arsenic	Skin/vascular	--	--	1.9E-03	1.9E-03
			Barium	--	--	N/A	0.0E+00	Barium	Kidney	--	--	2.4E-02	2.4E-02
			Chromium	--	--	N/A	0.0E+00	Chromium	NOAEL	--	--	8.3E-03	8.3E-03
			Iron	--	--	N/A	0.0E+00	Iron	Gastrointestinal	--	--	1.0E-02	1.0E-02
			Lead	--	--	N/A	0.0E+00	Lead	N/A	--	--	N/A	0.0E+00
			Manganese	--	--	N/A	0.0E+00	Manganese	N/A	--	--	2.3E-02	2.3E-02
			Nickel	--	--	N/A	0.0E+00	Nickel	Whole body	--	--	9.6E-03	9.6E-03
			Vanadium	--	--	N/A	0.0E+00	Vanadium	Kidney	--	--	1.5E-01	1.5E-01
				--	--	1.4E-08	1.4E-08	(Total)		--	--	2.4E-01	2.4E-01
			Total Risk Across Groundwater				1.4E-08	Total Hazard Index Across Groundwater					2.4E-01
Groundwater	Air	Shallow Aquifer - Volatization											
			Benzene	--	2.4E-09	--	2.4E-09	Benzene	Blood	--	3.6E-04	--	3.6E-04
			Bromomethane	--	NA	--	0.0E+00	Bromomethane	LOAEL	--	8.4E-03	--	8.4E-03
			Chloroethane	--	NA	--	0.0E+00	Chloroethane	Fetus	--	8.5E-06	--	8.5E-06
				--	2.4E-09	--	2.4E-09	(Total)		--	8.8E-03	--	8.8E-03
			Total Risk Across Air				2.4E-09	Total Hazard Index Across Air					8.8E-03

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
			Benzo(a)anthracene	2.6E-08	--	8.8E-09	3.4E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
			Benzo(a)pyrene	1.5E-07	--	5.0E-08	2.0E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
			Benzo(b)fluoranthene	3.7E-08	--	1.3E-08	5.0E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
			Dibenz(a,h)anthracene	1.3E-07	--	4.4E-08	1.7E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
			Hexachlorobenzene	2.9E-08	--	7.8E-09	3.7E-08	Hexachlorobenzene	Liver	1.6E-03	--	4.3E-04	2.0E-03
			Indeno(1,2,3-cd)pyrene	1.3E-08	--	4.5E-09	1.8E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
			Perchlorate	N/A	--	N/A	0.0E+00	Perchlorate	Thyroid	1.5E-02	--	3.9E-03	1.9E-02
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	5.0E-02	--	1.3E-03	5.2E-02
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	8.9E-02	--	1.6E-02	1.0E-01
			Arsenic	1.5E-06	--	1.2E-07	1.6E-06	Arsenic	Skin/vascular	2.4E-01	--	1.9E-02	2.5E-01
			Cadmium	N/A	--	N/A	0.0E+00	Cadmium	Kidney	6.8E-01	--	7.2E-02	7.5E-01
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	9.6E-03	--	1.0E-02	2.0E-02
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	2.0E-01	--	1.0E-02	2.1E-01
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	7.3E-01	--	1.9E-02	7.5E-01
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	1.1E-01	--	7.6E-02	1.9E-01
			Mercury	N/A	--	N/A	0.0E+00	Mercury	N/A	2.9E-02	--	1.1E-02	3.9E-02
			Nickel	N/A	--	N/A	0.0E+00	Nickel	Whole body	1.0E-02	--	6.7E-03	1.7E-02
			Silver	N/A	--	N/A	0.0E+00	Silver	Skin	2.7E-02	--	1.8E-02	4.5E-02
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	8.4E-02	--	2.2E-03	8.7E-02
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	1.2E-01	--	1.3E-01	2.5E-01
			Zinc	N/A	--	N/A	0.0E+00	Zinc	Blood	4.7E-02	--	1.2E-03	4.8E-02
				1.9E-06	--	2.5E-07	2.1E-06	(Total)		2.4E+00	--	3.9E-01	2.8E+00
			Total Risk Across Soil				2.1E-06	Total Hazard Index Across Soil					2.8E+00
Total Risk Across All Media and All Exposure Routes							2.2E-06	Total Hazard Index Across All Media and All Exposure Routes					3.1E+00

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
												Total Liver HI =	2.0E-03
												Total Thyroid HI =	1.9E-02
												Total Blood HI =	1.6E-01
												Total NOAEL HI =	2.8E-02
												Total Fetus HI =	1.4E-05
												Total Kidney HI =	1.2E+00
												Total CNS HI =	2.5E-01
												Total Whole Body HI =	1.4E-01
												Total Skin HI =	3.9E-01
												Total Vascular HI =	3.4E-01
												Total Gastrointestinal HI =	9.7E-01

TABLE 9.10.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
			Benzo(a)anthracene	1.3E-07	--	2.9E-07	4.3E-07	Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
			Benzo(a)pyrene	7.6E-07	--	1.7E-06	2.4E-06	Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
			Benzo(b)fluoranthene	1.9E-07	--	4.3E-07	6.2E-07	Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
			Dibenz(a,h)anthracene	6.6E-07	--	1.5E-06	2.1E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
			Hexachlorobenzene	1.5E-07	--	2.6E-07	4.1E-07	Hexachlorobenzene	Liver	3.4E-04	--	5.7E-04	9.0E-04
			Indeno(1,2,3-cd)pyrene	6.8E-08	--	1.5E-07	2.2E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
			Perchlorate	N/A	--	N/A	0.0E+00	Perchlorate	Thyroid	3.1E-03	--	5.3E-03	8.4E-03
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	1.0E-02	--	1.8E-03	1.2E-02
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	1.9E-02	--	2.1E-02	3.9E-02
			Arsenic	7.9E-06	--	4.0E-06	1.2E-05	Arsenic	Skin/vascular	4.9E-02	--	2.5E-02	7.4E-02
			Cadmium	N/A	--	N/A	0.0E+00	Cadmium	Kidney	1.4E-01	--	9.6E-02	2.4E-01
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	1.3E-02	--	9.0E-02	1.0E-01
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	4.1E-02	--	1.4E-02	5.5E-02
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	1.5E-01	--	2.6E-02	1.8E-01
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	2.4E-02	--	1.0E-01	1.2E-01
			Mercury	N/A	--	N/A	0.0E+00	Mercury	N/A	5.9E-03	--	1.4E-02	2.0E-02
			Nickel	N/A	--	N/A	0.0E+00	Nickel	Whole body	2.1E-03	--	8.9E-03	1.1E-02
			Silver	N/A	--	N/A	0.0E+00	Silver	Skin	5.6E-03	--	2.4E-02	2.9E-02
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	1.8E-02	--	3.0E-03	2.1E-02
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	2.6E-02	--	1.7E-01	1.9E-01
			Zinc	N/A	--	N/A	0.0E+00	Zinc	Blood	9.7E-03	--	1.7E-03	1.1E-02
				9.9E-06	--	8.3E-06	1.8E-05	(Total)		5.2E-01	--	6.0E-01	1.1E+00
			Total Risk Across Soil				1.8E-05	Total Hazard Index Across Soil					1.1E+00
			Total Risk Across All Media and All Exposure Routes				1.8E-05	Total Hazard Index Across All Media and All Exposure Routes					1.1E+00

Total Liver HI =	9.0E-04
Total Thyroid HI =	8.4E-03
Total Blood HI =	5.1E-02
Total NOAEL HI =	1.0E-01
Total Kidney HI =	4.3E-01
Total CNS HI =	1.4E-01
Total Whole Body HI =	5.0E-02
Total Skin HI =	1.2E-01
Total Vascular HI =	9.5E-02
Total Gastrointestinal HI =	2.3E-01

TABLE 9.11.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
			Benzo(a)anthracene	1.4E-08	--	9.0E-09	2.3E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
			Benzo(a)pyrene	7.8E-08	--	5.1E-08	1.3E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
			Benzo(b)fluoranthene	2.0E-08	--	1.3E-08	3.3E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
			Dibenz(a,h)anthracene	6.8E-08	--	4.5E-08	1.1E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
			Hexachlorobenzene	1.6E-08	--	8.0E-09	2.4E-08	Hexachlorobenzene	Liver	9.6E-05	--	4.8E-05	1.4E-04
			Indeno(1,2,3-cd)pyrene	7.0E-09	--	4.6E-09	1.2E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
			Perchlorate	N/A	--	N/A	0.0E+00	Perchlorate	Thyroid	8.9E-04	--	4.5E-04	1.3E-03
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	3.0E-03	--	1.5E-04	3.1E-03
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	5.3E-03	--	1.8E-03	7.1E-03
			Arsenic	8.1E-07	--	1.2E-07	9.3E-07	Arsenic	Skin/vascular	1.4E-02	--	2.1E-03	1.6E-02
			Cadmium	N/A	--	N/A	0.0E+00	Cadmium	Kidney	4.1E-02	--	8.2E-03	4.9E-02
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	3.8E-03	--	7.7E-03	1.1E-02
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	1.2E-02	--	1.2E-03	1.3E-02
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	4.3E-02	--	2.2E-03	4.6E-02
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	6.8E-03	--	8.6E-03	1.5E-02
			Mercury	N/A	--	N/A	0.0E+00	Mercury	N/A	1.7E-03	--	1.2E-03	2.9E-03
			Nickel	N/A	--	N/A	0.0E+00	Nickel	Whole body	6.0E-04	--	7.6E-04	1.4E-03
			Silver	N/A	--	N/A	0.0E+00	Silver	Skin	1.6E-03	--	2.0E-03	3.6E-03
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	5.0E-03	--	2.5E-04	5.3E-03
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	7.3E-03	--	1.4E-02	2.2E-02
			Zinc	N/A	--	N/A	0.0E+00	Zinc	Blood	2.8E-03	--	1.4E-04	2.9E-03
				1.0E-06	--	2.5E-07	1.3E-06	(Total)		1.5E-01	--	5.1E-02	2.0E-01
			Total Risk Across Soil				1.3E-06	Total Hazard Index Across Soil					2.0E-01
			Total Risk Across All Media and All Exposure Routes				1.3E-06	Total Hazard Index Across All Media and All Exposure Routes					2.0E-01

Total Liver HI =	1.4E-04
Total Thyroid HI =	1.3E-03
Total Blood HI =	1.0E-02
Total NOAEL HI =	1.1E-02
Total Kidney HI =	7.0E-02
Total CNS HI =	1.9E-02
Total Whole Body HI =	8.4E-03
Total Skin HI =	2.5E-02
Total Vascular HI =	2.1E-02
Total Gastrointestinal HI =	5.8E-02

TABLE 9.12.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
			Benzo(a)anthracene	2.7E-08	--	2.5E-08	5.2E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
			Benzo(a)pyrene	1.5E-07	--	1.4E-07	2.9E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
			Benzo(b)fluoranthene	3.9E-08	--	3.7E-08	7.6E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
			Dibenz(a,h)anthracene	1.3E-07	--	1.2E-07	2.6E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
			Hexachlorobenzene	3.1E-08	--	2.2E-08	5.3E-08	Hexachlorobenzene	Liver	7.0E-05	--	7.0E-05	1.4E-04
			Indeno(1,2,3-cd)pyrene	1.4E-08	--	1.3E-08	2.7E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
			Perchlorate	N/A	--	N/A	0.0E+00	Perchlorate	Thyroid	6.5E-04	--	6.4E-04	1.3E-03
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	2.2E-03	--	2.2E-04	2.4E-03
			Antimony	N/A	--	N/A	0.0E+00	Antimony	Blood/Whole Body	3.9E-03	--	2.6E-03	6.4E-03
			Arsenic	1.6E-06	--	3.4E-07	1.9E-06	Arsenic	Skin/vascular	1.0E-02	--	3.1E-03	1.3E-02
			Cadmium	N/A	--	N/A	0.0E+00	Cadmium	Kidney	3.0E-02	--	1.2E-02	4.1E-02
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	2.8E-03	--	1.1E-02	1.4E-02
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	8.5E-03	--	1.7E-03	1.0E-02
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	3.2E-02	--	3.2E-03	3.5E-02
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	4.9E-03	--	1.2E-02	1.7E-02
			Mercury	N/A	--	N/A	0.0E+00	Mercury	N/A	1.2E-03	--	1.8E-03	3.0E-03
			Nickel	N/A	--	N/A	0.0E+00	Nickel	Whole body	4.4E-04	--	1.1E-03	1.5E-03
			Silver	N/A	--	N/A	0.0E+00	Silver	Skin	1.2E-03	--	2.9E-03	4.1E-03
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/vascular	3.7E-03	--	3.6E-04	4.0E-03
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	5.4E-03	--	2.1E-02	2.6E-02
			Zinc	N/A	--	N/A	0.0E+00	Zinc	Blood	2.0E-03	--	2.0E-04	2.2E-03
				2.0E-06	--	7.1E-07	2.7E-06	(Total)		1.1E-01	--	7.3E-02	1.8E-01
			Total Risk Across Soil				2.7E-06	Total Hazard Index Across Soil					1.8E-01
			Total Risk Across All Media and All Exposure Routes				2.7E-06	Total Hazard Index Across All Media and All Exposure Routes					1.8E-01

Total Liver HI =	1.4E-04
Total Thyroid HI =	1.3E-03
Total Blood HI =	8.6E-03
Total NOAEL HI =	1.4E-02
Total Kidney HI =	6.7E-02
Total CNS HI =	2.0E-02
Total Whole Body HI =	7.9E-03
Total Skin HI =	2.1E-02
Total Vascular HI =	1.7E-02
Total Gastrointestinal HI =	4.5E-02

TABLE 9.13.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Current
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil							Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
								Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
								Hexachlorobenzene	Liver	1.4E-04	--	1.7E-04	3.1E-04
								Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
								Ammonium perchlorate	Thyroid	3.7E-04	--	4.7E-04	8.3E-04
								Aluminum	CNS	4.2E-03	--	5.3E-04	4.7E-03
								Antimony	Blood/Whole Body	2.0E-03	--	1.7E-03	3.7E-03
								Arsenic	Skin/vascular	1.6E-02	--	6.0E-03	2.2E-02
								Cadmium	Kidney	1.4E-03	--	7.1E-04	2.1E-03
								Chromium	NOAEL	3.2E-03	--	1.6E-02	1.9E-02
								Copper	Gastrointestinal	1.0E-03	--	2.6E-04	1.3E-03
								Iron	Gastrointestinal	3.9E-02	--	5.0E-03	4.4E-02
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	CNS	4.9E-03	--	1.6E-02	2.1E-02
								Mercury	N/A	4.3E-04	--	7.8E-04	1.2E-03
								Nickel	Whole body	3.7E-04	--	1.2E-03	1.5E-03
								Silver	Skin	2.3E-04	--	7.2E-04	9.5E-04
								Thallium	Skin/vascular	5.4E-03	--	6.9E-04	6.1E-03
								Vanadium	Kidney	1.1E-02	--	5.2E-02	6.2E-02
								Zinc	Blood	4.2E-04	--	5.4E-05	4.7E-04
								(Total)		8.9E-02	--	1.0E-01	1.9E-01
			Total Risk Across Suface Soil					Total Hazard Index Across Surface Soil					1.9E-01
			Total Risk Across All Media and All Exposure Routes					Total Hazard Index Across All Media and All Exposure Routes					1.9E-01

Total Liver HI =	3.1E-04
Total Thyroid HI =	8.3E-04
Total CNS HI =	2.5E-02
Total Blood HI =	4.1E-03
Total Skin HI =	2.9E-02
Total Vascular HI =	2.8E-02
Total Kidney HI =	6.5E-02
Total NOAEL HI =	1.9E-02
Total Gastrointestinal HI =	4.5E-02
Total Whole Body HI =	5.2E-03

TABLE 9.14.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
								Benzene	Blood	3.2E-03	N/A	5.5E-04	3.8E-03
								Bromomethane	NOAEL	1.8E-02	N/A	5.9E-04	1.9E-02
								Chloroethane	Fetus	1.2E-04	N/A	7.3E-06	1.3E-04
								4-Methylphenol	CNS, RESP & Whole Body	1.2E-02	N/A	1.2E-03	1.3E-02
								Aluminum	CNS	1.2E-02	N/A	3.1E-05	1.2E-02
								Antimony	Blood/Whole Body	6.5E-02	N/A	1.1E-03	6.6E-02
								Arsenic	Skin/vascular	1.0E-01	N/A	2.7E-04	1.0E-01
								Barium	Kidney	5.9E-02	N/A	2.2E-03	6.1E-02
								Chromium	NOAEL	2.4E-02	N/A	2.5E-03	2.7E-02
								Iron	Gastrointestinal	1.4E+00	N/A	3.6E-03	1.4E+00
								Lead	N/A	N/A	N/A	N/A	0.0E+00
								Manganese	N/A	1.2E+00	N/A	7.7E-03	1.2E+00
								Nickel	Whole body	4.0E-03	N/A	2.6E-04	4.3E-03
								Vanadium	Kidney	4.4E-02	N/A	4.4E-03	4.9E-02
								(Total)		2.9E+00	--	2.4E-02	3.0E+00
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					3.0E+00

TABLE 9.14.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
								Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
								Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
								Hexachlorobenzene	Liver	1.4E-04	--	3.2E-04	4.5E-04
								Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
								Ammonium perchlorate	Thyroid	3.5E-04	--	7.9E-04	1.1E-03
								Aluminum	CNS	3.8E-03	--	8.6E-04	4.6E-03
								Antimony	Blood/Whole Body	1.6E-03	--	2.5E-03	4.1E-03
								Arsenic	Skin/vascular	1.0E-02	--	6.9E-03	1.7E-02
								Cadmium	Kidney	9.6E-04	--	8.8E-04	1.8E-03
								Chromium	NOAEL	3.1E-03	--	2.8E-02	3.1E-02
								Copper	Gastrointestinal	8.5E-04	--	3.9E-04	1.2E-03
								Iron	Gastrointestinal	3.6E-02	--	8.2E-03	4.4E-02
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	CNS	4.5E-03	--	2.6E-02	3.0E-02
								Mercury	N/A	3.4E-04	--	1.1E-03	1.4E-03
								Nickel	Whole body	3.4E-04	--	1.9E-03	2.3E-03
								Silver	Skin	1.8E-04	--	1.0E-03	1.2E-03
								Thallium	Skin/vascular	5.6E-03	--	1.3E-03	6.9E-03
								Vanadium	Kidney	1.1E-02	--	9.7E-02	1.1E-01
								Zinc	Blood	3.4E-04	--	7.9E-05	4.2E-04
								(Total)		7.9E-02	--	1.8E-01	2.6E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					2.6E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.2E+00

TABLE 9.14.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
												Total Liver HI =	4.5E-04
												Total Thyroid HI =	1.1E-03
												Total Blood HI =	7.5E-02
												Total NOAEL HI =	7.7E-02
												Total Fetus HI =	1.3E-04
												Total Kidney HI =	2.2E-01
												Total CNS HI =	6.1E-02
												Total Whole Body HI =	9.0E-02
												Total Skin HI =	1.3E-01
												Total Vascular HI =	1.3E-01
												Total Gastrointestinal HI =	1.5E+00

TABLE 9.15.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
								Benzene	Blood	1.1E-02	N/A	1.2E-03	1.2E-02
								Bromomethane	NOAEL	6.1E-02	N/A	1.3E-03	6.2E-02
								Chloroethane	Fetus	4.1E-04	N/A	1.6E-05	4.2E-04
								4-Methylphenol	CNS, RESP & Whole Body	4.1E-02	N/A	2.7E-03	4.3E-02
								Aluminum	CNS	4.1E-02	N/A	8.7E-05	4.1E-02
								Antimony	Blood/Whole Body	2.2E-01	N/A	3.1E-03	2.2E-01
								Arsenic	Skin/vascular	3.5E-01	N/A	7.4E-04	3.5E-01
								Barium	Kidney	2.0E-01	N/A	6.1E-03	2.0E-01
								Chromium	NOAEL	8.0E-02	N/A	6.9E-03	8.7E-02
								Iron	Gastrointestinal	4.7E+00	N/A	1.0E-02	4.7E+00
								Lead	N/A	N/A	N/A	N/A	0.0E+00
								Manganese	N/A	4.0E+00	N/A	2.1E-02	4.0E+00
								Nickel	Whole body	1.3E-02	N/A	7.1E-04	1.4E-02
								Vanadium	Kidney	1.5E-01	N/A	1.2E-02	1.6E-01
								(Total)		9.8E+00	--	6.6E-02	9.9E+00
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					9.9E+00

TABLE 9.15.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
								Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
								Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
								Hexachlorobenzene	Liver	1.3E-03	--	4.1E-04	1.7E-03
								Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
								Ammonium perchlorate	Thyroid	3.2E-03	--	1.0E-03	4.3E-03
								Aluminum	CNS	3.5E-02	--	1.1E-03	3.6E-02
								Antimony	Blood/Whole Body	1.5E-02	--	3.3E-03	1.9E-02
								Arsenic	Skin/vascular	9.4E-02	--	9.0E-03	1.0E-01
								Cadmium	Kidney	9.0E-03	--	1.1E-03	1.0E-02
								Chromium	NOAEL	2.9E-02	--	3.7E-02	6.6E-02
								Copper	Gastrointestinal	8.0E-03	--	5.1E-04	8.5E-03
								Iron	Gastrointestinal	3.4E-01	--	1.1E-02	3.5E-01
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	CNS	4.2E-02	--	3.4E-02	7.6E-02
								Mercury	N/A	3.1E-03	--	1.4E-03	4.6E-03
								Nickel	Whole body	3.2E-03	--	2.5E-03	5.7E-03
								Silver	Skin	1.6E-03	--	1.3E-03	2.9E-03
								Thallium	Skin/vascular	5.3E-02	--	1.7E-03	5.4E-02
								Vanadium	Kidney	1.0E-01	--	1.3E-01	2.3E-01
								Zinc	Blood	3.2E-03	--	1.0E-04	3.3E-03
								(Total)		7.4E-01	--	2.3E-01	9.7E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					9.7E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.1E+01

TABLE 9.15.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
												Total Liver HI =	1.7E-03
												Total Thyroid HI =	4.3E-03
												Total Blood HI =	2.5E-01
												Total NOAEL HI =	2.2E-01
												Total Fetus HI =	4.2E-04
												Total Kidney HI =	6.0E-01
												Total CNS HI =	2.0E-01
												Total Whole Body HI =	3.0E-01
												Total Skin HI =	5.1E-01
												Total Vascular HI =	5.1E-01
												Total Gastrointestinal HI =	5.0E+00

TABLE 9.16.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
			Benzene	2.9E-07	--	3.8E-08	3.3E-07						
			Bromomethane	N/A	--	N/A	0.0E+00						
			Chloroethane	5.9E-08	--	2.6E-09	6.1E-08						
			4-Methylphenol	N/A	--	N/A	0.0E+00						
			Aluminum	N/A	--	N/A	0.0E+00						
			Antimony	N/A	--	N/A	0.0E+00						
			Arsenic	1.9E-05	--	4.4E-08	1.9E-05						
			Barium	N/A	--	N/A	0.0E+00						
			Chromium	N/A	--	N/A	0.0E+00						
			Iron	N/A	--	N/A	0.0E+00						
			Lead	N/A	--	N/A	0.0E+00						
			Manganese	N/A	--	N/A	0.0E+00						
			Nickel	N/A	--	N/A	0.0E+00						
			Vanadium	N/A	--	N/A	0.0E+00						
				2.0E-05	--	8.5E-08	2.0E-05						
			Total Risk Across Groundwater				2.0E-05	Total Hazard Index Across Groundwater					0.0E+00
			Total Risk Across All Media and All Exposure Routes				2.0E-05	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 9.17.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
								Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
								Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
								Hexachlorobenzene	Liver	1.2E-03	--	1.2E-04	1.4E-03
								Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
								Ammonium perchlorate	Thyroid	3.1E-03	--	3.1E-04	3.4E-03
								Aluminum	CNS	3.4E-02	--	3.4E-04	3.4E-02
								Antimony	Blood/Whole Body	1.5E-02	--	9.8E-04	1.6E-02
								Arsenic	Skin/vascular	9.1E-02	--	2.7E-03	9.4E-02
								Cadmium	Kidney	8.6E-03	--	3.4E-04	9.0E-03
								Chromium	NOAEL	4.2E-03	--	1.7E-03	5.8E-03
								Copper	Gastrointestinal	7.7E-03	--	1.5E-04	7.8E-03
								Iron	Gastrointestinal	3.2E-01	--	3.2E-03	3.3E-01
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	CNS	4.1E-02	--	1.0E-02	5.1E-02
								Mercury	N/A	3.0E-03	--	4.3E-04	3.5E-03
								Nickel	Whole body	3.1E-03	--	7.7E-04	3.8E-03
								Silver	Skin	1.6E-03	--	3.9E-04	2.0E-03
								Thallium	Skin/vascular	5.1E-02	--	5.1E-04	5.1E-02
								Vanadium	Kidney	9.9E-02	--	3.8E-02	1.4E-01
								Zinc	Blood	3.1E-03	--	3.1E-05	3.1E-03
								(Total)		6.9E-01	--	6.0E-02	7.5E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					7.5E-01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					7.5E-01

Total Liver HI =	1.4E-03
Total Thyroid HI =	3.4E-03
Total Blood HI =	1.9E-02
Total NOAEL HI =	5.8E-03
Total Kidney HI =	1.5E-01
Total CNS HI =	8.5E-02
Total Whole Body HI =	2.0E-02
Total Skin HI =	1.5E-01
Total Vascular HI =	1.4E-01
Total Gastrointestinal HI =	3.4E-01

TABLE 9.18.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
								Benzo(a)anthracene	N/A	N/A	--	N/A	0.0E+00
								Benzo(a)pyrene	N/A	N/A	--	N/A	0.0E+00
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	0.0E+00
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	0.0E+00
								Hexachlorobenzene	Liver	1.3E-04	--	1.7E-04	3.0E-04
								Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	0.0E+00
								Ammonium perchlorate	Thyroid	3.2E-04	--	4.2E-04	7.4E-04
								Aluminum	CNS	3.5E-03	--	4.5E-04	4.0E-03
								Antimony	Blood/Whole Body	1.5E-03	--	1.3E-03	2.8E-03
								Arsenic	Skin/vascular	9.5E-03	--	3.6E-03	1.3E-02
								Cadmium	Kidney	9.0E-04	--	4.6E-04	1.4E-03
								Chromium	NOAEL	2.9E-03	--	1.5E-02	1.8E-02
								Copper	Gastrointestinal	8.0E-04	--	2.0E-04	1.0E-03
								Iron	Gastrointestinal	3.4E-02	--	4.3E-03	3.8E-02
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	CNS	4.3E-03	--	1.4E-02	1.8E-02
								Mercury	N/A	3.2E-04	--	5.8E-04	8.9E-04
								Nickel	Whole body	3.2E-04	--	1.0E-03	1.3E-03
								Silver	Skin	1.6E-04	--	5.3E-04	6.9E-04
								Thallium	Skin/vascular	5.3E-03	--	6.7E-04	5.9E-03
								Vanadium	Kidney	1.0E-02	--	5.1E-02	6.1E-02
								Zinc	Blood	3.2E-04	--	4.1E-05	3.6E-04
				0.0E+00	--	0.0E+00	0.0E+00	(Total)		7.4E-02	--	9.3E-02	1.7E-01
						Total Risk Across Soil	0.0E+00					Total Hazard Index Across Soil	1.7E-01
						Total Risk Across All Media and All Exposure Routes	0.0E+00					Total Hazard Index Across All Media and All Exposure Routes	1.7E-01

Total Liver HI =	3.0E-04
Total Thyroid HI =	7.4E-04
Total Blood HI =	3.2E-03
Total NOAEL HI =	1.8E-02
Total Kidney HI =	6.2E-02
Total CNS HI =	2.2E-02
Total Whole Body HI =	4.2E-03
Total Skin HI =	2.0E-02
Total Vascular HI =	1.9E-02
Total Gastrointestinal HI =	3.9E-02

TABLE 10.1.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Current
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 11 Surface Soil						Cadmium	Kidney	1.4E-01	--	9.8E-02	2.4E-01
								Chromium	NOAEL	1.7E-02	--	1.2E-01	1.3E-01
								Iron	Gastrointestinal	2.0E-01	--	3.4E-02	2.4E-01
								Manganese	CNS	2.9E-02	--	1.2E-01	1.5E-01
								Vanadium	Kidney	2.7E-02		1.7E-01	2.0E-01
			(Total)	0.0E+00	--	0.0E+00	0.0E+00	(Total)		4.2E-01	--	5.4E-01	9.6E-01
			Total Risk Across Suface Soil				0.0E+00	Total Hazard Index Across Surface Soil					9.6E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					9.6E-01

Total Kidney HI =	4.4E-01
Total NOAEL HI =	1.3E-01
Total Gastrointestinal HI =	2.4E-01
Total CNS HI =	1.5E-01

TABLE 10.2.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
								4-Methylphenol	CNS, RESP & Whole Body	1.3E-01	--	9.9E-03	1.4E-01
								Aluminum	CNS	8.6E-01	--	1.7E-03	8.6E-01
								Antimony	Blood/Whole Body	3.2E-01	--	4.3E-03	3.3E-01
								Arsenic	Skin/vascular	7.5E-01	--	1.5E-03	7.5E-01
								Barium	Kidney	6.6E-01	--	1.9E-02	6.8E-01
								Chromium	NOAEL	5.4E-01	--	4.4E-02	5.9E-01
								Iron	Gastrointestinal	4.1E+00	--	8.1E-03	4.1E+00
								Manganese	N/A	3.6E+00	--	1.8E-02	3.6E+00
								Nickel	Whole body	1.5E-01	--	7.5E-03	1.6E-01
								Vanadium	Kidney	1.5E+00	--	1.2E-01	1.6E+00
								(Total)		1.3E+01	--	2.3E-01	1.3E+01
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					1.3E+01
Soil*	Soil	Site 11 Soil											
								Cadmium	Kidney	2.0E-01	--	1.1E-01	3.0E-01
								Chromium	NOAEL	1.9E-02	--	9.8E-02	1.2E-01
								Iron	Gastrointestinal	2.1E-01	--	2.8E-02	2.4E-01
								Manganese	CNS	3.3E-02	--	1.1E-01	1.4E-01
								Vanadium	Kidney	3.6E-02	--	1.8E-01	2.2E-01
								(Total)		5.0E-01	--	5.2E-01	1.0E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					1.0E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.4E+01

Total Blood HI =	3.3E-01
Total NOAEL HI =	7.0E-01
Total Kidney HI =	2.8E+00
Total CNS HI =	1.1E+00
Total Whole Body HI =	6.2E-01
Total Skin HI =	7.5E-01
Total Vascular HI =	7.5E-01
Total Gastrointestinal HI =	4.3E+00

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
								4-Methylphenol	CNS, RESP & Whole Body	2.9E-01	--	2.2E-02	3.2E-01
								Aluminum	CNS	2.0E+00	--	5.0E-03	2.0E+00
								Antimony	Blood/Whole Body	7.5E-01	--	1.2E-02	7.6E-01
								Arsenic	Skin/vascular	1.7E+00	--	4.3E-03	1.8E+00
								Barium	Kidney	1.5E+00	--	5.4E-02	1.6E+00
								Chromium	NOAEL	1.3E+00	--	1.3E-01	1.4E+00
								Iron	Gastrointestinal	9.5E+00	--	2.3E-02	9.5E+00
								Lead	N/A	N/A	--	N/A	0.0E+00
								Manganese	N/A	8.4E+00	--	5.2E-02	8.5E+00
								Nickel	Whole body	3.5E-01	--	2.2E-02	3.7E-01
								Vanadium	Kidney	3.5E+00	--	3.4E-01	3.9E+00
								(Total)		2.9E+01	--	6.6E-01	3.0E+01
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					3.0E+01
Soil*	Soil	Site 11 Soil											
								Aluminum	CNS	1.4E-01	--	2.6E-03	1.4E-01
								Antimony	Blood/Whole Body	2.4E-01	--	3.0E-02	2.7E-01
								Arsenic	Skin/vascular	6.4E-01	--	3.6E-02	6.8E-01
								Cadmium	Kidney	1.9E+00	--	1.4E-01	2.0E+00
								Chromium	NOAEL	1.7E-01	--	1.3E-01	3.0E-01
								Copper	Gastrointestinal	5.3E-01	--	2.0E-02	5.5E-01
								Iron	Gastrointestinal	2.0E+00	--	3.7E-02	2.0E+00
								Manganese	CNS	3.1E-01	--	1.5E-01	4.6E-01
								Silver	Skin	7.3E-02	--	3.4E-02	1.1E-01
								Thallium	Skin/vascular	2.3E-01	--	4.3E-03	2.3E-01
								Vanadium	Kidney	3.4E-01		2.4E-01	5.8E-01
								Zinc	Blood	1.3E-01	--	2.4E-03	1.3E-01
								(Total)		6.6E+00	--	8.2E-01	7.5E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					7.5E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.8E+01

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
												Total Blood HI =	1.2E+00
												Total NOAEL HI =	1.7E+00
												Total Kidney HI =	8.0E+00
												Total CNS HI =	2.9E+00
												Total Whole Body HI =	1.7E+00
												Total Skin HI =	2.8E+00
												Total Vascular HI =	2.7E+00
												Total Gastrointestinal HI =	1.2E+01
												Total Lifetime HI =	4.5E+00

TABLE 10.4.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Residen
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Arsenic	1.8E-04	--	4.0E-07	1.8E-04						
				1.8E-04	--	4.0E-07	1.8E-04						
			Total Risk Across Groundwater				1.8E-04	Total Hazard Index Across Groundwater					0.0E+00
			Total Risk Across All Media and All Exposure Routes				1.8E-04	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 10.5.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil						Antimony	Blood/Whole Body	8.9E-02	--	1.6E-02	1.0E-01
								Arsenic	Skin/vascular	2.4E-01	--	1.9E-02	2.5E-01
								Cadmium	Kidney	6.8E-01	--	7.2E-02	7.5E-01
								Copper	Gastrointestinal	2.0E-01	--	1.0E-02	2.1E-01
								Iron	Gastrointestinal	7.3E-01	--	1.9E-02	7.5E-01
								Manganese	CNS	1.1E-01	--	7.6E-02	1.9E-01
								Vanadium	Kidney	1.2E-01	--	1.3E-01	2.5E-01
								(Total)		2.2E+00	--	3.4E-01	2.5E+00
				0.0E+00	--	0.0E+00	0.0E+00	Total Hazard Index Across Soil					2.5E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					2.5E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00						

Total Blood HI =	1.0E-01
Total Kidney HI =	1.0E+00
Total Whole Body HI =	1.0E-01
Total Skin HI =	2.5E-01
Total Vascular HI =	2.5E-01
Total Gastrointestinal HI =	9.6E-01
Total CNS HI =	1.9E-01

TABLE 10.6.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 11 Soil											
								Cadmium	Kidney	1.4E-01	--	9.6E-02	2.4E-01
								Chromium	NOAEL	1.3E-02	--	9.0E-02	1.0E-01
								Iron	Gastrointestinal	1.5E-01	--	2.6E-02	1.8E-01
								Manganese	CNS	2.4E-02	--	1.0E-01	1.2E-01
								Vanadium	Kidney	2.6E-02	--	1.7E-01	1.9E-01
				0.0E+00	--	0.0E+00	0.0E+00	(Total)		3.6E-01	--	4.8E-01	8.4E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					8.4E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					8.4E-01

Total NOAEL HI =	1.0E-01
Total Kidney HI =	4.3E-01
Total Gastrointestinal HI =	1.8E-01
Total CNS HI =	1.2E-01

TABLE 10.7.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Residen
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water						Arsenic	Skin/vascular	1.0E-01	N/A	2.7E-04	1.0E-01
								Iron	Gastrointestinal	1.4E+00	N/A	3.6E-03	1.4E+00
								Manganese	CNS	1.2E+00	N/A	7.7E-03	1.2E+00
								(Total)		2.7E+00	--	1.2E-02	2.7E+00
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					2.7E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					2.7E+00

Total Skin HI =	1.0E-01
Total Vascular HI =	1.0E-01
Total Gastrointestinal HI =	1.4E+00
Total CNS HI =	1.2E+00

TABLE 10.8.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 11, NDWIH

Scenario Timeframe: Future
Receptor Population: Residen
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water											
								Antimony	Blood/Whole Body	2.2E-01	N/A	3.1E-03	2.2E-01
								Arsenic	Skin/vascular	3.5E-01	N/A	7.4E-04	3.5E-01
								Barium	Kidney	2.0E-01	N/A	6.1E-03	2.0E-01
								Iron	Gastrointestinal	4.7E+00	N/A	1.0E-02	4.7E+00
								Manganese	CNS	4.0E+00	N/A	2.1E-02	4.0E+00
								Vanadium	Kidney	1.5E-01	N/A	1.2E-02	1.6E-01
								(Total)		9.4E+00	--	4.1E-02	9.5E+00
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					9.5E+00
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					9.5E+00

Total Blood HI =	2.2E-01
Total Kidney HI =	3.6E-01
Total Whole Body HI =	2.2E-01
Total Skin HI =	3.5E-01
Total Vascular HI =	3.5E-01
Total Gastrointestinal HI =	4.7E+00
Total CNS HI =	4.0E+00

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 17, NDWIH

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Site 17 Surface Soil	Trespasser/Visitor	Adolescent	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
					Adult	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
		Air	Emissions from Site 17 Soil	Trespasser/Visitor	Adolescent	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale emissions from soil.
					Adult	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale emissions from soil.
Current/Future	Surface Water	Surface Water	Mattawoman Creek	Recreational User	Adult	Dermal Absorption	On-site	Quant	Recreational users may contact surface water.
						Ingestion	On-site	Quant	Recreational users may contact surface water.
					Child	Dermal Absorption	On-site	Quant	Recreational users may contact surface water.
						Ingestion	On-site	Quant	Recreational users may contact surface water.
	Sediment	Sediment	Mattawoman Creek	Recreational User	Adult	Dermal Absorption	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
						Ingestion	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
					Child	Dermal Absorption	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
						Ingestion	On-site	None	The sediment is completely covered by water, and there is no shoreline with sediment. Therefore, the ingestion and dermal exposure to sediment is not a complete pathway.
		Animal Tissues	Fish	Fisher	Adult	Ingestion	On-site/Off-site	Qual	Fish tissue samples not collected for Site 17. Ingestion of fish caught in Mattawoman Creek and the unnamed creek was not quantatatively evaluated in the risk assessment.
					Child	Ingestion	On-site/Off-site	Qual	Fish tissue samples not collected for Site 17. Ingestion of fish caught in Mattawoman Creek and the unnamed creek was not quantatatively evaluated in the risk assessment.
Future	Groundwater	Groundwater	Shallow Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child/Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
			Shallow Aquifer - Water	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers may contact groundwater while performing construction or excavation activities.
						Ingestion	On-site	None	Incidental ingestion of groundwater by construction workers would be minimal during construction or excavation activities.
		Air	Shallow Aquifer - Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Inhalation	On-site	None	Children are assumed not to shower.
					Child/Adult	Inhalation	On-site	None	Adult will be used to evaluate child/adult since children are assumed not to shower.
			Shallow Aquifer - Volatilization	Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors from groundwater while performing construction or excavation activities.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 17, NDWIH

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil*	Soil	Site 17 Soil	Resident	Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction worker may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Construction worker may be exposed to surface and subsurface soil during excavation activities.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Site workers may be exposed to surface and subsurface soil during maintenance activities, site inspections, or daily duties.
						Ingestion	On-site	Quant	Site workers may be exposed to surface and subsurface soil during maintenance activities, site inspections, or daily duties.
				Trespasser/Visitor	Adolescent	Dermal Absorption	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
					Adult	Dermal Absorption	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
		Air	Emissions from Site 17 Soil	Resident	Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors or fugitive dust from soil during excavation activities.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Site workers may be exposed to vapors or fugitive dust from Site 17 soils during maintenance activities, site inspections, or daily duties.
				Trespasser/Visitor	Adolescent	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors or fugitive dust from Site 17 soils.
					Adult	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors or fugitive dust from Site 17 soils.

* Surface and subsurface soil

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
106-46-7	1,4-Dichlorobenzene	0.0014	J	0.0017	J	MG/KG	IS17SS150001P	2/15	0.011 - 0.16	0.0017	N/A	26.6 C	0.0071	SSL	NO	BSL
67-64-1	Acetone	0.0054	J	0.0054	J	MG/KG	IS17SS060001	1/15	0.011 - 0.16	0.0054	N/A	7,000 N	2.2	SSL	NO	BSL
110-82-7	Cyclohexane	0.0017	J	0.026		MG/KG	IS17SS100001	6/15	0.011 - 0.16	0.026	N/A	N/A	N/A	N/A	NO	NTX
124-48-1	Dibromochloromethane	0.014	UJ	0.014	J	MG/KG	IS17SS090001 IS17SS080001	1/15	0.011 - 0.16	0.014	N/A	7.60 C	0.00083	SSL	NO	BSL
100-41-4	Ethylbenzene	0.0019	J	0.0029	J	MG/KG	IS17SS060001	2/15	0.011 - 0.16	0.0029	N/A	782 N	1.5	SSL	NO	BSL
100-42-5	Styrene	0.0039	J	0.0039	J	MG/KG	IS17SS050001	1/15	0.011 - 0.16	0.0039	N/A	1,564 N	5.7	SSL	NO	BSL
108-88-3	Toluene	0.25		0.25		MG/KG	IS17SS020001	1/15	0.011 - 0.16	0.25	N/A	1,564 N	0.879	SSL	NO	BSL
79-01-6	Trichloroethene	0.0083	J	0.025	J	MG/KG	IS17SS070001	2/15	0.011 - 0.16	0.025	N/A	1.6 C	0.00026	SSL	NO	BSL
1330-20-7	Xylene, total	0.0015	J	0.02		MG/KG	IS17SS060001 IS17SS100001	8/15	0.011 - 0.16	0.02	N/A	1,564 N	0.3	SSL	NO	BSL
98-86-2	Acetophenone	0.049	J	0.072	J	MG/KG	IS17SS060001	2/15	0.37 - 0.6	0.072	N/A	782 N	0.32	SSL	NO	BSL
100-52-7	Benzaldehyde	0.047	J	1.1		MG/KG	IS17SS010001	4/15	0.37 - 0.6	1.1	N/A	782 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	0.051	J	0.52		MG/KG	IS17SS010001	3/15	0.37 - 0.6	0.52	N/A	0.875 C	1.46	SSL	NO	BSL
50-32-8	Benzo(a)pyrene	0.078	J	0.13	J	MG/KG	IS17SS010001	2/15	0.37 - 0.6	0.13	N/A	0.0875 C	0.374	SSL	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.1	J	0.97		MG/KG	IS17SS010001	4/15	0.37 - 0.6	0.97	N/A	0.875 C	4.51	SSL	YES	ASL
207-08-9	Benzo(k)fluoranthene	0.099	J	0.38	J	MG/KG	IS17SS010001	3/15	0.37 - 0.6	0.38	N/A	8.75 C	45.1	SSL	NO	BSL
218-01-9	Chrysene	0.087	J	0.71		MG/KG	IS17SS080001	4/15	0.37 - 0.6	0.71	N/A	87.5 C	150	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	0.041	J	0.041	J	MG/KG	IS17SS110001	1/15	0.37 - 0.6	0.041	N/A	782 N	496	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.054	J	0.069	J	MG/KG	IS17SS010001	2/15	0.37 - 0.6	0.069	N/A	0.0875 C	1.39	SSL	NO	BSL
206-44-0	Fluoranthene	0.057	J	1.4		MG/KG	IS17SS080001	5/15	0.37 - 0.6	1.4	N/A	313 N	625	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.06	J	0.13	J	MG/KG	IS17SS010001	3/15	0.37 - 0.6	0.13	N/A	0.875 C	12.7	SSL	NO	BSL
85-01-8	Phenanthrene	0.06	J	0.44	J	MG/KG	IS17SS080001	2/15	0.37 - 0.6	0.44	N/A	235 N	68.2	SSL	NO	BSL
129-00-0	Pyrene	0.047	J	0.74		MG/KG	IS17SS080001	8/15	0.37 - 0.6	0.74	N/A	235 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.045	J	0.051	J	MG/KG	IS17SS030001	2/15	0.37 - 0.6	0.051	N/A	45.6 C	2890	SSL	NO	BSL
99-35-4	1,3,5-Trinitrobenzene	0.21	J	0.21	J	MG/KG	IS17SS150001P	1/15	0.25 - 0.25	0.21	N/A	235 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	0.03	J	0.046	J	MG/KG	IS17SS040001	2/15	0.25 - 0.25	0.046	N/A	0.782 N	0.0037	SSL	NO	BSL
99-99-0	4-Nitrotoluene	0.24	J	0.24	J	MG/KG	IS17SS070001	1/10	0.25 - 0.63	0.24	N/A	78 N	N/A	N/A	NO	BSL
7790-98-9	Perchlorate	0.12	J	0.12	J	MG/KG	IS17SS100001	1/15	0.0046 - 0.1	0.12	N/A	21 N	N/A	N/A	NO	BSL
556-88-7	Nitroguanidine	0.04	J	0.04	J	MG/KG	IS17SS040001	1/15	0.1 - 0.1	0.04	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	3,780		10,500		MG/KG	IS17SS150001P	15/15	4.4 - 6.8	10500	N/A	7,821 N	N/A	N/A	YES	ASL
7440-36-0	Antimony	1.3	J	1.5	L	MG/KG	IS17SS010001	2/15	0.69 - 3.1	1.5	N/A	3.13 N	1.32	SSL	NO	BSL
7440-38-2	Arsenic	1.4	J	13.6		MG/KG	IS17SS060001	14/15	0.71 - 2.6	13.6	N/A	0.426 C	0.0261	SSL	YES	ASL
7440-39-3	Barium	28.8	J	116		MG/KG	IS17SS100001	15/15	0.033 - 0.15	116	N/A	548 N	211	SSL	NO	BSL
7440-41-7	Beryllium	0.17	J	0.5	J	MG/KG	IS17SS100001	5/15	0.018 - 0.073	0.5	N/A	15.6 N	120	SSL	NO	BSL
7440-43-9	Cadmium	0.26	J	6.9		MG/KG	IS17SS080001	9/15	0.056 - 0.29	6.9	N/A	7.80 N	5.49	SSL	NO	BSL
7440-70-2	Calcium	445	J	4,490	E	MG/KG	IS17SS100001	15/15	1.7 - 3	4490	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	7.5		32.9		MG/KG	IS17SS010001	15/15	0.25 - 1.5	32.9	N/A	23.5 N	4.2	SSL	YES	ASL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-48-4	Cobalt	2.6	J	29		MG/KG	IS17SS060001	15/15	0.19 - 0.8	29	N/A	160 N	N/A	N/A	NO	BSL
7440-50-8	Copper	5.6	J	90.7		MG/KG	IS17SS010001	15/15	0.29 - 0.69	90.7	N/A	313 N	1052	SSL	NO	BSL
57-12-5	Cyanide	0.077	J	0.64		MG/KG	IS17SS020001 IS17SS030001	3/15	0.56 - 2.8	0.64	N/A	156 N	14.7	SSL	NO	BSL
7439-89-6	Iron	8,950		224,000		MG/KG	IS17SS060001	15/15	3.6 - 19.8	224000	N/A	2,346 N	N/A	N/A	YES	ASL
7439-92-1	Lead	7.4		602		MG/KG	IS17SS010001	15/15	0.33 - 0.94	602	N/A	400	N/A	N/A	YES	ASL
7439-95-4	Magnesium	469	J	1,690		MG/KG	IS17SS100001	15/15	3.2 - 4.9	1690	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	42.7		752		MG/KG	IS17SS060001	15/15	0.033 - 0.29	752	N/A	156 N	95.2	SSL	YES	ASL
7439-97-6	Mercury	0.12	J	0.41		MG/KG	IS17SS060001	6/15	0.056 - 0.091	0.41	N/A	2.35 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	5.7	J	32.8		MG/KG	IS17SS010001	15/15	0.45 - 0.69	32.8	N/A	156 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	315	J	1,200	J	MG/KG	IS17SS100001	15/15	4.3 - 19	1200	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	1.1		1.6	L	MG/KG	IS17SS050001	2/15	0.89 - 3.1	1.6	N/A	39.1 N	1.9	SSL	NO	BSL
7440-22-4	Silver	0.79		0.81		MG/KG	IS17SS030001P	3/15	0.25 - 1.1	0.81	N/A	39.1 N	3.1	SSL	NO	BSL
7440-23-5	Sodium	112		600	J	MG/KG	IS17SS090001	8/15	54.3 - 159	600	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	1.4		1.4		MG/KG	IS17SS020001 IS17SS030001P	2/15	1.3 - 3.8	1.4	N/A	0.548 N	0.364	SSL	YES	ASL
7440-62-2	Vanadium	12.2	J	29.4		MG/KG	IS17SS100001	15/15	0.17 - 1	29.4	N/A	2.3 N	21.9	SSL	YES	ASL
7440-66-6	Zinc	31.1		1,140	E	MG/KG	IS17SS080001	15/15	0.15 - 0.44	1140	N/A	2,346 N	1,362	SSL	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Residential Soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Residential Soil Ingestion RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for mercuric chloride used as surrogate for mercury.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for perchlorate calculated based on the RfD of 0.0005 mg/kg-day, Interim Assessment Guidance for Perchlorate, June 1999, developed by ORD's NCEA.
Trichloroethene screening value is calculated based on a noncarcinogenic hazard of 0.1. The noncarcinogenic screening level at HQ=0.1 is more conservative than the carcinogenic value provided in the Region III RBC table.

Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
SSL = Region III Soil Screening Level, for groundwater migration, DAF 20
Cancer benchmark value = 1E-06, adjusted HQ=0.1
(EPA Region III RBC Table)

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
106-46-7	1,4-Dichlorobenzene	8.3E-05	J	1.0E-04	J	µg/m^3	IS17SS150001P	2/15		1.0E-04	N/A	2.8E-01 C	N/A	N/A	NO	BSL
67-64-1	Acetone	3.3E-04	J	3.3E-04	J	µg/m^3	IS17SS060001	1/15		3.3E-04	N/A	3.3E+02 N	N/A	N/A	NO	BSL
110-82-7	Cyclohexane	7.1E-04	J	1.1E-02		µg/m^3	IS17SS100001	6/15		1.1E-02	N/A	6.2E+02	N/A	N/A	NO	BSL
124-48-1	Dibromochloromethane	7.1E-04	UJ	7.1E-04	J	µg/m^3	IS17SS090001 IS17SS080001	1/15		7.1E-04	N/A	7.5E-02 C	N/A	N/A	NO	BSL
100-41-4	Ethylbenzene	2.7E-04	J	4.1E-04	J	µg/m^3	IS17SS060001	2/15		4.1E-04	N/A	1.1E+02 N	N/A	N/A	NO	BSL
100-42-5	Styrene	2.2E-04	J	2.2E-04	J	µg/m^3	IS17SS050001	1/15		2.2E-04	N/A	1.0E+02 N	N/A	N/A	NO	BSL
108-88-3	Toluene	4.8E-02		4.8E-02		µg/m^3	IS17SS020001	1/15		4.8E-02	N/A	4.2E+01 N	N/A	N/A	NO	BSL
79-01-6	Trichloroethene	2.0E-03	J	5.9E-03	J	µg/m^3	IS17SS070001	2/15		5.9E-03	N/A	1.6E-02 C	N/A	N/A	NO	BSL
1330-20-7	Xylene, total	2.0E-04	J	2.7E-03		µg/m^3	IS17SS060001 IS17SS100001	8/15		2.7E-03	N/A	1.1E+01 N	N/A	N/A	NO	BSL
98-86-2	Acetophenone	3.7E-08	J	5.5E-08	J	µg/m^3	IS17SS060001	2/15		5.5E-08	N/A	3.7E+01 N	N/A	N/A	NO	BSL
100-52-7	Benzaldehyde	3.6E-08	J	8.3E-07		µg/m^3	IS17SS010001	4/15		8.3E-07	N/A	3.7E+01 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	3.9E-08	J	3.9E-07		µg/m^3	IS17SS010001	3/15		3.9E-07	N/A	8.6E-03 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	5.9E-08	J	9.8E-08	J	µg/m^3	IS17SS010001	2/15		9.8E-08	N/A	2.0E-03 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	7.6E-08	J	7.3E-07		µg/m^3	IS17SS010001	4/15		7.3E-07	N/A	8.6E-03 C	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	7.5E-08	J	2.9E-07	J	µg/m^3	IS17SS010001	3/15		2.9E-07	N/A	8.6E-02 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	6.6E-08	J	5.4E-07		µg/m^3	IS17SS080001	4/15		5.4E-07	N/A	8.6E-01 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	3.1E-08	J	3.1E-08	J	µg/m^3	IS17SS110001	1/15		3.1E-08	N/A	3.7E+01 N	N/A	N/A	NO	BSL
53-70-3	Dibenz(a,h)anthracene	4.1E-08	J	5.2E-08	J	µg/m^3	IS17SS010001	2/15		5.2E-08	N/A	8.6E-04 C	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	4.3E-08	J	1.1E-06		µg/m^3	IS17SS080001	5/15		1.1E-06	N/A	1.5E+01 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	4.5E-08	J	9.8E-08	J	µg/m^3	IS17SS010001	3/15		9.8E-08	N/A	8.6E-03 C	N/A	N/A	NO	BSL
85-01-8	Phenanthrene	4.5E-08	J	3.3E-07	J	µg/m^3	IS17SS080001	2/15		3.3E-07	N/A	1.1E+01 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	9.6E-06	J	1.5E-04		µg/m^3	IS17SS080001	8/15		1.5E-04	N/A	1.1E+01 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	3.4E-08	J	3.9E-08	J	µg/m^3	IS17SS030001	2/15		3.9E-08	N/A	4.5E-01 C	N/A	N/A	NO	BSL
99-35-4	1,3,5-Trinitrobenzene	1.6E-07	J	1.6E-07	J	µg/m^3	IS17SS150001P	1/15		1.6E-07	N/A	1.1E+01 N	N/A	N/A	NO	BSL
99-65-0	1,3-Dinitrobenzene	2.3E-08	J	3.5E-08	J	µg/m^3	IS17SS040001	2/15		3.5E-08	N/A	3.7E-02 N	N/A	N/A	NO	BSL
99-99-0	4-Nitrotoluene	1.8E-07	J	1.8E-07	J	µg/m^3	IS17SS070001	1/10		1.8E-07	N/A	3.7E+00 N	N/A	N/A	NO	BSL
7790-98-9	Perchlorate	9.1E-08	J	9.1E-08	J	µg/m^3	IS17SS100001	1/15		9.1E-08	N/A	1.8E-01 N	N/A	N/A	NO	BSL
556-88-7	Nitroguanidine	3.0E-08	J	3.0E-08	J	µg/m^3	IS17SS040001	1/15		3.0E-08	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	2.9E-03		8.0E-03		µg/m^3	IS17SS150001P	15/15		8.0E-03	N/A	3.7E-01 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	9.8E-07	J	1.1E-06	L	µg/m^3	IS17SS010001	2/15		1.1E-06	N/A	1.5E-01 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	1.1E-06	J	1.0E-05		µg/m^3	IS17SS060001	14/15		1.0E-05	N/A	4.1E-04 C	N/A	N/A	NO	BSL
7440-39-3	Barium	2.2E-05	J	8.8E-05		µg/m^3	IS17SS100001	15/15		8.8E-05	N/A	5.1E-02 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	1.3E-07	J	3.8E-07	J	µg/m^3	IS17SS100001	5/15		3.8E-07	N/A	7.5E-04 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	2.0E-07	J	5.2E-06		µg/m^3	IS17SS080001	9/15		5.2E-06	N/A	9.9E-04 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	3.4E-04	J	3.4E-03	E	µg/m^3	IS17SS100001	15/15		3.4E-03	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	5.7E-06		2.5E-05		µg/m^3	IS17SS010001	15/15		2.5E-05	N/A	1.5E-04 N	N/A	N/A	NO	BSL
7440-48-4	Cobalt	2.0E-06	J	2.2E-05		µg/m^3	IS17SS060001	15/15		2.2E-05	N/A	6.4E-04 N	N/A	N/A	NO	BSL
7440-50-8	Copper	4.2E-06	J	6.9E-05		µg/m^3	IS17SS010001	15/15		6.9E-05	N/A	1.5E+01 N	N/A	N/A	NO	BSL
57-12-5	Cyanide	5.8E-08	J	4.8E-07		µg/m^3	IS17SS020001 IS17SS030001	3/15		4.8E-07	N/A	7.3E+00 N	N/A	N/A	NO	BSL
7439-89-6	Iron	6.8E-03		1.7E-01		µg/m^3	IS17SS060001	15/15		1.7E-01	N/A	1.1E+02 N	N/A	N/A	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7439-92-1	Lead	5.6E-06		4.6E-04		$\mu g/m^3$	IS17SS010001	15/15		4.6E-04	N/A	N/A	N/A	N/A	NO	NTX
7439-95-4	Magnesium	3.6E-04	J	1.3E-03		$\mu g/m^3$	IS17SS100001	15/15		1.3E-03	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	3.2E-05		5.7E-04		$\mu g/m^3$	IS17SS060001	15/15		5.7E-04	N/A	5.2E-03 N	N/A	N/A	NO	BSL
7439-97-6	Mercury	9.1E-08	J	3.1E-07		$\mu g/m^3$	IS17SS060001	6/15		3.1E-07	N/A	3.1E-02 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	4.3E-06	J	2.5E-05		$\mu g/m^3$	IS17SS010001	15/15		2.5E-05	N/A	7.3E+00 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	2.4E-04	J	9.1E-04	J	$\mu g/m^3$	IS17SS100001	15/15		9.1E-04	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	8.3E-07		1.2E-06	L	$\mu g/m^3$	IS17SS050001	2/15		1.2E-06	N/A	1.8E+00 N	N/A	N/A	NO	BSL
7440-22-4	Silver	6.0E-07		6.1E-07		$\mu g/m^3$	IS17SS030001P	3/15		6.1E-07	N/A	1.8E+00 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	8.5E-05		4.5E-04	J	$\mu g/m^3$	IS17SS090001	8/15		4.5E-04	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	1.1E-06		1.1E-06		$\mu g/m^3$	IS17SS020001 IS17SS030001P	2/15		1.1E-06	N/A	2.6E-02 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	9.2E-06	J	2.2E-05		$\mu g/m^3$	IS17SS100001	15/15		2.2E-05	N/A	1.0E-01 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	2.4E-05		8.6E-04	E	$\mu g/m^3$	IS17SS080001	15/15		8.6E-04	N/A	1.1E+02 N	N/A	N/A	NO	BSL

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.2.A.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Ambient Air, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for mercuric chloride used as surrogate for mercury.
RBC value for perchlorate calculated based on the RfD of 0.0005 mg/kg-day, Interim Assessment Guidance for Perchlorate, June 1999, developed by ORD's NCEA.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 17 NDWIH
Site 17, Indian Head NSWC

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
1,4-Dichlorobenzene	6.90E-02	9.96E-02	7.90E-06	6.17E+02	3.70E+00	7.38E+01	
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	
Cyclohexane	8.39E-02	7.84E+00	9.10E-06	9.63E+02	5.78E+00	5.50E+01	
Dibromochloromethane	1.96E-02	3.21E-02	1.05E-05	6.31E+01	3.79E-01	2.60E+03	
Ethylbenzene	7.50E-02	3.23E-01	7.80E-06	3.63E+02	2.18E+00	1.69E+02	
Styrene	7.10E-02	1.13E-01	8.00E-06	7.76E+02	4.66E+00	3.10E+02	
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E+00	5.26E+02	
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	
Xylene, total	7.69E-02	3.01E-01	7.80E-06	3.89E+02	2.33E+00	1.78E+02	
Acetophenone	N/A	4.99E-04	N/A	4.68E+01	2.81E-01	1.66E+03	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman Creek

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
99-99-0	4-Nitrotoluene	0.110	J	0.110	J	UG/L	IS17SW02	1/6	0.2 - 0.2	0.11	N/A	61 N	N/A	N/A	NO	BSL
7429-90-5	Aluminum	258		664		UG/L	IS17SW02	3/6	18.8 - 18.8	664	N/A	36,500 N	N/A	N/A	NO	BSL
7440-39-3	Barium	23.4		25.8		UG/L	IS17SW03	6/6	0.4 - 0.4	25.8	N/A	2,555 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	9,750		11,800		UG/L	IS17SW06	6/6	8.2 - 8.2	11800	N/A	N/A	N/A	N/A	NO	NUT
7440-50-8	Copper	2.40		5.40		UG/L	IS17SW06	5/6	1.9 - 1.9	5.4	N/A	1,460 N	N/A	N/A	NO	BSL
7439-89-6	Iron	227		981		UG/L	IS17SW03	6/6	27.3 - 27.3	981	N/A	10,950 N	N/A	N/A	NO	BSL
7439-92-1	Lead	1.30	K	7.30		UG/L	IS17SW06	3/6	1.3 - 1.3	7.3	N/A	150	N/A	N/A	NO	BSL
7439-95-4	Magnesium	5,140	K	5,900		UG/L	IS17SW06	6/6	13.4 - 13.4	5900	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	87.4	K	106		UG/L	IS17SW03	6/6	0.4 - 0.4	106	N/A	730 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	2.50	K	3.50		UG/L	IS17SW04	5/6	1.9 - 1.9	3.5	N/A	730 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	2,650	K	3,030		UG/L	IS17SW06	6/6	52.4 - 52.4	3030	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	5.80	K	5.80		UG/L	IS17SW05	1/6	4.3 - 860	5.8	N/A	183 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	12,100	K	15,900		UG/L	IS17SW06	6/6	439 - 439	15900	N/A	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	1.5	J	2.10	J	UG/L	IS17SW02 IS17SW03	4/6	1.4 - 1.4	2.1	N/A	11 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	24.2	J	32.7	J	UG/L	IS17SW06	3/6	0.6 - 0.6	32.7	N/A	10,950 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
10xTap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1) per discussion with Dawn Ioven (EPA Region III Toxicologist).
Lead screening toxicity value is 15 µg/l, the EPA lead action level for Tap water.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Mattawoman Creek

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
IS17SS020001 IS17SS030001P																

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
100-41-4	Ethylbenzene	50	J	50	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	50	N/A	134 N	700	PMCL	NO	BSL
108-88-3	Toluene	200		200		UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	200	N/A	74.7 N	1000	PMCL	YES	ASL
75-01-4	Vinyl chloride	40	J	3,000		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	3000	N/A	0.0150 C	2	PMCL	YES	ASL
156-59-2	cis-1,2-Dichloroethene	37	J	4,200		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	4200	N/A	6.08 N	70	PMCL	YES	ASL
106-44-5	4-Methylphenol	4	J	62	J	UG/L	IS17MW011000 IS17MW01	2/3	10 - 100	62	N/A	18.3 N	N/A		YES	ASL
108-95-2	Phenol	19	J	19	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 100	19	N/A	1,100 N	N/A		NO	BSL
99-35-4	1,3,5-Trinitrobenzene	4	J	4	J	UG/L	IS17MW011000 IS17MW01	1/3	0.2 - 6	4	N/A	110 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	1.4	J	1.4	J	UG/L	IS17MW011000 IS17MW01	1/3	0.2 - 6	1.4	N/A	0.365 N	N/A		YES	ASL
118-96-7	2,4,6-Trinitrotoluene	1		5.8	J	UG/L	IS17MW011000 IS17MW01	2/3	0.2 - 6	5.8	N/A	2.20 C	N/A		YES	ASL
121-14-2	2,4-Dinitrotoluene	0.28		1.8	J	UG/L	IS17MW011000 IS17MW01	3/3	0.2 - 6	1.8	N/A	7.3 N	N/A		NO	BSL
606-20-2	2,6-Dinitrotoluene	0.12	J	0.14	J	UG/L	IS17MW021000 IS17MW02	2/3	0.2 - 6	0.14	N/A	3.65 N	N/A		NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	0.2		0.2		UG/L	IS17MW021000 IS17MW02	1/3	0.2 - 6	0.2	N/A	N/A	N/A		NO	NTX
99-08-1	3-Nitrotoluene	0.18	J	0.18	J	UG/L	IS17MW031000 IS17MW03	1/3	0.2 - 6	0.18	N/A	12.2 N	N/A		NO	BSL
19406-51-0	4-Amino-2,6-dinitrotoluene	0.39		0.39		UG/L	IS17MW031000 IS17MW03	1/3	0.2 - 6	0.39	N/A	N/A	N/A		NO	NTX
99-99-0	4-Nitrotoluene	2.8	J	2.8	J	UG/L	IS17MW011000 IS17MW01	1/3	0.37 - 6.9	2.8	N/A	6.1 N	N/A		NO	BSL
98-95-3	Nitrobenzene	0.098	J	0.098	J	UG/L	IS17MW021000 IS17MW02	1/3	0.2 - 6	0.098	N/A	0.353 N	N/A		NO	BSL
121-82-4	RDX	3.3	J	3.3	J	UG/L	IS17MW011000 IS17MW01	1/3	0.5 - 15	3.3	N/A	0.609 C	4	PMCL	YES	ASL
479-45-8	Tetryl	0.12	J	5.9	J	UG/L	IS17MW011000 IS17MW01	2/3	0.2 - 6	5.9	N/A	36.5 N	N/A		NO	BSL
7429-90-5	Aluminum	420	J	31,500	J	UG/L	IS17MW031000	3/3	19.9 - 19.9	31500	N/A	3,650 N	50 - 200	SMCL	YES	ASL
7440-36-0	Antimony	3.6	J	3.6	J	UG/L	IS17MW011000	1/3	3.1 - 3.1	3.6	N/A	1.46 N	6	PMCL	YES	ASL
7440-38-2	Arsenic	4	J	4	J	UG/L	IS17MW031000 IS17MW03	1/3	3.2 - 3.2	4	N/A	0.0446 C	10	PMCL	YES	ASL
7440-39-3	Barium	93.5	J	202	J	UG/L	IS17MW031000	3/3	0.15 - 0.15	202	N/A	256 N	2000	PMCL	NO	BSL
7440-41-7	Beryllium	0.18	J	0.18	J	UG/L	IS17MW021000 IS17MW02	1/3	0.08 - 0.08	0.18	N/A	7.3 N	4	PMCL	NO	BSL
7440-43-9	Cadmium	0.3	J	0.3	J	UG/L	IS17MW011000 IS17MW01	1/3	0.25 - 0.25	0.3	N/A	1.83 N	5	PMCL	NO	BSL
7440-70-2	Calcium	5,440	J	37,800	J	UG/L	IS17MW021000	3/3	7.7 - 7.7	37800	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	5.8	J	86.9	J	UG/L	IS17MW031000	3/3	1.1 - 1.1	86.9	N/A	11.0 N	100	PMCL	YES	ASL
7440-48-4	Cobalt	2.6	J	32.7	J	UG/L	IS17MW031000	3/3	0.83 - 0.83	32.7	N/A	73 N	N/A		NO	BSL
7440-50-8	Copper	5.7	J	39.7	J	UG/L	IS17MW031000	3/3	1.3 - 1.3	39.7	N/A	146 N	1000	SMCL	NO	BSL
57-12-5	Cyanide	0.1	J	0.1	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 10	0.1	N/A	73 N	200	PMCL	NO	BSL
7439-89-6	Iron	27,100	J	71,000	J	UG/L	IS17MW021000	3/3	16 - 16	71000	N/A	1,095 N	300	SMCL	YES	ASL
7439-92-1	Lead	4.9		13.9		UG/L	IS17MW031000 IS17MW03	2/3	1.9 - 1.9	13.9	N/A	15	15	AL	NO	BSL
7439-95-4	Magnesium	5,330		15,700		UG/L	IS17MW021000	3/3	14.2 - 14.2	15700	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	540		2,620		UG/L	IS17MW021000	3/3	0.15 - 0.15	2620	N/A	73 N	50	SMCL	YES	ASL
7440-02-0	Nickel	7	J	73.4		UG/L	IS17MW031000	3/3	2 - 2	73.4	N/A	73 N	N/A		YES	ASL
7440-09-7	Potassium	3,350	J	7,720		UG/L	IS17MW021000	3/3	19.5 - 19.5	7720	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	4.3	J	4.3	J	UG/L	IS17MW011000 IS17MW01	1/3	4 - 4	4.3	N/A	18.3 N	50	PMCL	NO	BSL
7440-23-5	Sodium	26,800	J	46,400	J	UG/L	IS17MW011000	3/3	244 - 244	46400	N/A	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	1.4	J	49	J	UG/L	IS17MW031000	3/3	0.76 - 0.76	49	N/A	1.1 N	N/A		YES	ASL
7440-66-6	Zinc	128		128		UG/L	IS17MW031000 IS17MW03	1/3	1.2 - 1.2	128	N/A	1,095 N	5000	SMCL	NO	BSL

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentration.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 15 ug/L, the EPA Safe Drinking Water Act action level for lead.

[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater - Water in Excavation Pit

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
100-41-4	Ethylbenzene	50	J	50	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	50	N/A	134 N	700	PMCL	NO	BSL
108-88-3	Toluene	200		200		UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	200	N/A	74.7 N	1000	PMCL	YES	ASL
75-01-4	Vinyl chloride	40	J	3,000		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	3000	N/A	0.0150 C	2	PMCL	YES	ASL
156-59-2	cis-1,2-Dichloroethene	37	J	4,200		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	4200	N/A	6.08 N	70	PMCL	YES	ASL
106-44-5	4-Methylphenol	4	J	62	J	UG/L	IS17MW011000 IS17MW01	2/3	10 - 100	62	N/A	18.3 N	N/A		YES	ASL
108-95-2	Phenol	19	J	19	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 100	19	N/A	1,100 N	N/A		NO	BSL
99-35-4	1,3,5-Trinitrobenzene	4	J	4	J	UG/L	IS17MW011000 IS17MW01	1/3	0.2 - 6	4	N/A	110 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	1.4	J	1.4	J	UG/L	IS17MW011000 IS17MW01	1/3	0.2 - 6	1.4	N/A	0.365 N	N/A		YES	ASL
118-96-7	2,4,6-Trinitrotoluene	1		5.8	J	UG/L	IS17MW011000 IS17MW01	2/3	0.2 - 6	5.8	N/A	2.20 C	N/A		YES	ASL
121-14-2	2,4-Dinitrotoluene	0.28		1.8	J	UG/L	IS17MW011000 IS17MW01	3/3	0.2 - 6	1.8	N/A	7.3 N	N/A		NO	BSL
606-20-2	2,6-Dinitrotoluene	0.12	J	0.14	J	UG/L	IS17MW021000 IS17MW02	2/3	0.2 - 6	0.14	N/A	3.65 N	N/A		NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	0.2		0.2		UG/L	IS17MW021000 IS17MW02	1/3	0.2 - 6	0.2	N/A	N/A	N/A		NO	NTX
99-08-1	3-Nitrotoluene	0.18	J	0.18	J	UG/L	IS17MW031000 IS17MW03	1/3	0.2 - 6	0.18	N/A	12.2 N	N/A		NO	BSL
19406-51-0	4-Amino-2,6-dinitrotoluene	0.39		0.39		UG/L	IS17MW031000 IS17MW03	1/3	0.2 - 6	0.39	N/A	N/A	N/A		NO	NTX
99-99-0	4-Nitrotoluene	2.8	J	2.8	J	UG/L	IS17MW011000 IS17MW01	1/3	0.37 - 6.9	2.8	N/A	6.1 N	N/A		NO	BSL
98-95-3	Nitrobenzene	0.098	J	0.098	J	UG/L	IS17MW021000 IS17MW02	1/3	0.2 - 6	0.098	N/A	0.353 N	N/A		NO	BSL
121-82-4	RDX	3.3	J	3.3	J	UG/L	IS17MW011000 IS17MW01	1/3	0.5 - 15	3.3	N/A	0.609 C	4	PMCL	YES	ASL
479-45-8	Tetryl	0.12	J	5.9	J	UG/L	IS17MW011000 IS17MW01	2/3	0.2 - 6	5.9	N/A	36.5 N	N/A		NO	BSL
7429-90-5	Aluminum	420	J	31,500	J	UG/L	IS17MW031000	3/3	19.9 - 19.9	31500	N/A	3,650 N	50 - 200	SMCL	YES	ASL
7440-36-0	Antimony	3.6	J	3.6	J	UG/L	IS17MW011000	1/3	3.1 - 3.1	3.6	N/A	1.46 N	6	PMCL	YES	ASL
7440-38-2	Arsenic	4	J	4	J	UG/L	IS17MW031000 IS17MW03	1/3	3.2 - 3.2	4	N/A	0.0446 C	10	PMCL	YES	ASL
7440-39-3	Barium	93.5	J	202	J	UG/L	IS17MW031000	3/3	0.15 - 0.15	202	N/A	256 N	2000	PMCL	NO	BSL
7440-41-7	Beryllium	0.18	J	0.18	J	UG/L	IS17MW021000 IS17MW02	1/3	0.08 - 0.08	0.18	N/A	7.3 N	4	PMCL	NO	BSL
7440-43-9	Cadmium	0.3	J	0.3	J	UG/L	IS17MW011000 IS17MW01	1/3	0.25 - 0.25	0.3	N/A	1.83 N	5	PMCL	NO	BSL
7440-70-2	Calcium	5,440	J	37,800	J	UG/L	IS17MW021000	3/3	7.7 - 7.7	37800	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	5.8	J	86.9	J	UG/L	IS17MW031000	3/3	1.1 - 1.1	86.9	N/A	11.0 N	100	PMCL	YES	ASL
7440-48-4	Cobalt	2.6	J	32.7	J	UG/L	IS17MW031000	3/3	0.83 - 0.83	32.7	N/A	73.0 N	N/A		NO	BSL
7440-50-8	Copper	5.7	J	39.7	J	UG/L	IS17MW031000	3/3	1.3 - 1.3	39.7	N/A	146 N	1000	SMCL	NO	BSL
57-12-5	Cyanide	0.1	J	0.1	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 10	0.1	N/A	73 N	200	PMCL	NO	BSL
7439-89-6	Iron	27,100	J	71,000	J	UG/L	IS17MW021000	3/3	16 - 16	71000	N/A	1,095 N	300	SMCL	YES	ASL
7439-92-1	Lead	4.9		13.9		UG/L	IS17MW031000 IS17MW03	2/3	1.9 - 1.9	13.9	N/A	15	15	AL	NO	BSL
7439-95-4	Magnesium	5,330		15,700		UG/L	IS17MW021000	3/3	14.2 - 14.2	15700	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	540		2,620		UG/L	IS17MW021000	3/3	0.15 - 0.15	2620	N/A	73 N	50	SMCL	YES	ASL
7440-02-0	Nickel	7	J	73.4		UG/L	IS17MW031000	3/3	2 - 2	73.4	N/A	73 N	N/A		YES	ASL
7440-09-7	Potassium	3,350	J	7,720		UG/L	IS17MW021000	3/3	19.5 - 19.5	7720	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	4.3	J	4.3	J	UG/L	IS17MW011000 IS17MW01	1/3	4 - 4	4.3	N/A	18.3 N	50	PMCL	NO	BSL
7440-23-5	Sodium	26,800	J	46,400	J	UG/L	IS17MW011000	3/3	244 - 244	46400	N/A	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	1.4	J	49	J	UG/L	IS17MW031000	3/3	0.76 - 0.76	49	N/A	1.1 N	N/A		YES	ASL
7440-66-6	Zinc	128		128		UG/L	IS17MW031000 IS17MW03	1/3	1.2 - 1.2	128	N/A	1,095 N	5000	SMCL	NO	BSL

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater - Water in Excavation Pit

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003 U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 15 ug/L, the EPA Safe Drinking Water Act action level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Groundwater - Water Vapors at Showerhead

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
100-41-4	Ethylbenzene	50	J	50	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	50	N/A	134 N	700	PMCL	NO	BSL
108-88-3	Toluene	200		200		UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	200	N/A	74.7 N	1000	PMCL	YES	ASL
75-01-4	Vinyl chloride	40	J	3,000		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	3000	N/A	0.0150 C	2	PMCL	YES	ASL
156-59-2	cis-1,2-Dichloroethene	37	J	4,200		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	4200	N/A	6.08 N	70	PMCL	YES	ASL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards

IS17SS020001 IS17SS030001P

Table 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Groundwater - Water Vapors from Excavation Pit

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
100-41-4	Ethylbenzene	50	J	50	J	UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	50	N/A	134 N	700	PMCL	NO	BSL
108-88-3	Toluene	200		200		UG/L	IS17MW011000 IS17MW01	1/3	10 - 290	200	N/A	74.7 N	1000	PMCL	YES	ASL
75-01-4	Vinyl chloride	40	J	3,000		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	3000	N/A	0.0150 C	2	PMCL	YES	ASL
156-59-2	cis-1,2-Dichloroethene	37	J	4,200		UG/L	IS17MW021000 IS17MW02	2/3	10 - 290	4200	N/A	6.08 N	70	PMCL	YES	ASL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards

IS17SS020001 IS17SS030001P

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 17 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	0.0018	J	0.0018	J	MG/KG	IS17SB030203	1/30	0.011 - 0.16	0.0018	N/A	2,190 N	6	SSL	NO	BSL
540-59-0	1,2-Dichloroethene (total)	0.43		0.43		MG/KG	IS17SB080203	1/4	0.012 - 0.06	0.43	N/A	70.4 N	0.037	SSL	NO	BSL
106-46-7	1,4-Dichlorobenzene	0.0014	J	0.0017	J	MG/KG	IS17SS150001P	2/30	0.011 - 0.16	0.0017	N/A	26.6 C	0.0071	SSL	NO	BSL
78-93-3	2-Butanone	0.0046	J	0.0067	J	MG/KG	IS17SB070203	2/30	0.011 - 0.16	0.0067	N/A	4,693 N	0.79	SSL	NO	BSL
67-64-1	Acetone	0.0054	J	0.033		MG/KG	IS17SB050203	4/30	0.011 - 0.16	0.033	N/A	7,000 N	2.21	SSL	NO	BSL
110-82-7	Cyclohexane	0.0014	J	0.026		MG/KG	IS17SS100001	11/30	0.011 - 0.16	0.026	N/A	N/A	N/A	N/A	NO	NTX
124-48-1	Dibromochloromethane	0.014	UJ	0.014	J	MG/KG	IS17SS090001 IS17SS080001	1/30	0.011 - 0.16	0.014	N/A	7.60 C	0.00083	SSL	NO	BSL
100-41-4	Ethylbenzene	0.0019	J	0.0033	J	MG/KG	IS17SB060203	6/30	0.011 - 0.16	0.0033	N/A	782 N	1.5	SSL	NO	BSL
75-09-2	Methylene chloride	0.024		0.024		MG/KG	IS17SB010203P	1/30	0.011 - 0.16	0.024	N/A	85.2 C	0.019	SSL	NO	BSL
100-42-5	Styrene	0.0021	J	0.0039	J	MG/KG	IS17SS050001	2/30	0.011 - 0.16	0.0039	N/A	1,564 N	5.7	SSL	NO	BSL
108-88-3	Toluene	0.0015	J	0.25		MG/KG	IS17SS020001	3/30	0.011 - 0.16	0.25	N/A	1,564 N	0.879	SSL	NO	BSL
79-01-6	Trichloroethene	0.0033	J	0.68		MG/KG	IS17SB080203	7/30	0.011 - 0.16	0.68	N/A	1.6 C	0.00026	SSL	NO	BSL
1330-20-7	Xylene, total	0.0015	J	0.023		MG/KG	IS17SB060203	15/30	0.011 - 0.16	0.023	N/A	1,564 N	0.3	SSL	NO	BSL
156-59-2	cis-1,2-Dichloroethene	0.0075	J	0.39		MG/KG	IS17SB080203	4/30	0.011 - 0.16	0.39	N/A	78.2 N	0.035	SSL	NO	BSL
156-60-5	trans-1,2-Dichloroethene	0.018	J	0.018	J	MG/KG	IS17SB080203	1/30	0.011 - 0.16	0.018	N/A	156 N	0.082	SSL	NO	BSL
83-32-9	Acenaphthene	0.076	J	0.076	J	MG/KG	IS17SB030203	1/30	0.37 - 0.6	0.076	N/A	469 N	10	SSL	NO	BSL
98-86-2	Acetophenone	0.049	J	0.072	J	MG/KG	IS17SS060001	2/30	0.37 - 0.6	0.072	N/A	782 N	0.319	SSL	NO	BSL
120-12-7	Anthracene	0.063	J	0.075	J	MG/KG	IS17SB020203	2/30	0.37 - 0.6	0.075	N/A	2,346 N	47	SSL	NO	BSL
100-52-7	Benzaldehyde	0.047	J	1.1		MG/KG	IS17SS010001	4/30	0.37 - 0.6	1.1	N/A	782 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	0.049	J	0.73		MG/KG	IS17SB020203	6/30	0.37 - 0.6	0.73	N/A	0.875 C	1.46	SSL	NO	BSL
50-32-8	Benzo(a)pyrene	0.055	J	0.27	J	MG/KG	IS17SB020203	5/30	0.37 - 0.6	0.27	N/A	0.0875 C	0.374	SSL	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.1	J	1.5		MG/KG	IS17SB020203	7/30	0.37 - 0.6	1.5	N/A	0.875 C	4.51	SSL	YES	ASL
207-08-9	Benzo(k)fluoranthene	0.099	J	0.63		MG/KG	IS17SB020203	5/30	0.37 - 0.6	0.63	N/A	8.75 C	45.1	SSL	NO	BSL
86-74-8	Carbazole	0.047	J	0.049	J	MG/KG	IS17SB030203	2/30	0.37 - 0.6	0.049	N/A	31.9 C	0.47	SSL	NO	BSL
218-01-9	Chrysene	0.058	J	0.88		MG/KG	IS17SB020203	7/30	0.37 - 0.6	0.88	N/A	87.5 C	146	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	0.041	J	0.063	J	MG/KG	IS17SB020203	2/30	0.37 - 0.6	0.063	N/A	782 N	496	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.054	J	0.19	J	MG/KG	IS17SB020203	3/30	0.37 - 0.6	0.19	N/A	0.0875 C	1.39	SSL	YES	ASL
206-44-0	Fluoranthene	0.048	J	1.4		MG/KG	IS17SS080001	8/30	0.37 - 0.6	1.4	N/A	313 N	625	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.06	J	0.36	J	MG/KG	IS17SB020203	6/30	0.37 - 0.6	0.36	N/A	0.875 C	12.7	SSL	NO	BSL
85-01-8	Phenanthrene	0.06	J	0.44	J	MG/KG	IS17SS080001	4/30	0.37 - 0.6	0.44	N/A	235 N	68.2	SSL	NO	BSL
129-00-0	Pyrene	0.047	J	0.74		MG/KG	IS17SS080001	13/30	0.37 - 0.6	0.74	N/A	235 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.045	J	0.28	J	MG/KG	IS17SB090203	4/30	0.37 - 0.6	0.28	N/A	45.6 C	2890	SSL	NO	BSL
99-35-4	1,3,5-Trinitrobenzene	0.21	J	0.21	J	MG/KG	IS17SS150001P	1/30	0.25 - 0.25	0.21	N/A	235 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	0.03	J	0.046	J	MG/KG	IS17SS040001	3/30	0.25 - 0.25	0.046	N/A	0.782 N	0.0037	SSL	NO	BSL
88-72-2	2-Nitrotoluene	0.17	J	0.17	J	MG/KG	IS17SB010203 IS17SB030203	2/30	0.25 - 0.25	0.17	N/A	78.2 N	N/A	N/A	NO	BSL
99-99-0	4-Nitrotoluene	0.23	J	0.24	J	MG/KG	IS17SS070001	2/20	0.25 - 0.63	0.24	N/A	78 N	N/A	N/A	NO	BSL

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 17 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7790-98-9	Perchlorate	0.057	J	0.12	J	MG/KG	IS17SS100001	2/30	0.0046 - 0.1	0.12	N/A	21 N	N/A	N/A	NO	BSL
556-88-7	Nitroguanidine	0.04	J	0.04	J	MG/KG	IS17SS040001	1/30	0.1 - 0.1	0.04	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	3,780		10,500		MG/KG	IS17SS150001P	30/30	4.4 - 6.8	10500	N/A	7,821 N	N/A	N/A	YES	ASL
7440-36-0	Antimony	1.3	J	1.5	L	MG/KG	IS17SS010001	2/30	0.69 - 3.1	1.5	N/A	3.13 N	1.32	SSL	NO	BSL
7440-38-2	Arsenic	1.4	J	13.6		MG/KG	IS17SS060001	29/30	0.71 - 2.6	13.6	N/A	0.426 C	0.0261	SSL	YES	ASL
7440-39-3	Barium	28.8	J	116		MG/KG	IS17SS100001	30/30	0.033 - 0.15	116	N/A	548 N	211	SSL	NO	BSL
7440-41-7	Beryllium	0.17	J	0.75	J	MG/KG	IS17SB010203P	9/30	0.018 - 0.073	0.75	N/A	15.6 N	120	SSL	NO	BSL
7440-43-9	Cadmium	0.16	J	6.9		MG/KG	IS17SS080001	19/30	0.056 - 0.29	6.9	N/A	7.80 N	5.49	SSL	NO	BSL
7440-70-2	Calcium	245	J	4,490	E	MG/KG	IS17SS100001	28/30	1.7 - 3	4490	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	7.5		32.9		MG/KG	IS17SS010001	30/30	0.25 - 1.5	32.9	N/A	23.5 N	4.2	SSL	YES	ASL
7440-48-4	Cobalt	2.6	J	29		MG/KG	IS17SS060001	30/30	0.19 - 0.8	29	N/A	160 N	N/A		NO	BSL
7440-50-8	Copper	5.6	J	519		MG/KG	IS17SB080203	30/30	0.29 - 0.69	519	N/A	313 N	1052	SSL	YES	ASL
57-12-5	Cyanide	0.077	J	0.66		MG/KG	IS17SB010203	6/30	0.56 - 2.8	0.66	N/A	156 N	14.7	SSL	NO	BSL
7439-89-6	Iron	8,950		224,000		MG/KG	IS17SS020001 IS17SS030001P	30/30	3.6 - 19.8	224000	N/A	2,346 N	N/A		YES	ASL
7439-92-1	Lead	7.4		602		MG/KG	IS17SS010001	30/30	0.3 - 0.94	602	N/A	400	N/A		YES	ASL
7439-95-4	Magnesium	469	J	1,690		MG/KG	IS17SS100001	30/30	3.1 - 4.9	1690	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	39.5		752		MG/KG	IS17SS060001	30/30	0.033 - 0.29	752	N/A	156 N	95.2	SSL	YES	ASL
7439-97-6	Mercury	0.089	J	1.1	L	MG/KG	IS17SB030203	11/30	0.056 - 0.091	1.1	N/A	2.35 N	N/A		NO	BSL
7440-02-0	Nickel	5.7	J	32.8		MG/KG	IS17SS010001	30/30	0.44 - 0.69	32.8	N/A	156 N	N/A		NO	BSL
7440-09-7	Potassium	315	J	1,200	J	MG/KG	IS17SS100001	29/30	4.3 - 19	1200	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	1.1		1.6	L	MG/KG	IS17SS050001	4/30	0.89 - 3.1	1.6	N/A	39.1 N	1.9	SSL	NO	BSL
7440-22-4	Silver	0.79		0.85		MG/KG	IS17SB020203	6/30	0.25 - 1.1	0.85	N/A	39.1 N	3.1	SSL	NO	BSL
7440-23-5	Sodium	112		600	J	MG/KG	IS17SS090001	13/30	54.3 - 159	600	N/A	N/A	N/A		NO	NUT
7440-28-0	Thallium	1.3		1.5		MG/KG	IS17SB020203	5/30	1.2 - 3.8	1.5	N/A	0.548 N	0.364	SSL	YES	ASL
7440-62-2	Vanadium	12.2	J	32.3		MG/KG	IS17SB010203	30/30	0.17 - 1	32.3	N/A	2.3 N	21.9	SSL	YES	ASL
7440-66-6	Zinc	27.5	J	1,140	E	MG/KG	IS17SS080001	30/30	0.14 - 0.44	1140	N/A	2,346 N	1362	SSL	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Residential Soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Residential Soil Ingestion RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for mercuric chloride used as surrogate for mercury.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 17 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

RBC value for perchlorate calculated based on the RfD of 0.0005 mg/kg-day, Interim Assessment Guidance for Perchlorate, June 1999, developed by ORD's NCEA.

Trichloroethene screening value is calculated based on a noncarcinogenic hazard of 0.1. The noncarcinogenic screening level at HQ=0.1 is more conservative than the carcinogenic value provided in the Region III RBC table.

SSL = Region III Soil Screening Level, for groundwater migration, DAF 20

Cancer benchmark value = 1E-06, adjusted HQ=0.1

(EPA Region III RBC Table)

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Table 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	6.3E-04	J	6.3E-04	J	$\mu g/m^3$	IS17SB030203	1/30		6.3E-04	N/A	2.3E+02 N	N/A	N/A	NO	BSL
540-59-0	1,2-Dichloroethene (total)	1.4E-01		1.4E-01		$\mu g/m^3$	IS17SB080203	1/4		1.4E-01	N/A	3.3E+00 N	N/A	N/A	NO	BSL
106-46-7	1,4-Dichlorobenzene	8.3E-05	J	1.0E-04	J	$\mu g/m^3$	IS17SS150001	2/30		1.0E-04	N/A	2.8E-01 C	N/A	N/A	NO	BSL
78-93-3	2-Butanone	1.2E-04	J	1.7E-04	J	$\mu g/m^3$	IS17SB070203	2/30		1.7E-04	N/A	1.0E+02 N	N/A	N/A	NO	BSL
67-64-1	Acetone	3.3E-04	J	2.0E-03		$\mu g/m^3$	IS17SB050203	4/30		2.0E-03	N/A	3.3E+02 N	N/A	N/A	NO	BSL
110-82-7	Cyclohexane	5.9E-04	J	1.1E-02		$\mu g/m^3$	IS17SS100001	11/30		1.1E-02	N/A	6.2E+02	N/A	N/A	NO	BSL
124-48-1	Dibromochloromethane	7.1E-04	UJ	7.1E-04	J	$\mu g/m^3$	IS17SS090001	1/30		7.1E-04	N/A	7.5E-02 C	N/A	N/A	NO	BSL
100-41-4	Ethylbenzene	2.7E-04	J	4.7E-04	J	$\mu g/m^3$	IS17SB060203	6/30		4.7E-04	N/A	1.1E+02 N	N/A	N/A	NO	BSL
75-09-2	Methylene chloride	7.4E-03		7.4E-03		$\mu g/m^3$	IS17SB010203	1/30		7.4E-03	N/A	3.8E+00 C	N/A	N/A	NO	BSL
100-42-5	Styrene	1.2E-04	J	2.2E-04	J	$\mu g/m^3$	IS17SB040203	2/30		2.2E-04	N/A	1.0E+02 N	N/A	N/A	NO	BSL
108-88-3	Toluene	2.9E-04	J	4.8E-02		$\mu g/m^3$	IS17SS020001	3/30		4.8E-02	N/A	4.2E+01 N	N/A	N/A	NO	BSL
79-01-6	Trichloroethene	7.8E-04	J	1.6E-01		$\mu g/m^3$	IS17SB080203	7/30		1.6E-01	N/A	1.6E-02 C	N/A	N/A	YES	ASL
1330-20-7	Xylene, total	2.0E-04	J	3.1E-03		$\mu g/m^3$	IS17SB060203	15/30		3.1E-03	N/A	1.1E+00 N	N/A	N/A	NO	BSL
156-59-2	cis-1,2-Dichloroethene	2.0E-03	J	1.0E-01		$\mu g/m^3$	IS17SB080203	4/30		1.0E-01	N/A	3.7E+00 N	N/A	N/A	NO	BSL
156-60-5	trans-1,2-Dichloroethene	6.0E-03	J	6.0E-03	J	$\mu g/m^3$	IS17SB080203	1/30		6.0E-03	N/A	7.3E+00 N	N/A	N/A	NO	BSL
83-32-9	Acenaphthene	2.7E-04	J	2.7E-04	J	$\mu g/m^3$	IS17SB030203	1/30		2.7E-04	N/A	2.2E+01 N	N/A	N/A	NO	BSL
98-86-2	Acetophenone	3.7E-08	J	5.5E-08	J	$\mu g/m^3$	IS17SS060001	2/30		5.5E-08	N/A	3.7E+01 N	N/A	N/A	NO	BSL
120-12-7	Anthracene	6.2E-05	J	1.4E-04	J	$\mu g/m^3$	IS17SB020203	2/30		1.4E-04	N/A	1.1E+02 N	N/A	N/A	NO	BSL
100-52-7	Benzaldehyde	3.6E-08	J	8.3E-07		$\mu g/m^3$	IS17SS010001	4/30		8.3E-07	N/A	3.7E+01 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	3.7E-08	J	5.5E-07		$\mu g/m^3$	IS17SB020203	6/30		5.5E-07	N/A	8.6E-03 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	4.2E-08	J	2.0E-07	J	$\mu g/m^3$	IS17SB020203	5/30		2.0E-07	N/A	2.0E-03 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	7.6E-08	J	1.1E-06		$\mu g/m^3$	IS17SB020203	7/30		1.1E-06	N/A	8.6E-03 C	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	7.5E-08	J	4.8E-07		$\mu g/m^3$	IS17SB020203	5/30		4.8E-07	N/A	8.6E-02 C	N/A	N/A	NO	BSL
86-74-8	Carbazole	3.6E-08	J	3.7E-08	J	$\mu g/m^3$	IS17SB030203	2/30		3.7E-08	N/A	3.1E-01 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	4.4E-08	J	6.7E-07		$\mu g/m^3$	IS17SB020203	7/30		6.7E-07	N/A	8.6E-01 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	3.1E-08	J	4.8E-08	J	$\mu g/m^3$	IS17SB020203	2/30		4.8E-08	N/A	3.7E+01 N	N/A	N/A	NO	BSL
53-70-3	Dibenz(a,h)anthracene	4.1E-08	J	1.4E-07	J	$\mu g/m^3$	IS17SB020203	3/30		1.4E-07	N/A	8.6E-04 C	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	3.6E-08	J	1.1E-06		$\mu g/m^3$	IS17SS080001	8/30		1.1E-06	N/A	1.5E+01 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	4.5E-08	J	2.7E-07	J	$\mu g/m^3$	IS17SB020203	6/30		2.7E-07	N/A	8.6E-03 C	N/A	N/A	NO	BSL
85-01-8	Phenanthrene	4.5E-08	J	3.3E-07	J	$\mu g/m^3$	IS17SS080001	4/30		3.3E-07	N/A	1.1E+01 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	9.6E-06	J	1.5E-04		$\mu g/m^3$	IS17SS080001	13/30		1.5E-04	N/A	1.1E+01 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	3.4E-08	J	2.1E-07	J	$\mu g/m^3$	IS17SB090203	4/30		2.1E-07	N/A	4.5E-01 C	N/A	N/A	NO	BSL
99-35-4	1,3,5-Trinitrobenzene	1.6E-07	J	1.6E-07	J	$\mu g/m^3$	IS17SS150001	1/30		1.6E-07	N/A	1.1E+01 N	N/A	N/A	NO	BSL
99-65-0	1,3-Dinitrobenzene	2.3E-08	J	3.5E-08	J	$\mu g/m^3$	IS17SS040001	3/30		3.5E-08	N/A	3.7E-02 N	N/A	N/A	NO	BSL
88-72-2	2-Nitrotoluene	1.3E-07	J	1.3E-07	J	$\mu g/m^3$	IS17SB010203 IS17SB030203	2/30		1.3E-07	N/A	3.7E+00 N	N/A	N/A	NO	BSL
99-99-0	4-Nitrotoluene	1.7E-07	J	1.8E-07	J	$\mu g/m^3$	IS17SS070001	2/20		1.8E-07	N/A	3.7E+00 N	N/A	N/A	NO	BSL
7790-98-9	Perchlorate	4.3E-08	J	9.1E-08	J	$\mu g/m^3$	IS17SS100001	2/30		9.1E-08	N/A	1.8E-01 N	N/A	N/A	NO	BSL
556-88-7	Nitroguanidine	3.0E-08	J	3.0E-08	J	$\mu g/m^3$	IS17SS040001	1/30		3.0E-08	N/A	N/A	N/A	N/A	NO	NTX

Table 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 17 NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7429-90-5	Aluminum	2.9E-03		8.0E-03		µg/m^3	IS17SB070203	30/30		8.0E-03	N/A	3.7E-01 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	9.8E-07	J	1.1E-06	L	µg/m^3	IS17SS010001	2/30		1.1E-06	N/A	1.5E-01 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	1.1E-06	J	1.0E-05		µg/m^3	IS17SS060001	29/30		1.0E-05	N/A	4.1E-04 C	N/A	N/A	NO	BSL
7440-39-3	Barium	2.2E-05	J	8.8E-05		µg/m^3	IS17SS100001	30/30		8.8E-05	N/A	5.1E-02 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	1.3E-07	J	5.7E-07	J	µg/m^3	IS17SB010203	9/30		5.7E-07	N/A	7.5E-04 C	N/A	N/A	NO	BSL
7440-43-9	Cadmium	1.2E-07	J	5.2E-06		µg/m^3	IS17SS080001	19/30		5.2E-06	N/A	9.9E-04 C	N/A	N/A	NO	BSL
7440-70-2	Calcium	1.9E-04	J	3.4E-03	E	µg/m^3	IS17SS100001	28/30		3.4E-03	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	5.7E-06		2.5E-05		µg/m^3	IS17SS010001	30/30		2.5E-05	N/A	1.5E-04 C	N/A	N/A	NO	BSL
7440-48-4	Cobalt	2.0E-06	J	2.2E-05		µg/m^3	IS17SS060001	30/30		2.2E-05	N/A	6.4E-04 C	N/A	N/A	NO	BSL
7440-50-8	Copper	4.2E-06	J	3.9E-04		µg/m^3	IS17SB080203	30/30		3.9E-04	N/A	1.5E+01 N	N/A	N/A	NO	BSL
57-12-5	Cyanide	5.8E-08	J	5.0E-07		µg/m^3	IS17SB010203	6/30		5.0E-07	N/A	7.3E+00 N	N/A	N/A	NO	BSL
7439-89-6	Iron	6.8E-03		1.7E-01		µg/m^3	IS17SS020001 IS17SS030001P	30/30		1.7E-01	N/A	1.1E+02 N	N/A	N/A	NO	BSL
7439-92-1	Lead	5.6E-06		4.6E-04		µg/m^3	IS17SS010001	30/30		4.6E-04	N/A	N/A	N/A	N/A	NO	NTX
7439-95-4	Magnesium	3.6E-04	J	1.3E-03		µg/m^3	IS17SS100001	30/30		1.3E-03	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	3.0E-05		5.7E-04		µg/m^3	IS17SS060001	30/30		5.7E-04	N/A	5.2E-03 N	N/A	N/A	NO	BSL
7439-97-6	Mercury	6.7E-08	J	8.3E-07	L	µg/m^3	IS17SB030203	11/30		8.3E-07	N/A	3.1E-02 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	4.3E-06	J	2.5E-05		µg/m^3	IS17SS010001	30/30		2.5E-05	N/A	7.3E+00 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	2.4E-04	J	9.1E-04	J	µg/m^3	IS17SS100001	29/30		9.1E-04	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	8.3E-07		1.2E-06	L	µg/m^3	IS17SS050001	4/30		1.2E-06	N/A	1.8E+00 N	N/A	N/A	NO	BSL
7440-22-4	Silver	6.0E-07		6.4E-07		µg/m^3	IS17SB020203	6/30		6.4E-07	N/A	1.8E+00 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	8.5E-05		4.5E-04	J	µg/m^3	IS17SS090001	13/30		4.5E-04	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	9.8E-07		1.1E-06		µg/m^3	IS17SB020203	5/30		1.1E-06	N/A	2.6E-02 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	9.2E-06	J	2.4E-05		µg/m^3	IS17SB010203	30/30		2.4E-05	N/A	1.1E-01 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	2.1E-05	J	8.6E-04	E	µg/m^3	IS17SS080001	30/30		8.6E-04	N/A	1.1E+02 N	N/A	N/A	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.9.A.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Ambient Air, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for mercuric chloride used as surrogate for mercury.
RBC value for perchlorate calculated based on the RfD of 0.0005 mg/kg-day, Interim Assessment Guidance for Perchlorate, June 1999, developed by ORD's NCEA.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.9.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 17 NDWIH
Site 17, Indian Head NSWC

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
1,1,1-Trichloroethane	7.80E-02	7.05E-01	8.80E-06	1.10E+02	6.60E-01	1.33E+03	
1,2-Dichloroethene (total)	7.07E-02	3.85E-01	1.19E-05	5.25E+01	3.15E-01	6.30E+03	
1,4-Dichlorobenzene	6.90E-02	9.96E-02	7.90E-06	6.17E+02	3.70E+00	7.38E+01	
2-Butanone	9.03E-02	4.30E-04	3.84E-05	4.50E+00	2.70E-02	2.39E+05	
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	
Cyclohexane	8.39E-02	7.84E+00	9.10E-06	9.63E+02	5.78E+00	5.50E+01	
Dibromochloromethane	1.96E-02	3.21E-02	1.05E-05	6.31E+01	3.79E-01	2.60E+03	
Ethylbenzene	7.50E-02	3.23E-01	7.80E-06	3.63E+02	2.18E+00	1.69E+02	
Methylene Chloride	1.01E-01	8.98E-02	1.17E-05	1.17E+01	7.02E-02	1.30E+04	
Styrene	7.10E-02	1.13E-01	8.00E-06	7.76E+02	4.66E+00	3.10E+02	
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E+00	5.26E+02	
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	
Xylene, total	7.69E-02	3.01E-01	7.80E-06	3.89E+02	2.33E+00	1.78E+02	
cis-1,2-Dichloroethene	7.36E-02	1.67E-01	1.13E-05	3.55E+01	2.13E-01	3.50E+03	
trans-1,2-Dichloroethene	7.07E-02	3.85E-01	1.19E-05	5.25E+01	3.15E-01	6.30E+03	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	
Acetophenone	N/A	4.99E-04	N/A	4.68E+01	2.81E-01	1.66E+03	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 17, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)pyrene	MG/KG	0.21	0.234	0.13	J	MG/KG	0.13	Max	W-Test (3,2)	0.13	Max	W-Test (3,2)
Benzo(b)fluoranthene	MG/KG	0.308	0.423	0.97		MG/KG	0.42	95% UCL-T	W-Test (4)	0.25	Mean-T	W-Test (4)
Aluminum	MG/KG	7,275	8,109	10,500		MG/KG	8109	95% UCL-N	W-Test (3)	7275	Mean-N	W-Test (3)
Arsenic	MG/KG	4.73	6.29	13.6		MG/KG	7.49	95% UCL-T	W-Test (4)	3.78	Mean-T	W-Test (4)
Chromium	MG/KG	16	18.7	32.9		MG/KG	19.0	95% UCL-T	W-Test (1)	15.2	Mean-T	W-Test (1)
Iron	MG/KG	32,830	57,218	224,000		MG/KG	45,422	95% UCL-N	W-Test (4)	20,952	Mean-T	W-Test (4)
Lead	MG/KG	73.1	141	602		MG/KG	73.1	Mean-N	W-Test (4)	73.1	Mean-N	W-Test (4)
Manganese	MG/KG	272	377	752		MG/KG	545	95% UCL-T	W-Test (1)	189	Mean-T	W-Test (1)
Thallium	MG/KG	0.94	1.1	1.4		MG/KG	1.10	95% UCL-T	W-Test (4)	0.90	Mean-T	W-Test (4)
Vanadium	MG/KG	21.65	23.6	29.4		MG/KG	23.6	95% UCL-N	W-Test (3)	21.7	Mean-N	W-Test (3)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater - Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Toluene	UG/L	117	286	200		UG/L	200	Max	W-Test (5)	117	Mean-N	W-Test (6)
Vinyl chloride	UG/L	1,015	3,913	3,000		UG/L	3,000	Max	W-Test (5)	1,015	Mean-N	W-Test (6)
cis-1,2-Dichloroethene	UG/L	1,414	5,482	4,200		UG/L	4,200	Max	W-Test (5)	1,414	Mean-N	W-Test (6)
4-Methylphenol	UG/L	23.7	79.6	62.0	J	UG/L	62.0	Max	W-Test (5)	23.7	Mean-N	W-Test (6)
1,3-Dinitrobenzene	UG/L	0.533	1.80	1.40	J	UG/L	1.40	Max	W-Test (5)	0.53	Mean-N	W-Test (6)
2,4,6-Trinitrotoluene	UG/L	2.30	7.47	5.80	J	UG/L	5.80	Max	W-Test (5)	2.30	Mean-N	W-Test (6)
RDX	UG/L	1.27	4.24	3.30	J	UG/L	3.30	Max	W-Test (5)	1.27	Mean-N	W-Test (6)
Aluminum	UG/L	11,850	40,666	31,500	J	UG/L	31,500	Max	W-Test (5)	11,850	Mean-N	W-Test (6)
Antimony	UG/L	2.23	4.23	3.60	J	UG/L	3.60	Max	W-Test (5)	2.23	Mean-N	W-Test (6)
Arsenic	UG/L	2.40	4.74	4.00	J	UG/L	4.00	Max	W-Test (5)	2.40	Mean-N	W-Test (6)
Chromium	UG/L	45.0	113	86.9	J	UG/L	86.9	Max	W-Test (5)	45.0	Mean-N	W-Test (6)
Iron	UG/L	43,167	83,965	71,000	J	UG/L	71,000	Max	W-Test (5)	43,167	Mean-N	W-Test (6)
Manganese	UG/L	1,457	3,247	2,620		UG/L	2,620	Max	W-Test (5)	1,457	Mean-N	W-Test (6)
Nickel	UG/L	37.1	93.8	73.4		UG/L	73.4	Max	W-Test (5)	37.1	Mean-N	W-Test (6)
Vanadium	UG/L	19.9	62.9	49.0	J	UG/L	49.0	Max	W-Test (5)	19.9	Mean-N	W-Test (6)

Full statistics for data included in Appendix. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Higher of normal or log-transformed value used for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater - Water in Excavation Pit

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Toluene	UG/L	117	286	200		UG/L	200	Max	W-Test (5)	117	Mean-N	W-Test (6)
Vinyl chloride	UG/L	1,015	3,913	3,000		UG/L	3,000	Max	W-Test (5)	1,015	Mean-N	W-Test (6)
cis-1,2-Dichloroethene	UG/L	1,414	5,482	4,200		UG/L	4,200	Max	W-Test (5)	1,414	Mean-N	W-Test (6)
4-Methylphenol	UG/L	23.7	79.6	62.0	J	UG/L	62.0	Max	W-Test (5)	23.7	Mean-N	W-Test (6)
1,3-Dinitrobenzene	UG/L	0.533	1.80	1.40	J	UG/L	1.40	Max	W-Test (5)	0.53	Mean-N	W-Test (6)
2,4,6-Trinitrotoluene	UG/L	2.30	7.47	5.80	J	UG/L	5.80	Max	W-Test (5)	2.30	Mean-N	W-Test (6)
RDX	UG/L	1.27	4.24	3.30	J	UG/L	3.30	Max	W-Test (5)	1.27	Mean-N	W-Test (6)
Aluminum	UG/L	11,850	40,666	31,500	J	UG/L	31,500	Max	W-Test (5)	11,850	Mean-N	W-Test (6)
Antimony	UG/L	2.23	4.23	3.60	J	UG/L	3.60	Max	W-Test (5)	2.23	Mean-N	W-Test (6)
Arsenic	UG/L	2.40	4.74	4.00	J	UG/L	4.00	Max	W-Test (5)	2.40	Mean-N	W-Test (6)
Chromium	UG/L	45.0	113	86.9	J	UG/L	86.9	Max	W-Test (5)	45.0	Mean-N	W-Test (6)
Iron	UG/L	43,167	83,965	71,000	J	UG/L	71,000	Max	W-Test (5)	43,167	Mean-N	W-Test (6)
Manganese	UG/L	1,457	3,247	2,620		UG/L	2,620	Max	W-Test (5)	1,457	Mean-N	W-Test (6)
Nickel	UG/L	37.1	93.8	73.4		UG/L	73.4	Max	W-Test (5)	37.1	Mean-N	W-Test (6)
Vanadium	UG/L	19.9	62.9	49.0	J	UG/L	49.0	Max	W-Test (5)	19.9	Mean-N	W-Test (6)

Full statistics for data included in Appendix. Unfiltered results for metals since construction worker expected to directly contact groundwater.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Higher of normal or log-transformed value used for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Groundwater - Water Vapors at Showerhead

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Toluene	UG/L	117	286	200		UG/L	200	Max	W-Test (5)	117	Mean-N	W-Test (6)
Vinyl chloride	UG/L	1,015	3,913	3,000		UG/L	3,000	Max	W-Test (5)	1,015	Mean-N	W-Test (6)
cis-1,2-Dichloroethene	UG/L	1,414	5,482	4,200		UG/L	4,200	Max	W-Test (5)	1,414	Mean-N	W-Test (6)

Full statistics for data included in Appendix. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Higher of normal or log-transformed value used for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Groundwater - Water Vapors from Excavation Pit

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Toluene	UG/L	117	286	200		UG/L	200	Max	W-Test (5)	117	Mean-N	W-Test (6)
Vinyl chloride	UG/L	1,015	3,913	3,000		UG/L	3,000	Max	W-Test (5)	1,015	Mean-N	W-Test (6)
cis-1,2-Dichloroethene	UG/L	1,414	5,482	4,200		UG/L	4,200	Max	W-Test (5)	1,414	Mean-N	W-Test (6)

Full statistics for data included in Appendix. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Higher of normal or log-transformed value used for EPC.

(5) Maximum concentration used for RME EPC because fewer than five samples.

(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Site 17 Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)pyrene	MG/KG	0.201	0.218	0.270	J	MG/KG	0.218	95% UCL-N	W-Test (4)	0.201	Mean-N	W-Test (4)
Benzo(b)fluoranthene	MG/KG	0.303	0.394	1.50		MG/KG	0.351	95% UCL-T	W-Test (4)	0.25	Mean-T	W-Test (4)
Dibenz(a,h)anthracene	MG/KG	0.205	0.220	0.190	J	MG/KG	0.19	Max	W-Test (4,2)	0.19	Max	W-Test (4,2)
Aluminum	MG/KG	7,547	8,065	10,500		MG/KG	8,065	95% UCL-N	W-Test (3)	7,547	Mean-N	W-Test (3)
Arsenic	MG/KG	4.45	5.31	13.6		MG/KG	5.60	95% UCL-T	W-Test (1)	3.76	Mean-T	W-Test (1)
Chromium	MG/KG	14.9	16.3	32.9		MG/KG	16.2	95% UCL-T	W-Test (4)	14.3	Mean-T	W-Test (4)
Copper	MG/KG	37.8	66.6	519		MG/KG	40.7	95% UCL-T	W-Test (4)	18.4	Mean-T	W-Test (4)
Iron	MG/KG	25,415	37,320	224,000		MG/KG	28,131	95% UCL-T	W-Test (4)	18,770	Mean-T	W-Test (4)
Lead	MG/KG	51.0	84.5	602		MG/KG	25.5	Mean-T	W-Test (4)	25.5	Mean-T	W-Test (4)
Manganese	MG/KG	200	256	752		MG/KG	270	95% UCL-T	W-Test (1)	147	95% UCL-T	W-Test (1)
Thallium	MG/KG	0.910	1.01	1.50		MG/KG	1.00	95% UCL-T	W-Test (4)	0.87	Mean-T	W-Test (4)
Vanadium	MG/KG	22.79	24.2	32.3		MG/KG	24.2	95% UCL-N	W-Test (3)	22.8	Mean-N	W-Test (3)

* Surface soil & subsurface soil combined.

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.7

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Trichloroethene	MG/KG	0.030	0.068	0.68		MG/KG	0.019	95% UCL-T	W-Test (4)	0.0026	Mean-T	W-Test (4)

* Surface soil & subsurface soil combined.

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997, (4)	3,700	EPA, 1997, (4)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (5)	0.11	EPA, 1997, (5)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) Surface area is 25% of total surface area for 12-15 year old male. 95th percentile for total surface area is 1.85 m^2, 50th percentile for total surface area is 1.49 m^2.

(5) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1		see Table 3.1		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (2)	5,700	EPA, 1997, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area is based on trespasser wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.

(3) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.2	--	see Table 3.2	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.2	--	see Table 3.2	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	20,000	EPA, 1992, (1)	18,000	EPA, 1997b, (1)	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	x CF1 x CF2
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm2, with a mean of 20,000 cm2; the mean is used.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.2	--	see Table 3.2	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	1	EPA, 1997a	1	EPA, 1997a	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.2	--	see Table 3.2	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	x CF1 x CF2
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.2	--	see Table 3.2	see Table …	CDI (mg/kg-day) =
	DAevent-A	Dermally Absorbed Dose per Event, Adult	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x EF x 1/AT
	DAevent-C	Dermally Absorbed Dose per Event, Child	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	
	DA-Adj	Dermally Absorbed Dose, Age-adjusted	mg-year/event-kg	calculated		calculated		DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics:
	ET-A	Exposure Time, Adult	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	DAevent-A (mg/cm2-event) =
	ET-C	Exposure Time, Child	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET-A x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	DAevent-C (mg/cm2-event) =
	SA-A	Skin Surface Area, Adult	cm^2	20,000	EPA, 1992	18,000	EPA, 1997b	PC x CW x ET-C x CF1 x CF2
	SA-C	Skin Surface Area, Child	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	Organics:
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	DAevent-A (mg/cm2-event) =
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	2 x PC x CW x (sqrt((6 x t x ET-A)/3.1415)) x CF1 x CF2
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	DAevent-C (mg/cm2-event) =
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	2 x PC x CW x (sqrt((6 x t x ET-C)/3.1415)) x CF1 x CF2
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.2	--	see Table 3.2	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W-A	Ingestion Rate of Water, Adult	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
	IR-W-C	Ingestion Rate of Water, Child	liters/day	1	EPA, 1997a	1	EPA, 1997a	
	IR-W-Adj	Ingestion Rate of Water, Age-adjusted	liter-year/kg-day	1.09	calculated	0.58	calculated	IR-W-Adj (liter-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-W-C / BW-C) + (ED-A x IR-W-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.3		see Table 3.3	chem. specific	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-day	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-day) =
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	PC x CW x ET x CF1 x CF2
	t*	Time to Reach Steady-state	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	B	Ratio of Permeability of Stratum Corneum to Epidermis	dimensionless	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Organics :
	ET	Exposure Time	hr/day	8	(1)	4	(1)	ET<t*: DAevent (mg/cm2-day) =
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (2)	2,000	EPA, 1992, (2)	x CF1 x CF2
	EF	Exposure Frequency	days/year	42	(3)	42	(3)	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	ET>t*: DAevent (mg/cm2-day) =
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	x CF1 x CF2
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgment based on construction activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(3) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Air

Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

Receptor Population: Resident

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	InhExp	Inhalation Exposure per Shower	mg/kg-shower	see Table 3.4	--	see Table 3.4	--	Foster & Chrostowski Shower Inhalation Model for InhExp
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	InhExp x EF x ED x 1/AT
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA. 1989	3,285	EPA. 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3	see Table 3.5		see Table 3.5		Two-Film Volatilization Model for CA
	IN	Inhalation Rate	m^3/hour	1.7	EPA, 1997	1.7	EPA, 1997	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	
	EF	Exposure Frequency	days/year	42	(2)	42	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1993	CA x IN x ET x EF x ED x 1/BW x 1/AT
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA. 1989	365	EPA. 1989	

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (1)	5,700	EPA, 1997, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997, (2)	0.2	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil
(1) Surface area based on resident wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is based on maximum adherence factor for gardeners.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,400	EPA, 1997, (1)	2,900	EPA, 1997, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (2)	0.11	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

* Surface and subsurface soil
(1) Surface area based on resident wearing shorts and short sleeve shirt. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S-Adj x EF x CF3 x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	EPA, 1993	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	114.29	calculated	46.43	calculated	IR-S-Adj (mg-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6	see Table 3	CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, Adult	cm^2	6,600	EPA, 1997a	5,700	EPA, 1997a	CS x DA-Adj x DABS x CF3 x EF x 1/AT
	SA-C	Skin Surface Area Available for Contact, Child	cm^2	3,400	EPA, 1997b	2,900	EPA, 1997b	
	SSAF-A	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997a	0.2	EPA, 1992	DA-Adj (mg-year/kg-day) =
	SSAF-C	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997a	0.11	EPA, 1997a	[(ED-C x SA-C x SSAF-C / BW-C) +
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	602	calculated	274	calculated	(ED-A x SA-A x SSAF-A / BW-A)]
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

* Surface and subsurface soil

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	480	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.24	EPA, 1997, (2)	0.24	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

* Surface and subsurface soil
(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.
(2) Soil to skin adherence factor is based on maximum adherence factor for construction workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997, (2)	0.32	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	

* Surface and subsurface soil

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) SSAF based on maximum adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997, (4)	3,700	EPA, 1997, (4)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (5)	0.11	EPA, 1997, (5)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) Surface area is 25% of total surface area for 12-15 year old male. 95th percentile for total surface area is 1.85 m^2, 50th percentile for total surface area is 1.49 m^2.

(5) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.15

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6		see Table 3.6		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (2)	5,700	EPA, 1997, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area is based on trespasser wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.

(3) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.16

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 3.7	- -	see Table 3.7	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997 (2)	0.6	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	219	EPA,1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface Soil

(1) Professional Judgment conservatively assumed all day.

(2) Inhalation rate based on average adult at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.17

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 3.7	- -	see Table 3.7	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.8	EPA, 1997 (2)	0.8	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment conservatively assumed all day.

(2) Inhalation rate based on child, aged 6 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.18

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 3.7	- -	see Table 3.7	- -	CA x IN-Adj x EF x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	CA (mg/m^3) = CS (1/PEF + 1/VF)
	IN-A	Inhalation Rate, Adult	m^3/hour	0.6	EPA, 1997 (2)	0.6	EPA, 1997 (2)	
	IN-C	Inhalation Rate, Child	m^3/hour	0.8	EPA, 1997 (3)	0.8	EPA, 1997 (3)	IN-Adj (m^3-year/kd-day) =
	IN-Adj	Inhalation Rate, Age-adjusted	m^3-year/kg-day	12.62	calculated	9.53	calculated	(ED-C x IN-C x ET / BW-C) + (ED-A x IN-A x ET / BW-A)
	ET	Exposure Time	hours/day	24	(1)	24	(1)	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment conservatively assumed all day.

(2) Inhalation rate based on average adult at a light activity level.

(3) Inhalation rate based on child, aged 6 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.19

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7		see Table 3.7	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 3.7	- -	see Table 3.7	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	3.9	EPA, 1997 (2)	3.9	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate based on average adult at a heavy activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Calc. (1): Calculated in Appendix--- Section Generation of Fugitive Dust During Construction Activities.

TABLE 4.20

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7	--	see Table 3.7	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.1	EPA, 1997 (2)	2.1	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	2409	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate based on average adult at a moderate activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.21

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7	--	see Table 3.7	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	1.0	EPA, 1997 (5)	1.0	EPA, 1997 (5)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	9	(3)	9	(3)	
	BW	Body Weight	kg	51	EPA, 1997,(4)	51	EPA, 1997,(4)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Professional Judgment assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 9 year old and 18 year old male body weight.

(5) Inhalation rate based on child, aged 10 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.22

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7	--	see Table 3.7	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997 (3)	0.6	EPA, 1997 (3)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Inhalation rate based on average adult at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 17, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	CNS	100	NCEA	08/26/1996
	Subchronic	N/A								
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Whole body/Blood	1000/1	IRIS	03/15/2001
	Subchronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Whole body/Blood	1000/1	HEAST	07/01/1997
Arsenic	Chronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin/vascular	3/1	IRIS	03/15/2001
	Subchronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin/vascular	3/1	HEAST	07/01/1997
Benzo(a)pyrene	Chronic	N/A								
Benzo(b)fluoranthene	Chronic	N/A								
Cadmium (water)	Chronic	5.0E-04	mg/kg-day	0.025	1.3E-05	mg/kg-day	Kidney	10/1	IRIS	03/08/2001
(for water)	Subchronic	N/A								
Cadmium (food)	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	03/08/2001
(for soil)	Subchronic	N/A								
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	NOAEL	300/3	IRIS	03/15/2001
	Subchronic	2.0E-02	mg/kg-day	0.025	5.0E-04	mg/kg-day	NOAEL	100	HEAST	07/01/1997
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal		HEAST	07/01/1997
	Subchronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal		HEAST	07/01/1997
cis-1,2-Dichloroethene	Chronic	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Blood	3000	HEAST	07/01/1997
	Subchronic	1.0E-01	mg/kg-day	1	1.0E-01	mg/kg-day	Blood	300	HEAST	07/01/1997
Dibenzo(a,h)anthracene	Chronic	N/A								
1,3-Dinitirobenzene	Chronic	1.0E-04	mg/kg-day	1	1.0E-04	mg/kg-day	Spleen	3000	IRIS	03/20/2001
	Subchronic	N/A								
Iron	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Gastrointestinal	1	NCEA	07/23/1996
Lead	Chronic	N/A								
	Subchronic	N/A								
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								
Manganese (food)	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								
4-Methylphenol	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	CNS, RESP & Whole Body	1000	HEAST	07/01/1997
	Subchronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	CNS, RESP & Whole Body	1000	HEAST	07/01/1997
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Whole body	300	IRIS	03/12/2001
	Subchronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Whole body	300	HEAST	07/01/1997

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 17, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
RDX	Chronic	3.0E-03	mg/kg-day	1	3.0E-03	mg/kg-day	Prostrate	100	IRIS	03/20/2001
	Subchronic	3.0E-03	mg/kg-day	1	3.0E-03	mg/kg-day	Prostrate	100	HEAST	08/22/2000
Thallium	Chronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin/vascular	3	EPA Region III	10/05/2000
	Subchronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin	3	HEAST	07/01/1997
Toluene	Chronic	2.0E-01	mg/kg-day	1	2.0E-01	mg/kg-day	Liver/kidney	1000	IRIS	03/20/2001
	Subchronic	2.0E+00	mg/kg-day	1	2.0E+00	mg/kg-day	Liver/kidney	100	HEAST	07/01/1997
Trichloroethene	Chronic	6.0E-03	mg/kg-day	1	6.0E-03	mg/kg-day	Liver, Kidney, Fetus	3000	NCEA	1997
	Subchronic	N/A				mg/kg-day				
2,4,6-Trinitrotoluene	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	1000	IRIS	03/21/2001
	Subchronic		mg/kg-day							
Vanadium	Chronic	1.0E-03	mg/kg-day	0.026	2.6E-05	mg/kg-day	Kidney	100	NCEA	05/01/2000
	Subchronic	N/A								
Vinyl Chloride	Chronic	3.0E-03	mg/kg-day	1	3.0E-03	mg/kg-day	Liver	30	IRIS	03/20/2001
	Subchronic	N/A								

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

(2) See Risk Assessment text for derivation of the "Absorbed Cancer Slope Factor for Dermal".

Definitions NA = Not Available

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

USEPA R3 = Region 3 Risk-Based Concentration Table

TABLE 5.2

Site 17, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
Aluminum	Chronic	3.50E-03	mg/m^3	1.00E-03	mg/kg-day	CNS	300	RBC	10/05/2000
Antimony	Chronic	N/A							
Arsenic	Chronic	N/A							
Benzo(a)pyrene	Chronic	N/A							
Benzo(b)fluoranthene	Chronic	N/A							
Cadmium	Chronic	2.00E-04	mg/m^3	5.70E-05	mg/kg-day	Kidney	10	NCEA	06/06/2002
Chromium (VI)	Chronic	1.05E-04	mg/m^3	3.00E-05	mg/kg-day	Respiratory	300	IRIS	03/12/2001
	Subchronic	1.05E-03	mg/m^3	3.00E-04	mg/kg-day	NOAEL	100	NCEA	11/18/1997
Copper	Chronic	N/A							
cis-1,2-Dichloroethene	Chronic	N/A							
Dibenzo(a,h)anthracene	Chronic	N/A							
1,3-Dinitrobenzene	Chronic	N/A							
Iron	Chronic	N/A							
Lead	Chronic	N/A							
Manganese	Chronic	5.01E-05	mg/m^3	1.43E-05	mg/kg-day	CNS	1000	IRIS	03/15/2001
4-Methylphenol	Chronic	N/A							
Nickel	Chronic	N/A							
RDX	Chronic	N/A							
Thallium	Chronic	N/A							
Toluene	Chronic	4.0E-01	mg/m3	1.14E-01	mg/kg-day	CNS	300	IRIS	03/20/2001
Trichloroethene	Chronic	N/A							
2,4,6-Trinitrotoluene	Chronic	N/A							
Vanadium	Chronic	N/A							
Vinyl Chloride	Chronic	1.00E-01	mg/m^3	2.80E-02	mg/kg-day	Liver	30	IRIS	08/07/2000

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
Site 17, NDWIH

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Aluminum	N/A						
Antimony	N/A						
Arsenic	1.5E+00	0.95	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/2001
Benzo(a)pyrene	7.3E+00	0.89	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/08/2001
Benzo(b)fluoranthene	7.3E-01	0.89	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Cadmium	N/A				B1	IRIS	03/08/2001
Chromium (hexavalent)	N/A				D	IRIS	03/08/2001
Copper	N/A						
Dibenz(a,h)anthracene	7.3E+00	0.89	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
1,3-Dinitrobenzene	N/A						
Iron	N/A						
Lead	N/A						
Manganese	N/A				D	IRIS	03/08/2001
4-Methylphenol	N/A						
Nickel	N/A						
RDX	1.1E-01	1	1.1E-01	$(mg/kg\text{-}day)^{-1}$	C	IRIS	03/20/2001
Thallium	N/A						
Toluene	N/A						
Trichloroethene	1.1E-02	1	1.1E-02	$(mg/kg\text{-}day)^{-1}$		NCEA	1997
2,4,6-Trinitrotoluene	3.0E-02	1	3.0E-02	$(mg/kg\text{-}day)^{-1}$	C	IRIS	03/20/2001
Vanadium	N/A						
Vinyl Chloride (lifetime)	1.4E+00	1	1.4E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/20/2001
Vinyl Chloride (adult)	7.2E-01	1	7.2E-01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	08/07/2000

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

(2) See Risk Assessment text for derivation of the "Absorbed Cancer Slope Factor for Dermal".

* USEPA recommends that the adjustment for dermal toxicity is not performed for this constituent (USEPA 2001).

NA = Not Available
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment
USEPA R3 = Region 3 Risk-Based Concentration Table

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
Site 17, NDWIH

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Aluminum	N/A							
Antimony	N/A							
Arsenic	4.3E-03	(ug/m3) $^{-1}$	3500	1.5E+01	(mg/kg-day) $^{-1}$	A	IRIS	03/08/2001
Benzo(a)pyrene	8.9E-04	(ug/m3) $^{-1}$	3500	3.1E+00	(mg/kg-day) $^{-1}$	B2	NCEA	11/18/1994
Benzo(b)fluoranthene	N/A					B2	IRIS	03/08/2001
Cadmium	1.8E-03	(ug/m3) $^{-1}$	3500	6.3E+00	(mg/kg-day) $^{-1}$	B1	IRIS	03/08/2001
Chromium (hexavalent)	1.2E-02	(ug/m3) $^{-1}$	3500	4.2E+01	(mg/kg-day) $^{-1}$	A	IRIS	03/08/2001
Copper	N/A							
Dibenz(a,h)anthracene	N/A					B2	IRIS	03/08/2001
1,3-Dinitrobenzene	N/A					D	IRIS	03/20/2001
Iron	N/A							
Lead	N/A							
4-Methylphenol	N/A							
Manganese	N/A					D	IRIS	03/08/2001
Nickel	N/A							
RDX	N/A							
Thallium	N/A							
Toluene	N/A							
Trichloroethene	1.7E-06	(ug/m3) $^{-1}$	3500	6.0E-03	(mg/kg-day) $^{-1}$		NCEA	1997
2,4,6-Trinitrotoluene	N/A							
Vanadium	N/A							
Vinyl Chloride (lifetime)	4.4E-06	(ug/m3) $^{-1}$	3500	1.5E-02	(mg/kg-day) $^{-1}$	A	IRIS	03/20/2001
Vinyl Chloride (adult)	8.8E-06	(ug/m3) $^{-1}$	3500	3.1E-02	(mg/kg-day) $^{-1}$	A	IRIS	03/20/2001

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment
U = Under review.
N/A = Not Available

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
D - Not classifiable as a human carcinogen

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg
(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	3.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	2.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.3E-03
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.0E-03
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	5.3E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.8E-03
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	1.3E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.2E-02
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	2.0E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	1.5E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.6E-03
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	3.1E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.4E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	6.6E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.6E-03
	(Total)												7.2E-02
Dermal Absorption	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	2.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	7.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.1E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-04
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	3.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-03
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	2.7E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.6E-03
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	6.4E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.1E-03
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	7.7E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	9.6E-03
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	1.5E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.2E-04
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.3E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.3E-02
	(Total)												3.0E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.0E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	2.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	8.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.7E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E-03
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.1E-03
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	3.9E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.3E-03
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	9.2E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.1E-02
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	1.1E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.5E-03
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	2.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.2E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.8E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.8E-03
	(Total)												5.2E-02
Dermal Absorption	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	2.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	8.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.2E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.2E-04
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	3.3E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-03
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	2.8E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.7E-03
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	6.7E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.2E-03
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	8.1E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	1.6E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.3E-04
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.5E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.3E-02
	(Total)												3.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	8.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	5.5E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	2.7E-02
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	8.2E-02	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.7E+01
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	1.2E-01	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.2E+01
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	1.7E-03	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	3.4E-01
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	3.8E-05	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	3.8E-01
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	1.6E-04	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	3.2E-01
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	9.0E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.0E-02
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	8.6E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	8.6E-01
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	9.9E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.5E-01
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	1.1E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.7E-01
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	2.4E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	7.9E-01
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	1.9E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.5E+00
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	7.2E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.6E+00
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	2.0E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.0E-01
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	1.3E-03	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.3E+00
	(Total)												5.4E+01
Dermal Absorption	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	1.7E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	8.6E-03
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	3.4E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.1E+00
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	8.3E-03	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	8.3E-01
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	1.3E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.7E-02
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	9.4E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	9.4E-03
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	3.1E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	6.1E-03
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	5.5E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.8E-04
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	1.7E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E-03
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	2.0E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	3.3E-03
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	2.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.3E-04
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	4.8E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	6.3E-02
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	3.9E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-02
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	1.4E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.8E-01
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	4.0E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.0E-04
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	2.7E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.0E-01
	(Total)												2.4E+00
												Total Hazard Index Across All Exposure Routes/Pathways	5.6E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.3.RME Supplement
N/A - not available or not applicable.

Table 7.3a.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	2.00E+02	µg/l	4.5E-02	3.2E-01	0.2	6.29E-06
Vinyl chloride	3.00E+03	µg/l	7.3E-03	2.1E-01	0.2	1.24E-05
cis-1,2-Dichloroethene[1]	4.20E+03	µg/l	1.0E-02	3.4E-01	0.2	3.03E-05
4-Methylphenol	6.20E+01	µg/l	1.0E-02	4.0E-01	0.2	4.85E-07
1,3-Dinitrobenzene[2]	1.40E+00	µg/l	2.1E-03	9.3E-01	0.2	3.42E-09
2,4,6-Trinitrotoluene[2]	5.80E+00	µg/l	1.1E-03	2.1E+00	0.2	1.12E-08
RDX[2]	3.30E+00	µg/l	3.5E-04	2.0E+00	0.2	2.00E-09
Aluminum	3.15E+04	µg/l	1.0E-03	N/A	0.2	6.30E-06
Antimony	3.60E+00	µg/l	1.0E-03	N/A	0.2	7.20E-10
Arsenic	4.00E+00	µg/l	1.0E-03	N/A	0.2	8.00E-10
Chromium	8.69E+01	µg/l	1.0E-03	N/A	0.2	1.74E-08
Iron	7.10E+04	µg/l	1.0E-03	N/A	0.2	1.42E-05
Manganese	2.62E+03	µg/l	1.0E-03	N/A	0.2	5.24E-07
Nickel	7.34E+01	µg/l	1.0E-04	N/A	0.2	1.47E-09
Vanadium	4.90E+01	µg/l	1.0E-03	N/A	0.2	9.80E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Used permeability constant and lag time values for trans-1,2-dichloroethene.
[2] Parameter values calculated on Table 7.3b.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

Table 7.3b.RME Supplement
Calculation of DAevent
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical	MW	log Kow	Kow	log Kp[1]	Kp (cm/hr)	B[1]	log Dsc/lsc[1]	lsc (cm)	log Dsc[1]	Dsc (cm^2/hr)	Tau[1] (hr)	c[1]	b[1]	T*[1] (hr)
1,3-dinitrobenzene	168.12	1.49	3.09E+01	-2.69E+00	2.05E-03	3.09E-03	-3.75E+00	1.00E-03	-6.75E+00	1.80E-07	9.28E-01	3.36E-01	3.04E-01	2.23E+00
2,4,6-Trinitrotoluene	227	1.6	3.98E+01	-2.97E+00	1.07E-03	3.98E-03	-4.10E+00	1.00E-03	-7.10E+00	7.86E-08	2.12E+00	3.37E-01	3.04E-01	5.09E+00
RDX	222.26	0.87	7.41E+00	-3.46E+00	3.48E-04	7.41E-04	-4.08E+00	1.00E-03	-7.08E+00	8.40E-08	1.98E+00	3.34E-01	3.03E-01	4.76E+00

1. Equations from *Dermal Exposure Assessment: Principles and Applications* . EPA/600/8-91/011B. January 1992.

TABLE 7.4.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	1.3E-02	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	6.4E-02
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	1.9E-01	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	6.4E+01
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	2.7E-01	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.7E+01
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	4.0E-03	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	7.9E-01
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	8.9E-05	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	8.9E-01
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	3.7E-04	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	7.4E-01
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	2.1E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	7.0E-02
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	2.0E+00	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.0E+00
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	2.3E-04	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	5.8E-01
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	2.6E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.5E-01
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	5.6E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.9E+00
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	4.5E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E+01
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	1.7E-01	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.4E+00
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	4.7E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.3E-01
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	3.1E-03	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.1E+00
	(Total)												1.3E+02
Dermal Absorption	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	3.9E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	1.9E-02
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	7.6E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.5E+00
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	1.9E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.9E+00
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	3.0E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	6.0E-02
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	2.1E-06	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	2.1E-02
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	6.9E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.4E-02
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	1.2E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	4.1E-04
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	5.0E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.0E-03
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	5.7E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	9.5E-03
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	6.3E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-03
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	1.4E-05	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.8E-01
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	1.1E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.7E-02
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	4.1E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.2E-01
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	1.2E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.5E-03
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	7.8E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	3.0E-01
	(Total)												5.6E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E+02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.4.RME Supplement
N/A - not available or not applicable.

Table 7.4.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	2.00E+02	µg/l	4.5E-02	3.2E-01	0.33	8.08E-06
Vinyl chloride	3.00E+03	µg/l	7.3E-03	2.1E-01	0.33	1.59E-05
cis-1,2-Dichloroethene[1]	4.20E+03	µg/l	1.0E-02	3.4E-01	0.33	3.89E-05
4-Methylphenol	6.20E+01	µg/l	1.0E-02	4.0E-01	0.33	6.23E-07
1,3-Dinitrobenzene[2]	1.40E+00	µg/l	2.1E-03	9.3E-01	0.33	4.40E-09
2,4,6-Trinitrotoluene[2]	5.80E+00	µg/l	1.1E-03	2.1E+00	0.33	1.44E-08
RDX[2]	3.30E+00	µg/l	3.5E-04	2.0E+00	0.33	2.57E-09
Aluminum	3.15E+04	µg/l	1.0E-03	N/A	0.33	1.04E-05
Antimony	3.60E+00	µg/l	1.0E-03	N/A	0.33	1.19E-09
Arsenic	4.00E+00	µg/l	1.0E-03	N/A	0.33	1.32E-09
Chromium	8.69E+01	µg/l	1.0E-03	N/A	0.33	2.87E-08
Iron	7.10E+04	µg/l	1.0E-03	N/A	0.33	2.34E-05
Manganese	2.62E+03	µg/l	1.0E-03	N/A	0.33	8.65E-07
Nickel	7.34E+01	µg/l	1.0E-04	N/A	0.33	2.42E-09
Vanadium	4.90E+01	µg/l	1.0E-03	N/A	0.33	1.62E-08

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Used permeability constant and lag time values for trans-1,2-dichloroethene.
[2] Parameter values calculated on Table 7.3b.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.5.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	6.5E-04	mg/kg-day	2.0E+00	mg/kg-day	N/A	N/A	3.3E-04
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	1.6E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.3E-01
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	3.2E-03	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	3.2E-02
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	4.7E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	9.4E-03
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	2.5E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	2.5E-03
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	6.6E-07	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.3E-03
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	1.2E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	4.0E-05
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	2.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-03
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	2.5E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	4.2E-03
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	2.8E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.3E-04
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	6.1E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.2E-02
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	4.9E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.6E-02
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	1.8E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.3E-01
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	5.1E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	6.4E-04
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	3.4E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.3E-01
	(Total)												9.8E-01
												Total Hazard Index Across All Exposure Routes/Pathways	9.8E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
Dermal absorption per event calculated in Table 7.5.RME Supplement
N/A - not available or not applicable.

Table 7.5.RME Supplement
Calculation of DAevent
Shallow Aquifer - Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
Toluene	2.0E+02	µg/l	4.5E-02	3.2E-01	8	7.47E-05	7.7E-01	5.4E-02	3
Vinyl chloride	3.0E+03	µg/l	7.3E-03	2.1E-01	8	1.84E-04	5.2E-01	2.3E-03	3
cis-1,2-Dichloroethene [1]	4.2E+03	µg/l	1.0E-02	3.4E-01	8	3.63E-04	8.2E-01	7.2E-03	3
4-Methylphenol	6.2E+01	µg/l	1.0E-02	4.0E-01	8	5.42E-06	9.6E-01	8.7E-03	3
1,3-Dinitrobenzene [2]	1.4E+00	µg/l	2.1E-03	9.3E-01	8	2.83E-08	2.2E+00	3.1E-03	3
2,4,6-Trinitrotoluene [2]	5.8E+00	µg/l	1.1E-03	2.1E+00	8	7.63E-08	5.1E+00	4.0E-03	3
RDX [2]	3.3E+00	µg/l	3.5E-04	2.0E+00	8	1.38E-08	4.8E+00	7.4E-04	3
Aluminum	3.2E+04	µg/l	1.0E-03	N/A	8	2.52E-04	N/A	N/A	1
Antimony	3.6E+00	µg/l	1.0E-03	N/A	8	2.88E-08	N/A	N/A	1
Arsenic	4.0E+00	µg/l	1.0E-03	N/A	8	3.20E-08	N/A	N/A	1
Chromium	8.7E+01	µg/l	1.0E-03	N/A	8	6.95E-07	N/A	N/A	1
Iron	7.1E+04	µg/l	1.0E-03	N/A	8	5.68E-04	N/A	N/A	1
Manganese	2.6E+03	µg/l	1.0E-03	N/A	8	2.10E-05	N/A	N/A	1
Nickel	7.3E+01	µg/l	1.0E-04	N/A	8	5.87E-08	N/A	N/A	1
Vanadium	4.9E+01	µg/l	1.0E-03	N/A	8	3.92E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
ET<t*: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B)) x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:
[1] Used permeability constant and lag time values for trans-1,2-dichloroethene.
[2] Parameter values calculated on Table 7.3b.RME Supplement.
Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.6.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Toluene	2.0E+02	µg/l	1.23E-02	mg/kg/shower	R	1.2E-02	mg/kg-day	1.1E-01	mg/kg-day	4.0E-01	mg/m^3	1.0E-01
	Vinyl chloride	3.0E+03	µg/l	2.16E-01	mg/kg/shower	R	2.1E-01	mg/kg-day	2.8E-02	mg/kg-day	1.0E-01	mg/m^3	7.4E+00
	cis-1,2-Dichloroethene	4.2E+03	µg/l	2.54E-01	mg/kg/shower	R	2.4E-01	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(Total)												7.5E+00
												Total Hazard Index Across All Exposure Routes/Pathways	7.5E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic Inhalation.
N/A - Not applicable
Route EPC value calculations shown on Table 7.6.RME Supplement

Table 7.6.RME Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 17, NDWIH

Site 17, NDWIH	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3 - min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Toluene	2.0E+02	9.2E+01	6.4E-03	1.33E+03	1.38E+01	1.33E+01	1.80E+01	9.02E+01	6.01E+02	1.23E-02
Vinyl chloride	3.0E+03	6.3E+01	8.2E-02	1.61E+03	1.68E+01	1.67E+01	2.26E+01	1.59E+03	1.06E+04	2.16E-01
cis-1,2-Dichloroethene	4.2E+03	9.7E+01	7.6E-03	1.29E+03	1.35E+01	1.30E+01	1.76E+01	1.87E+03	1.24E+04	2.54E-01

Variables	Units	Exposure Assumptions	Source
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1	NA
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2	NA
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3	NA
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4	NA
Tl = Calibration temp. of water	K (20C +273)	293	F&C
Ts = Shower water temperature	k (45C)	318	F&C
Us = water viscosity at Ts	centipoise	0.596	F&C
Ul = water viscosity at Tl	cp	1.002	F&C
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5	NA
sdt = shower droplet drop time	sec	2	F&C
d = shower droplet diameter	mm	1	F&C
FR = shower water flow rate	l/min	20	F&C
SV = shower room air volume	m^3	3	F&C
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6	NA
VR = ventilation rate	l/min	13.8	USEPA, 1991
BW = body weight	kg	70	USEPA, 1991
Ds = duration of shower	min	12	USEPA, 1989
Dt = total duration in shower room	min	15	
R = air exchange rate	min^{-1}	0.0083	F&C
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7	NA
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8	NA

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	see time series example on Table I-GW-5	
Equation 8:	**Einh =**	**If t>Ds** (((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation													
	Toluene	2.0E+02	µg/l	5.3E-02	mg/m^3	R	1.2E-03	mg/kg-day	1.1E-01	mg/kg-day	4.0E-01	mg/m3	1.0E-02
	Vinyl chloride	3.0E+03	µg/l	8.8E-01	mg/m^3	R	2.0E-02	mg/kg-day	2.8E-02	mg/kg-day	1.0E-01	mg/m3	7.0E-01
	cis-1,2-Dichloroethene	4.2E+03	µg/l	1.1E+00	mg/m^3	R	2.4E-02	mg/kg-day	N/A	N/A	2.5E+00	mg/m^3	N/A
	(Total)												7.1E-01
												Total Hazard Index Across All Exposure Routes/Pathways	7.1E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
N/A - Not applicable
Route EPC value calculations shown on Table 7.7.RME Supplement

Table 7.7.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Scenario
Site 17, NDWIH

Chemical	**Cw** (μg/L)	**MW** (mol/gram)	**K_H** (unitless)	**k_l** (cm/hr)	**k_g** (cm/hr)	**K_v** (cm/hr)	**ER** (mg/hr-cm^2)	**ERa** (g/sec-m^2)	**Ca** (mg/m^3)
Toluene	2.00E+02	9.2E+01	2.72E-01	3.38E+00	2.05E+03	3.36E+00	6.72E-04	1.87E-06	5.30E-02
Vinyl chloride	3.00E+03	6.3E+01	1.11E+00	3.72E+00	2.26E+03	3.72E+00	1.11E-02	3.10E-05	8.79E-01
cis-1,2-Dichloroethene	4.20E+03	9.7E+01	1.67E-01	3.34E+00	2.02E+03	3.30E+00	1.39E-02	3.85E-05	1.09E+00

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 $ER = Kv * Cw * L/1000\ cm^3 * mg/1000\ \mu g$

Equation 5 $ERa = ER * g/1000\ mg * hr/60\ min * min/60\ sec * 10000\ cm^2/m^2$

Variables	**Units**	**Exposure Assumptions**
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch) Length = 20 m, Width = 3 m	(m^2)	60
ERa = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

TABLE 7.8.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	3.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	4.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.1E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-02
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	7.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.6E-02
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.2E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	7.4E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.6E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.4E-03
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	3.9E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-01
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.5E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	3.7E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-02
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.4E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.0E-02
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.3E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.3E-02
	(Total)												2.5E-01
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	5.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	8.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	4.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.5E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.5E-03
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	3.0E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.9E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.9E-02
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	7.4E-06	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.8E-04
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	5.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.7E-02
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	4.9E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	6.1E-02
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.6E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.4E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.7E-01
	(Total)												3.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	5.4E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.9.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	2.8E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	4.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	2.4E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.0E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.0E-01
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	7.2E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.4E-01
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.1E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	6.9E-02
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.2E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.3E-02
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	3.6E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.2E+00
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.3E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	3.5E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.7E-01
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.3E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.8E-01
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.1E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.1E-01
	(Total)												2.3E+00
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	6.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	5.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.9E-03
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	4.0E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.3E-02
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	3.9E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	5.2E-02
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	9.7E-06	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	2.4E-04
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	6.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.2E-02
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	6.1E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	6.5E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	8.1E-02
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	2.4E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.4E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	5.8E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.2E-01
	(Total)												4.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.7E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.10.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	8.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	3.8E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.8E-02
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.8E-02
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	7.6E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.8E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.9E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	4.8E-03
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	1.3E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.4E-01
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.2E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	1.3E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.3E-02
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	4.7E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	6.7E-02
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.1E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.1E-01
	(Total)												8.2E-01
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	3.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	5.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	3.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.0E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.0E-03
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.0E-03
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.0E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	4.0E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.1E-06	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.3E-04
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	3.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.2E-02
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	3.4E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.2E-02
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.8E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.0E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.2E-01
	(Total)												1.8E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	3.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	7.9E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	7.9E-03
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	5.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.8E-02
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	1.6E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.3E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	4.0E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.0E-03
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	2.8E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.2E-02
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	2.5E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	2.6E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.3E-02
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	9.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.4E-02
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	2.4E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.4E-02
	(Total)												1.8E-01
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	4.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	7.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	4.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-03
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.3E-03
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.7E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.6E-02
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	6.8E-06	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.7E-04
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	4.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.6E-02
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	4.5E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.6E-02
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.7E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.4E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.0E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.5E-01
	(Total)												2.8E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.5E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	6.1E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	9.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	5.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	2.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.3E-03
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.2E-03
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	4.5E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.5E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.1E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	2.8E-04
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	7.9E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.6E-02
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	7.1E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	7.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.8E-03
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	2.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.0E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	6.8E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.8E-03
	(Total)												5.0E-02
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	4.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	6.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	3.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.1E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-04
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	2.4E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.9E-04
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.3E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.1E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	5.8E-07	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.4E-05
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	4.0E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-03
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	3.8E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.8E-03
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.4E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.0E-04
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.4E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.3E-02
	(Total)												2.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	7.3E-02

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.13.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	4.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	7.1E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	3.9E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.6E-03
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.8E-03
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	3.3E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.1E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	8.3E-06	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	2.1E-04
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	5.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.9E-02
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	5.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	5.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.7E-03
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	2.0E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.9E-03
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.9E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.9E-03
	(Total)												3.6E-02
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	4.2E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	6.7E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	3.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.2E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.2E-04
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	2.5E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.3E-04
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.4E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.2E-03
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	6.0E-07	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.5E-05
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	4.2E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.4E-03
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	4.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.0E-03
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.5E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.1E-04
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.6E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.4E-02
	(Total)												2.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	6.1E-02

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.14.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene (Total)	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	8.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
													0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	0.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 7.15.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene (Total)	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	5.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
													0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	0.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 7.16.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene (Total)	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	1.4E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
													0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	0.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 7.17.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene (Total)	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	7.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
													0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	0.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 7.18.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene (Total)	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	2.2E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
													0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	0.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 7.19.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Trichloroethene	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	9.8E-09	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(Total)												0.0E+00
												Total Hazard Index Across All Exposure Routes/Pathways	0.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 7.20.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Toluene	1.2E+02	µg/l	1.2E+02	µg/l	M	1.5E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	7.5E-03
	Vinyl chloride	1.0E+03	µg/l	1.0E+03	µg/l	M	1.3E-02	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	4.3E+00
	cis-1,2-Dichloroethene	1.4E+03	µg/l	1.4E+03	µg/l	M	1.8E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.8E+00
	4-Methylphenol	2.4E+01	µg/l	2.4E+01	µg/l	M	3.0E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	6.1E-02
	1,3-Dinitrobenzene	5.3E-01	µg/l	5.3E-01	µg/l	M	6.8E-06	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	6.8E-02
	2,4,6-Trinitrotoluene	2.3E+00	µg/l	2.3E+00	µg/l	M	2.9E-05	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	5.9E-02
	RDX	1.3E+00	µg/l	1.3E+00	µg/l	M	1.6E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.4E-03
	Aluminum	1.2E+04	µg/l	1.2E+04	µg/l	M	1.5E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.5E-01
	Antimony	2.2E+00	µg/l	2.2E+00	µg/l	M	2.9E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	7.2E-02
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	3.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-01
	Chromium	4.5E+01	µg/l	4.5E+01	µg/l	M	5.8E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.9E-01
	Iron	4.3E+04	µg/l	4.3E+04	µg/l	M	5.5E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.8E+00
	Manganese	1.5E+03	µg/l	1.5E+03	µg/l	M	1.9E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	9.3E-01
	Nickel	3.7E+01	µg/l	3.7E+01	µg/l	M	4.8E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.4E-02
	Vanadium	2.0E+01	µg/l	2.0E+01	µg/l	M	2.6E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.6E-01
	(Total)												9.9E+00
Dermal Absorption	Toluene	1.2E+02	µg/l	1.2E+02	µg/l	M	6.1E-04	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	3.0E-03
	Vinyl chloride	1.0E+03	µg/l	1.0E+03	µg/l	M	6.9E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.3E-01
	cis-1,2-Dichloroethene	1.4E+03	µg/l	1.4E+03	µg/l	M	1.7E-03	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.7E-01
	4-Methylphenol	2.4E+01	µg/l	2.4E+01	µg/l	M	3.1E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	6.1E-03
	1,3-Dinitrobenzene	5.3E-01	µg/l	5.3E-01	µg/l	M	2.1E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	2.1E-03
	2,4,6-Trinitrotoluene	2.3E+00	µg/l	2.3E+00	µg/l	M	7.3E-07	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.5E-03
	RDX	1.3E+00	µg/l	1.3E+00	µg/l	M	1.3E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	4.2E-05
	Aluminum	1.2E+04	µg/l	1.2E+04	µg/l	M	3.9E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.9E-04
	Antimony	2.2E+00	µg/l	2.2E+00	µg/l	M	7.4E-08	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.2E-03
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	7.9E-08	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.6E-04
	Chromium	4.5E+01	µg/l	4.5E+01	µg/l	M	1.5E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	2.0E-02
	Iron	4.3E+04	µg/l	4.3E+04	µg/l	M	1.4E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.7E-03
	Manganese	1.5E+03	µg/l	1.5E+03	µg/l	M	4.8E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	6.0E-02
	Nickel	3.7E+01	µg/l	3.7E+01	µg/l	M	1.2E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.5E-04
	Vanadium	2.0E+01	µg/l	2.0E+01	µg/l	M	6.6E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.5E-02
	(Total)												5.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.0E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.20.CT Supplement
N/A - not available or not applicable.

Table 7.20.CT Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	1.17E+02	µg/l	4.5E-02	3.2E-01	0.2	3.67E-06
Vinyl chloride	1.02E+03	µg/l	7.3E-03	2.1E-01	0.2	4.20E-06
cis-1,2-Dichloroethene[1]	1.41E+03	µg/l	1.0E-02	3.4E-01	0.2	1.02E-05
4-Methylphenol	2.37E+01	µg/l	1.0E-02	4.0E-01	0.2	1.85E-07
1,3-Dinitrobenzene[2]	5.33E-01	µg/l	2.1E-03	9.3E-01	0.2	1.30E-09
2,4,6-Trinitrotoluene[2]	2.30E+00	µg/l	1.1E-03	2.1E+00	0.2	4.45E-09
RDX[2]	1.27E+00	µg/l	3.5E-04	2.0E+00	0.2	7.68E-10
Aluminum	1.19E+04	µg/l	1.0E-03	N/A	0.2	2.37E-06
Antimony	2.23E+00	µg/l	1.0E-03	N/A	0.2	4.47E-10
Arsenic	2.40E+00	µg/l	1.0E-03	N/A	0.2	4.80E-10
Chromium	4.50E+01	µg/l	1.0E-03	N/A	0.2	9.00E-09
Iron	4.32E+04	µg/l	1.0E-03	N/A	0.2	8.63E-06
Manganese	1.46E+03	µg/l	1.0E-03	N/A	0.2	2.91E-07
Nickel	3.71E+01	µg/l	1.0E-04	N/A	0.2	7.43E-10
Vanadium	1.99E+01	µg/l	1.0E-03	N/A	0.2	3.99E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Used permeability constant and lag time values for trans-1,2-dichloroethene.
[2] Parameter values calculated on Table 7.5b.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.21.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Toluene	1.2E+02	µg/l	1.2E+02	µg/l	M	5.0E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	2.5E-02
	Vinyl chloride	1.0E+03	µg/l	1.0E+03	µg/l	M	4.3E-02	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.4E+01
	cis-1,2-Dichloroethene	1.4E+03	µg/l	1.4E+03	µg/l	M	6.0E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	6.0E+00
	4-Methylphenol	2.4E+01	µg/l	2.4E+01	µg/l	M	1.0E-03	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.0E-01
	1,3-Dinitrobenzene	5.3E-01	µg/l	5.3E-01	µg/l	M	2.3E-05	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	2.3E-01
	2,4,6-Trinitrotoluene	2.3E+00	µg/l	2.3E+00	µg/l	M	9.8E-05	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	2.0E-01
	RDX	1.3E+00	µg/l	1.3E+00	µg/l	M	5.4E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.8E-02
	Aluminum	1.2E+04	µg/l	1.2E+04	µg/l	M	5.1E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.1E-01
	Antimony	2.2E+00	µg/l	2.2E+00	µg/l	M	9.5E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.4E-01
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.4E-01
	Chromium	4.5E+01	µg/l	4.5E+01	µg/l	M	1.9E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	6.4E-01
	Iron	4.3E+04	µg/l	4.3E+04	µg/l	M	1.8E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.1E+00
	Manganese	1.5E+03	µg/l	1.5E+03	µg/l	M	6.2E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E+00
	Nickel	3.7E+01	µg/l	3.7E+01	µg/l	M	1.6E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.9E-02
	Vanadium	2.0E+01	µg/l	2.0E+01	µg/l	M	8.5E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	8.5E-01
	(Total)												3.3E+01
Dermal Absorption	Toluene	1.2E+02	µg/l	1.2E+02	µg/l	M	1.3E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	6.6E-03
	Vinyl chloride	1.0E+03	µg/l	1.0E+03	µg/l	M	1.5E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.0E-01
	cis-1,2-Dichloroethene	1.4E+03	µg/l	1.4E+03	µg/l	M	3.6E-03	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	3.6E-01
	4-Methylphenol	2.4E+01	µg/l	2.4E+01	µg/l	M	6.6E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.3E-02
	1,3-Dinitrobenzene	5.3E-01	µg/l	5.3E-01	µg/l	M	4.7E-07	mg/kg-day	1.0E-04	mg/kg-day	N/A	N/A	4.7E-03
	2,4,6-Trinitrotoluene	2.3E+00	µg/l	2.3E+00	µg/l	M	1.6E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	3.2E-03
	RDX	1.3E+00	µg/l	1.3E+00	µg/l	M	2.7E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	9.1E-05
	Aluminum	1.2E+04	µg/l	1.2E+04	µg/l	M	1.1E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-03
	Antimony	2.2E+00	µg/l	2.2E+00	µg/l	M	2.0E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	3.4E-03
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	2.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.3E-04
	Chromium	4.5E+01	µg/l	4.5E+01	µg/l	M	4.1E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	5.5E-02
	Iron	4.3E+04	µg/l	4.3E+04	µg/l	M	4.0E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-02
	Manganese	1.5E+03	µg/l	1.5E+03	µg/l	M	1.3E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.7E-01
	Nickel	3.7E+01	µg/l	3.7E+01	µg/l	M	3.4E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.3E-04
	Vanadium	2.0E+01	µg/l	2.0E+01	µg/l	M	1.8E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	7.0E-02
	(Total)												1.2E+00
												Total Hazard Index Across All Exposure Routes/Pathways	3.4E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.21.CT Supplement
N/A - not available or not applicable.

Table 7.21.CT Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	1.17E+02	µg/l	4.5E-02	3.2E-01	0.33	4.72E-06
Vinyl chloride	1.02E+03	µg/l	7.3E-03	2.1E-01	0.33	5.39E-06
cis-1,2-Dichloroethene[1]	1.41E+03	µg/l	1.0E-02	3.4E-01	0.33	1.31E-05
4-Methylphenol	2.37E+01	µg/l	1.0E-02	4.0E-01	0.33	2.38E-07
1,3-Dinitrobenzene[2]	5.33E-01	µg/l	2.1E-03	9.3E-01	0.33	1.67E-09
2,4,6-Trinitrotoluene[2]	2.30E+00	µg/l	1.1E-03	2.1E+00	0.33	5.72E-09
RDX[2]	1.27E+00	µg/l	3.5E-04	2.0E+00	0.33	9.87E-10
Aluminum	1.19E+04	µg/l	1.0E-03	N/A	0.33	3.91E-06
Antimony	2.23E+00	µg/l	1.0E-03	N/A	0.33	7.37E-10
Arsenic	2.40E+00	µg/l	1.0E-03	N/A	0.33	7.92E-10
Chromium	4.50E+01	µg/l	1.0E-03	N/A	0.33	1.49E-08
Iron	4.32E+04	µg/l	1.0E-03	N/A	0.33	1.42E-05
Manganese	1.46E+03	µg/l	1.0E-03	N/A	0.33	4.81E-07
Nickel	3.71E+01	µg/l	1.0E-04	N/A	0.33	1.23E-09
Vanadium	1.99E+01	µg/l	1.0E-03	N/A	0.33	6.58E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Used permeability constant and lag time values for trans-1,2-dichloroethene.
[2] Parameter values calculated on Table 7.5b.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.22.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Toluene	1.2E+02	µg/l	7.15E-03	mg/kg/shower	R	4.6E-03	mg/kg-day	1.1E-01	mg/kg-day	4.0E-01	mg/m^3	4.0E-02
	Vinyl chloride	1.0E+03	µg/l	7.31E-02	mg/kg/shower	R	4.7E-02	mg/kg-day	2.8E-02	mg/kg-day	1.0E-01	mg/m^3	1.7E+00
	cis-1,2-Dichloroethene	1.4E+03	µg/l	8.55E-02	mg/kg/shower	R	5.5E-02	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(Total)												1.7E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic Inhalation.
N/A - Not applicable; metals are not volatile.

Table 7.22.CT Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 17, NDWIH

Site 17, NDWIH	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3 - min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Toluene	1.2E+02	9.2E+01	6.4E-03	1.33E+03	1.38E+01	1.33E+01	1.80E+01	5.26E+01	3.51E+02	7.15E-03
Vinyl chloride	1.0E+03	6.3E+01	8.2E-02	1.61E+03	1.68E+01	1.67E+01	2.26E+01	5.37E+02	3.58E+03	7.31E-02
cis-1,2-Dichloroethene	1.4E+03	9.7E+01	7.6E-03	1.29E+03	1.35E+01	1.30E+01	1.76E+01	6.28E+02	4.19E+03	8.55E-02

Variables	Units	Exposure Assumptions	Source
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1	NA
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2	NA
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3	NA
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4	NA
Tl = Calibration temp. of water	K (20C +273)	293	F&C
Ts = Shower water temperature	k (45C)	318	F&C
Us = water viscosity at Ts	centipoise	0.596	F&C
Ul = water viscosity at Tl	cp	1.002	F&C
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5	NA
sdt = shower droplet drop time	sec	2	F&C
d = shower droplet diameter	mm	1	F&C
FR = shower water flow rate	l/min	20	F&C
SV = shower room air volume	m^3	3	F&C
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6	NA
VR = ventilation rate	l/min	13.8	USEPA, 1991
BW = body weight	kg	70	USEPA, 1991
Ds = duration of shower	min	12	USEPA, 1989
Dt = total duration in shower room	min	15	
R = air exchange rate	min^{-1}	0.0083	F&C
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7	NA
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8	NA

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	see time series example on Table I-GW-5	
Equation 8:	**Einh =**	**If t>Ds** (((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 7.23.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	8.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.5E-01	mg/kg	2.5E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	8.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	7.5E+03	mg/kg	7.5E+03	mg/kg	M	3.2E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.2E-02
	Arsenic	3.8E+00	mg/kg	3.8E+00	mg/kg	M	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.4E-02
	Chromium	1.4E+01	mg/kg	1.4E+01	mg/kg	M	6.1E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.0E-02
	Copper	1.8E+01	mg/kg	1.8E+01	mg/kg	M	7.9E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	2.0E-03
	Iron	1.9E+04	mg/kg	1.9E+04	mg/kg	M	8.0E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.7E-01
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	1.5E+02	mg/kg	1.5E+02	mg/kg	M	6.3E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-02
	Thallium	8.7E-01	mg/kg	8.7E-01	mg/kg	M	3.7E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.3E-02
	Vanadium	2.3E+01	mg/kg	2.3E+01	mg/kg	M	9.7E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.7E-02
	(Total)												5.6E-01
Dermal Absorption	Benzo(a)pyrene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	3.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.5E-01	mg/kg	2.5E-01	mg/kg	M	4.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	3.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.5E+03	mg/kg	7.5E+03	mg/kg	M	1.0E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.0E-03
	Arsenic	3.8E+00	mg/kg	3.8E+00	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.1E-03
	Chromium	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.9E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	2.6E-02
	Copper	1.8E+01	mg/kg	1.8E+01	mg/kg	M	2.5E-06	mg/kg-day	4.0E-02	N/A	N/A	N/A	6.3E-05
	Iron	1.9E+04	mg/kg	1.9E+04	mg/kg	M	2.6E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.5E-03
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	3.5E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	1.5E+02	mg/kg	1.5E+02	mg/kg	M	2.0E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.5E-02
	Thallium	8.7E-01	mg/kg	8.7E-01	mg/kg	M	1.2E-07	mg/kg-day	7.0E-05	0.0E+00	N/A	N/A	1.7E-03
	Vanadium	2.3E+01	mg/kg	2.3E+01	mg/kg	M	3.1E-06	mg/kg-day	2.6E-05	0.0E+00	N/A	N/A	1.2E-01
	(Total)												1.9E-01
												Total Hazard Index Across All Exposure Routes/Pathways	7.4E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.24.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	8.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.5E-01	mg/kg	2.5E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	7.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	7.5E+03	mg/kg	7.5E+03	mg/kg	M	3.1E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.1E-02
	Arsenic	3.8E+00	mg/kg	3.8E+00	mg/kg	M	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.2E-02
	Chromium	1.4E+01	mg/kg	1.4E+01	mg/kg	M	5.9E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.9E-03
	Copper	1.8E+01	mg/kg	1.8E+01	mg/kg	M	7.6E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.9E-03
	Iron	1.9E+04	mg/kg	1.9E+04	mg/kg	M	7.7E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.6E-01
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.0E-04	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	1.5E+02	mg/kg	1.5E+02	mg/kg	M	6.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.0E-02
	Thallium	8.7E-01	mg/kg	8.7E-01	mg/kg	M	3.6E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.1E-02
	Vanadium	2.3E+01	mg/kg	2.3E+01	mg/kg	M	9.4E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.4E-02
	(Total)												5.2E-01
Dermal Absorption	Benzo(a)pyrene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.5E-01	mg/kg	2.5E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	7.5E+03	mg/kg	7.5E+03	mg/kg	M	3.1E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.1E-04
	Arsenic	3.8E+00	mg/kg	3.8E+00	mg/kg	M	4.6E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-03
	Chromium	1.4E+01	mg/kg	1.4E+01	mg/kg	M	5.9E-07	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Copper	1.8E+01	mg/kg	1.8E+01	mg/kg	M	7.6E-07	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.9E-05
	Iron	1.9E+04	mg/kg	1.9E+04	mg/kg	M	7.7E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.6E-03
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Manganese	1.5E+02	mg/kg	1.5E+02	mg/kg	M	6.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.6E-03
	Thallium	8.7E-01	mg/kg	8.7E-01	mg/kg	M	3.6E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.1E-04
	Vanadium	2.3E+01	mg/kg	2.3E+01	mg/kg	M	9.4E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	3.6E-02
	(Total)												5.0E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.7E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	4.7E-09	mg/kg-day	7.3E+00	1/mg/kg/day	3.4E-08
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.1E-08
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	2.9E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	2.7E-07	mg/kg-day	1.5E+00	1/mg/kg/day	4.0E-07
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	6.8E-07	mg/kg-day	N/A	N/A	N/A
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	1.6E-03	mg/kg-day	N/A	N/A	N/A
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	2.6E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	2.0E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	3.9E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	8.5E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										4.5E-07
Dermal Absorption											
	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	3.1E-09	mg/kg-day	7.3E+00	1/mg/kg/day	2.2E-08
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	9.8E-09	mg/kg-day	7.3E-01	1/mg/kg/day	7.2E-09
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	4.1E-08	mg/kg-day	1.5E+00	1/mg/kg/day	6.1E-08
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	3.5E-08	mg/kg-day	N/A	N/A	N/A
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	8.3E-05	mg/kg-day	N/A	N/A	N/A
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	9.9E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	2.0E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.3E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										9.1E-08
										Total Risk Across All Exposure Routes/Pathways	5.4E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 17 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	9.1E-09	mg/kg-day	7.3E+00	1/mg/kg/day	6.6E-08
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	2.9E-08	mg/kg-day	7.3E-01	1/mg/kg/day	2.1E-08
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	5.7E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	5.2E-07	mg/kg-day	1.5E+00	1/mg/kg/day	7.8E-07
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	3.2E-03	mg/kg-day	N/A	N/A	N/A
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	5.1E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	3.8E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	7.6E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										8.7E-07
Dermal Absorption											
	Benzo(a)pyrene	1.3E-01	mg/kg	1.3E-01	mg/kg	M	8.6E-09	mg/kg-day	7.3E+00	1/mg/kg/day	6.2E-08
	Benzo(b)fluoranthene	4.2E-01	mg/kg	4.2E-01	mg/kg	M	2.7E-08	mg/kg-day	7.3E-01	1/mg/kg/day	2.0E-08
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	4.1E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	1.1E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.7E-07
	Chromium	1.9E+01	mg/kg	1.9E+01	mg/kg	M	9.6E-08	mg/kg-day	N/A	N/A	N/A
	Iron	4.5E+04	mg/kg	4.5E+04	mg/kg	M	2.3E-04	mg/kg-day	N/A	N/A	N/A
	Lead	7.3E+01	mg/kg	7.3E+01	mg/kg	M	3.7E-07	mg/kg-day	N/A	N/A	N/A
	Manganese	5.5E+02	mg/kg	5.5E+02	mg/kg	M	2.8E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.1E+00	mg/kg	1.1E+00	mg/kg	M	5.5E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										2.5E-07
										Total Risk Across All Exposure Routes/Pathways	1.1E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	3.0E-03	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	4.5E-02	mg/kg-day	1.4E+00	1/mg/kg/day	6.1E-02
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	6.3E-02	mg/kg-day	N/A	N/A	N/A
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	9.3E-04	mg/kg-day	N/A	N/A	N/A
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	2.1E-05	mg/kg-day	N/A	N/A	N/A
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	8.7E-05	mg/kg-day	3.0E-02	1/mg/kg/day	2.6E-06
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	4.9E-05	mg/kg-day	1.1E-01	1/mg/kg/day	5.4E-06
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	4.7E-01	mg/kg-day	N/A	N/A	N/A
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	5.4E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	6.0E-05	mg/kg-day	1.5E+00	1/mg/kg/day	9.0E-05
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	1.3E-03	mg/kg-day	N/A	N/A	N/A
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	1.1E+00	mg/kg-day	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	3.9E-02	mg/kg-day	N/A	N/A	N/A
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	1.1E-03	mg/kg-day	N/A	N/A	N/A
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	7.3E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										6.1E-02
Dermal Absorption											
	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	9.2E-04	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	1.8E-03	mg/kg-day	1.4E+00	1/mg/kg/day	2.5E-03
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	4.4E-03	mg/kg-day	N/A	N/A	N/A
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	7.1E-05	mg/kg-day	N/A	N/A	N/A
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	5.0E-07	mg/kg-day	N/A	N/A	N/A
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	1.6E-06	mg/kg-day	3.0E-02	1/mg/kg/day	4.9E-08
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	2.9E-07	mg/kg-day	1.1E-01	1/mg/kg/day	3.2E-08
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	1.0E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	1.3E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.9E-07
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	2.8E-06	mg/kg-day	N/A	N/A	N/A
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	2.3E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	8.5E-05	mg/kg-day	N/A	N/A	N/A
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	2.4E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	1.6E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										2.5E-03
										Total Risk Across All Exposure Routes/Pathways	6.3E-02

One-hit equation used for the vinyl chloride ingestion risk because risk less than 0.01.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Dermal absorption per event calculated in Table 8.3a.RME Supplement and 8.3b.RME Supplement.

N/A - not applicable.

Table 8.3a.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	2.0E+02	µg/l	4.5E-02	3.2E-01	0.2	6.29E-06
Vinyl chloride	3.0E+03	µg/l	7.3E-03	2.1E-01	0.2	1.24E-05
cis-1,2-Dichloroethene	4.2E+03	µg/l	1.0E-02	3.4E-01	0.2	3.03E-05
4-Methylphenol	6.2E+01	µg/l	1.0E-02	4.0E-01	0.2	4.85E-07
1,3-Dinitrobenzene[1]	1.4E+00	µg/l	2.1E-03	9.3E-01	0.2	3.42E-09
2,4,6-Trinitrotoluene[1]	5.8E+00	µg/l	1.1E-03	2.1E+00	0.2	1.12E-08
RDX[1]	3.3E+00	µg/l	3.5E-04	2.0E+00	0.2	2.00E-09
Aluminum	3.2E+04	µg/l	1.0E-03	N/A	0.2	6.30E-06
Antimony	3.6E+00	µg/l	1.0E-03	N/A	0.2	7.20E-10
Arsenic	4.0E+00	µg/l	1.0E-03	N/A	0.2	8.00E-10
Chromium	8.7E+01	µg/l	1.0E-03	N/A	0.2	1.74E-08
Iron	7.1E+04	µg/l	1.0E-03	N/A	0.2	1.42E-05
Manganese	2.6E+03	µg/l	1.0E-03	N/A	0.2	5.24E-07
Nickel	7.3E+01	µg/l	1.0E-04	N/A	0.2	1.47E-09
Vanadium	4.9E+01	µg/l	1.0E-03	N/A	0.2	9.80E-09

Inorganics: DAevent (mg/cn Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2 Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x E 2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Permeability constant and lag time calculated on Table 8.3c.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

Table 8.3b.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	2.0E+02	µg/l	4.5E-02	3.2E-01	0.33	8.08E-06
Vinyl chloride	3.0E+03	µg/l	7.3E-03	2.1E-01	0.33	1.59E-05
cis-1,2-Dichloroethene	4.2E+03	µg/l	1.0E-02	3.4E-01	0.33	3.89E-05
4-Methylphenol	6.2E+01	µg/l	1.0E-02	4.0E-01	0.33	6.23E-07
1,3-Dinitrobenzene[1]	1.4E+00	µg/l	2.1E-03	9.3E-01	0.33	4.40E-09
2,4,6-Trinitrotoluene[1]	5.8E+00	µg/l	1.1E-03	2.1E+00	0.33	1.44E-08
RDX[1]	3.3E+00	µg/l	3.5E-04	2.0E+00	0.33	2.57E-09
Aluminum	3.2E+04	µg/l	1.0E-03	N/A	0.33	1.04E-05
Antimony	3.6E+00	µg/l	1.0E-03	N/A	0.33	1.19E-09
Arsenic	4.0E+00	µg/l	1.0E-03	N/A	0.33	1.32E-09
Chromium	8.7E+01	µg/l	1.0E-03	N/A	0.33	2.87E-08
Iron	7.1E+04	µg/l	1.0E-03	N/A	0.33	2.34E-05
Manganese	2.6E+03	µg/l	1.0E-03	N/A	0.33	8.65E-07
Nickel	7.3E+01	µg/l	1.0E-04	N/A	0.33	2.42E-09
Vanadium	4.9E+01	µg/l	1.0E-03	N/A	0.33	1.62E-08

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Permeability constant and lag time calculated on Table 8.3c.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

Table 8.3c.RME Supplement
Calculation of DAevent
Sahllow Aquifer - Water
Site 17, NDWIH

Chemical	MW	log Kow	Kow	log Kp[1]	Kp (cm/hr)	B[1]	log Dsc/lsc[1]	lsc (cm)	log Dsc[1]	Dsc (cm^2/hr)	Tau[1] (hr)	c[1]	b[1]	T*[1] (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,3-Dinitrobenzene	168.12	1.49	3.09E+01	-2.69E+00	2.05E-03	3.09E-03	-3.75E+00	1.00E-03	-6.75E+00	1.80E-07	9.28E-01	3.36E-01	3.04E-01	2.23E+00	8	4.80E+00	9.70E-08
2,4,6-Trinitrotoluene	227	1.6	3.98E+01	-2.97E+00	1.07E-03	3.98E-03	-4.10E+00	1.00E-03	-7.10E+00	7.86E-08	2.12E+00	3.37E-01	3.04E-01	5.09E+00	8	2.23E+01	2.93E-07
RDX	222.26	0.87	7.41E+00	-3.46E+00	3.48E-04	7.41E-04	-4.08E+00	1.00E-03	-7.08E+00	8.40E-08	1.98E+00	3.34E-01	3.03E-01	4.76E+00	8	4.48E+01	1.87E-07

1. Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Toluene	2.0E+02	µg/l	2.0E+02	µg/l	M	9.3E-06	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	3.0E+03	µg/l	3.0E+03	µg/l	M	2.3E-05	mg/kg-day	1.4E+00	1/mg/kg/day	3.2E-05
	cis-1,2-Dichloroethene	4.2E+03	µg/l	4.2E+03	µg/l	M	4.3E-05	mg/kg-day	N/A	N/A	N/A
	4-Methylphenol	6.2E+01	µg/l	6.2E+01	µg/l	M	6.7E-07	mg/kg-day	N/A	N/A	N/A
	1,3-Dinitrobenzene	1.4E+00	µg/l	1.4E+00	µg/l	M	3.1E-09	mg/kg-day	N/A	N/A	N/A
	2,4,6-Trinitrotoluene	5.8E+00	µg/l	5.8E+00	µg/l	M	9.5E-09	mg/kg-day	3.0E-02	1/mg/kg/day	2.8E-10
	RDX	3.3E+00	µg/l	3.3E+00	µg/l	M	1.7E-09	mg/kg-day	1.1E-01	1/mg/kg/day	1.9E-10
	Aluminum	3.2E+04	µg/l	3.2E+04	µg/l	M	3.1E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	3.6E+00	µg/l	3.6E+00	µg/l	M	3.6E-09	mg/kg-day	N/A	N/A	N/A
	Arsenic	4.0E+00	µg/l	4.0E+00	µg/l	M	4.0E-09	mg/kg-day	1.5E+00	1/mg/kg/day	6.0E-09
	Chromium	8.7E+01	µg/l	8.7E+01	µg/l	M	8.7E-08	mg/kg-day	N/A	N/A	N/A
	Iron	7.1E+04	µg/l	7.1E+04	µg/l	M	7.1E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.6E+03	µg/l	2.6E+03	µg/l	M	2.6E-06	mg/kg-day	N/A	N/A	N/A
	Nickel	7.3E+01	µg/l	7.3E+01	µg/l	M	7.3E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	4.9E+01	µg/l	4.9E+01	µg/l	M	4.9E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										3.2E-05
							Total Risk Across All Exposure Routes/Pathways				3.2E-05

N/A - not applicable.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Dermal absorption per event calculated in Table 8.4a.RME Supplement and 8.4b.RME Supplement.

Table 8.4a.RME Supplement
Calculation of DAevent
Shallow Aquifer - Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
Toluene	2.0E+02	µg/l	4.5E-02	3.2E-01	8	7.47E-05	7.7E-01	5.4E-02	3
Vinyl chloride	3.0E+03	µg/l	7.3E-03	2.1E-01	8	1.84E-04	5.1E-01	2.3E-03	3
cis-1,2-Dichloroethene	4.2E+03	µg/l	1.0E-02	3.4E-01	8	3.46E-04	8.2E-01	7.2E-02	3
4-Methylphenol	6.2E+01	µg/l	1.0E-02	4.0E-01	8	5.42E-06	9.6E-01	8.7E-03	3
1,3-Dinitrobenzene[1]	1.4E+00	µg/l	2.1E-03	9.3E-01	8	2.48E-08	4.1E+00	4.0E-01	3
2,4,6-Trinitrotoluene[1]	5.8E+00	µg/l	1.1E-03	2.1E+00	8	7.63E-08	5.1E+00	4.0E-03	3
RDX[1]	3.3E+00	µg/l	3.5E-04	2.0E+00	8	1.38E-08	4.8E+00	7.4E-04	3
Aluminum	3.2E+04	µg/l	1.0E-03	N/A	8	2.52E-04	N/A	N/A	1
Antimony	3.6E+00	µg/l	1.0E-03	N/A	8	2.88E-08	N/A	N/A	1
Arsenic	4.0E+00	µg/l	1.0E-03	N/A	8	3.20E-08	N/A	N/A	1
Chromium	8.7E+01	µg/l	1.0E-03	N/A	8	6.95E-07	N/A	N/A	1
Iron	7.1E+04	µg/l	1.0E-03	N/A	8	5.68E-04	N/A	N/A	1
Manganese	2.6E+03	µg/l	1.0E-03	N/A	8	2.10E-05	N/A	N/A	1
Nickel	7.3E+01	µg/l	1.0E-04	N/A	8	5.87E-08	N/A	N/A	1
Vanadium	4.9E+01	µg/l	1.0E-03	N/A	8	3.92E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B)) x 0.001 l/cm3 (eq 3)

Notes:
[1] Permeability constant and lag time calculated on Table 8.3c.RME Supplement.
Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Toluene	2.0E+02	µg/l	1.2E-02	mg/kg/shower	R	4.0E-03	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	3.0E+03	µg/l	2.2E-01	mg/kg/shower	R	7.1E-02	mg/kg-day	3.1E-02	1/mg/kg/day	2.2E-03
	cis-1,2-Dichloroethene	4.2E+03	µg/l	2.5E-01	mg/kg/shower	R	8.3E-02	mg/kg-day	N/A	N/A	N/A
	(Total)										2.2E-03
										Total Risk Across All Exposure Routes/Pathways	2.2E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - Not applicable
Route EPC value calculations shown on Table 8.5.RME Supplement

Table 8.5.RME Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 17, Indian Head NSWC

Chemical	Exposure Point Concentration Cwo (ug/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (ug/l)	S (ug/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Site 17, NDWIH	2.0E+02	9.2E+01	6.37E-03	1.3E+03	1.4E+01	1.3E+01	1.8E+01	9.0E+01	6.0E+02	**1.2E-02**
Vinyl chloride	3.0E+03	6.3E+01	8.19E-02	1.6E+03	1.7E+01	1.7E+01	2.3E+01	1.6E+03	1.1E+04	**2.2E-01**
cis-1,2-Dichloroethene	4.2E+03	9.7E+01	7.58E-03	1.3E+03	1.3E+01	1.3E+01	1.8E+01	1.9E+03	1.2E+04	**2.5E-01**

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5
sdt = shower droplet drop time	sec	2
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	20
SV = shower room air volume	m^3	3
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
BW = body weight	kg	70
Ds = duration of shower	min	12
Dt = total duration in shower room	min	15
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	see time series example on Table I-GW-5	
Equation 8:	**Einh =**	**If t>Ds** (((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual*. USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 8.6.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Toluene	2.0E+02	µg/l	5.3E-02	mg/m^3	R	1.7E-05	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	3.0E+03	µg/l	8.8E-01	mg/m^3	R	2.8E-04	mg/kg-day	3.1E-02	1/mg/kg/day	8.6E-06
	cis-1,2-Dichloroethene	4.2E+03	µg/l	1.1E+00	mg/m^3	R	3.5E-04	mg/kg-day	N/A	N/A	N/A
											8.6E-06
										Total Risk Across All Exposure Routes/Pathways	8.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - Not applicable
Route EPC value calculations shown on Table 8.6.RME Supplement

Table 8.6.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Senario
Site 17, NDWIH

Chemical	Cw (μg/L)	MW (mol/gram)	K_H (unitless)	k_l (cm/hr)	k_g (cm/hr)	K_v (cm/hr)	ER (mg/hr)	ERa (g/sec-m^2)	Ca (mg/m^3)
Toluene	2.0E+02	9.2E+01	2.72E-01	3.38E+00	2.05E+03	3.36E+00	6.72E-04	1.87E-06	5.30E-02
Vinyl chloride	3.0E+03	6.3E+01	1.11E+00	3.72E+00	2.26E+03	3.72E+00	1.11E-02	3.10E-05	8.79E-01
cis-1,2-Dichloroethene	4.2E+03	9.7E+01	1.67E-01	3.34E+00	2.02E+03	3.30E+00	1.39E-02	3.85E-05	1.09E+00

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 $ER = Kv * Cw * L/1000\ cm^3 * mg/1000\ \mu g$

Equation 5 $ERa = ER * g/1000\ mg * hr/60\ min * min/60\ sec * 10000\ cm^2/m^2$

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch) Length = 20 m, Width = 3 m	(m^2)	60
Era = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	3.4E-07	mg/kg-day	7.3E+00	mg/kg-day	2.5E-06
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	5.5E-07	mg/kg-day	7.3E-01	mg/kg-day	4.0E-07
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	3.0E-07	mg/kg-day	7.3E+00	mg/kg-day	2.2E-06
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.3E-02	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	8.8E-06	mg/kg-day	1.5E+00	mg/kg-day	1.3E-05
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.5E-05	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	6.4E-05	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	4.4E-02	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.0E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	4.2E-04	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.8E-05	mg/kg-day	N/A	N/A	N/A
											1.8E-05
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	2.3E-07	mg/kg-day	7.3E+00	mg/kg-day	1.7E-06
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	3.8E-07	mg/kg-day	7.3E-01	mg/kg-day	2.7E-07
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	2.0E-07	mg/kg-day	7.3E+00	mg/kg-day	1.5E-06
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	6.7E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	1.4E-06	mg/kg-day	1.5E+00	mg/kg-day	2.1E-06
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	3.4E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	2.3E-03	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	2.1E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	2.2E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	8.2E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	2.0E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										5.5E-06
										Total Risk Across All Exposure Routes/Pathways	2.4E-05

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

TABLE 8.8.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	mg/kg-day	1.1E-07
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	2.4E-08	mg/kg-day	7.3E-01	mg/kg-day	1.7E-08
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	1.3E-08	mg/kg-day	7.3E+00	mg/kg-day	9.3E-08
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	5.4E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	3.8E-07	mg/kg-day	1.5E+00	mg/kg-day	5.6E-07
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.7E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	1.9E-03	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	1.8E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	6.7E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										7.8E-07
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	5.0E-09	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	8.1E-09	mg/kg-day	7.3E-01	mg/kg-day	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	4.4E-09	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.4E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	3.0E-08	mg/kg-day	1.5E+00	mg/kg-day	4.5E-08
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.9E-08	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	7.2E-08	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	5.0E-05	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.5E-08	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	4.8E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.8E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.3E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										4.5E-08
										Total Risk Across All Exposure Routes/Pathways	8.3E-07

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.9.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	7.6E-08	mg/kg-day	7.3E+00	mg/kg-day	5.6E-07
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	1.2E-07	mg/kg-day	7.3E-01	mg/kg-day	9.0E-08
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	6.6E-08	mg/kg-day	7.3E+00	mg/kg-day	4.8E-07
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	2.8E-03	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	2.0E-06	mg/kg-day	1.5E+00	mg/kg-day	2.9E-06
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	5.7E-06	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.4E-05	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	9.8E-03	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	8.9E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	9.4E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	3.5E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	8.5E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										4.1E-06
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.7E-07	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	2.7E-07	mg/kg-day	7.3E-01	mg/kg-day	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	1.5E-07	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	4.8E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	1.0E-06	mg/kg-day	1.5E+00	mg/kg-day	1.5E-06
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	9.6E-07	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.4E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	1.7E-03	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	1.6E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	5.9E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.4E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										1.5E-06
										Total Risk Across All Exposure Routes/Pathways	5.6E-06

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	7.8E-09	mg/kg-day	7.3E+00	mg/kg-day	5.7E-08
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	1.3E-08	mg/kg-day	7.3E-01	mg/kg-day	9.2E-09
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	6.8E-09	mg/kg-day	7.3E+00	mg/kg-day	5.0E-08
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	2.9E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	2.0E-07	mg/kg-day	1.5E+00	mg/kg-day	3.0E-07
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	5.8E-07	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	1.0E-03	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	9.2E-07	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	9.7E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	3.6E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	8.7E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										4.2E-07
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	5.1E-09	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	8.3E-09	mg/kg-day	7.3E-01	mg/kg-day	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	4.5E-09	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	3.1E-08	mg/kg-day	1.5E+00	mg/kg-day	4.6E-08
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	2.9E-08	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	7.4E-08	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	5.1E-05	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	4.6E-08	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	4.9E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	1.8E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.4E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										4.6E-08
										Total Risk Across All Exposure Routes/Pathways	4.6E-07

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.11.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	mg/kg-day	1.1E-07
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	2.5E-08	mg/kg-day	7.3E-01	mg/kg-day	1.8E-08
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	1.3E-08	mg/kg-day	7.3E+00	mg/kg-day	9.7E-08
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	5.6E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	3.9E-07	mg/kg-day	1.5E+00	mg/kg-day	5.9E-07
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.8E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	2.0E-03	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.8E-06	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	1.9E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	7.0E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										8.1E-07
Dermal Absorption	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Benzo(b)fluoranthene	3.5E-01	mg/kg	3.5E-01	mg/kg	M	2.3E-08	mg/kg-day	7.3E-01	mg/kg-day	N/A
	Dibenz(a,h)anthracene	1.9E-01	mg/kg	1.9E-01	mg/kg	M	1.3E-08	mg/kg-day	7.3E+00	mg/kg-day	N/A
	Aluminum	8.1E+03	mg/kg	8.1E+03	mg/kg	M	4.1E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	5.6E+00	mg/kg	5.6E+00	mg/kg	M	8.5E-08	mg/kg-day	1.5E+00	mg/kg-day	1.3E-07
	Chromium	1.6E+01	mg/kg	1.6E+01	mg/kg	M	8.2E-08	mg/kg-day	N/A	N/A	N/A
	Copper	4.1E+01	mg/kg	4.1E+01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A
	Iron	2.8E+04	mg/kg	2.8E+04	mg/kg	M	1.4E-04	mg/kg-day	N/A	N/A	N/A
	Lead	2.6E+01	mg/kg	2.6E+01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Manganese	2.7E+02	mg/kg	2.7E+02	mg/kg	M	1.4E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	1.0E+00	mg/kg	1.0E+00	mg/kg	M	5.1E-09	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										1.3E-07
										Total Risk Across All Exposure Routes/Pathways	9.4E-07

Soil* is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 8.12.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	7.7E-07	mg/kg-day	6.0E-03	mg/kg-day	4.6E-09
											4.6E-09
										Total Risk Across All Exposure Routes/Pathways	4.6E-09

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 8.13.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	1.9E-08	mg/kg-day	6.0E-03	mg/kg-day	1.2E-10
											1.2E-10
										Total Risk Across All Exposure Routes/Pathways	1.2E-10

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 8.14.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	2.6E-07	mg/kg-day	6.0E-03	mg/kg-day	1.6E-09
											1.6E-09
										Total Risk Across All Exposure Routes/Pathways	1.6E-09

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 8.15.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	2.9E-09	mg/kg-day	6.0E-03	mg/kg-day	1.7E-11
											1.7E-11
										Total Risk Across All Exposure Routes/Pathways	1.7E-11

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 8.16.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 17 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Trichloroethene	1.9E-02	mg/kg	4.5E-06	mg/m^3	M	3.4E-09	mg/kg-day	6.0E-03	mg/kg-day	2.0E-11
											2.0E-11
										Total Risk Across All Exposure Routes/Pathways	2.0E-11

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation. 'Route EPC equals Medium EPC x (1/PEF + 1/VF). PEF = 1.32E+9 m3/kg, VF calculated on Table 2.9.A.

(2) Chronic.

TABLE 8.17.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Toluene	1.2E+02	µg/l	1.2E+02	µg/l	M	6.2E-04	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	1.0E+03	µg/l	1.0E+03	µg/l	M	5.4E-03	mg/kg-day	1.4E+00	1/mg/kg/day	7.5E-03
	cis-1,2-Dichloroethene	1.4E+03	µg/l	1.4E+03	µg/l	M	7.5E-03	mg/kg-day	N/A	N/A	N/A
	4-Methylphenol	2.4E+01	µg/l	2.4E+01	µg/l	M	1.3E-04	mg/kg-day	N/A	N/A	N/A
	1,3-Dinitrobenzene	5.3E-01	µg/l	5.3E-01	µg/l	M	2.8E-06	mg/kg-day	N/A	N/A	N/A
	2,4,6-Trinitrotoluene	2.3E+00	µg/l	2.3E+00	µg/l	M	1.2E-05	mg/kg-day	3.0E-02	1/mg/kg/day	3.7E-07
	RDX	1.3E+00	µg/l	1.3E+00	µg/l	M	6.7E-06	mg/kg-day	1.1E-01	1/mg/kg/day	7.4E-07
	Aluminum	1.2E+04	µg/l	1.2E+04	µg/l	M	6.3E-02	mg/kg-day	N/A	N/A	N/A
	Antimony	2.2E+00	µg/l	2.2E+00	µg/l	M	1.2E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	1.3E-05	mg/kg-day	1.5E+00	1/mg/kg/day	1.9E-05
	Chromium	4.5E+01	µg/l	4.5E+01	µg/l	M	2.4E-04	mg/kg-day	N/A	N/A	N/A
	Iron	4.3E+04	µg/l	4.3E+04	µg/l	M	2.3E-01	mg/kg-day	N/A	N/A	N/A
	Manganese	1.5E+03	µg/l	1.5E+03	µg/l	M	7.7E-03	mg/kg-day	N/A	N/A	N/A
	Nickel	3.7E+01	µg/l	3.7E+01	µg/l	M	2.0E-04	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.0E+01	µg/l	2.0E+01	µg/l	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										7.6E-03
Dermal Absorption											
	Toluene	1.2E+02	µg/l	1.2E+02	µg/l	M	1.9E-04	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	1.0E+03	µg/l	1.0E+03	µg/l	M	2.2E-04	mg/kg-day	1.4E+00	1/mg/kg/day	3.0E-04
	cis-1,2-Dichloroethene	1.4E+03	µg/l	1.4E+03	µg/l	M	5.3E-04	mg/kg-day	N/A	N/A	N/A
	4-Methylphenol	2.4E+01	µg/l	2.4E+01	µg/l	M	9.6E-06	mg/kg-day	N/A	N/A	N/A
	1,3-Dinitrobenzene	5.3E-01	µg/l	5.3E-01	µg/l	M	6.7E-08	mg/kg-day	N/A	N/A	N/A
	2,4,6-Trinitrotoluene	2.3E+00	µg/l	2.3E+00	µg/l	M	2.3E-07	mg/kg-day	3.0E-02	1/mg/kg/day	6.9E-09
	RDX	1.3E+00	µg/l	1.3E+00	µg/l	M	4.0E-08	mg/kg-day	1.1E-01	1/mg/kg/day	4.4E-09
	Aluminum	1.2E+04	µg/l	1.2E+04	µg/l	M	1.4E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	2.2E+00	µg/l	2.2E+00	µg/l	M	2.7E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.4E+00	µg/l	2.4E+00	µg/l	M	2.9E-08	mg/kg-day	1.5E+00	1/mg/kg/day	4.4E-08
	Chromium	4.5E+01	µg/l	4.5E+01	µg/l	M	5.4E-07	mg/kg-day	N/A	N/A	N/A
	Iron	4.3E+04	µg/l	4.3E+04	µg/l	M	5.2E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	1.5E+03	µg/l	1.5E+03	µg/l	M	1.8E-05	mg/kg-day	N/A	N/A	N/A
	Nickel	3.7E+01	µg/l	3.7E+01	µg/l	M	4.5E-08	mg/kg-day	N/A	N/A	N/A
	Vanadium	2.0E+01	µg/l	2.0E+01	µg/l	M	2.4E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										3.0E-04
										Total Risk Across All Exposure Routes/Pathways	7.9E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 817a.ct Supplement and 8.12b.ct Supplement.
N/A - not applicable.

Table 8.17a.CT Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	1.2E+02	µg/l	4.5E-02	3.20E-01	0.2	3.67E-06
Vinyl chloride	1.0E+03	µg/l	7.3E-03	2.10E-01	0.2	4.20E-06
cis-1,2-Dichloroethene	1.4E+03	µg/l	1.0E-02	3.40E-01	0.2	1.02E-05
4-Methylphenol	2.4E+01	µg/l	1.0E-02	4.00E-01	0.2	1.85E-07
1,3-Dinitrobenzene[1]	5.3E-01	µg/l	2.1E-03	9.28E-01	0.2	1.30E-09
2,4,6-Trinitrotoluene[1]	2.3E+00	µg/l	1.1E-03	2.12E+00	0.2	4.45E-09
RDX[1]	1.3E+00	µg/l	3.5E-04	1.98E+00	0.2	7.68E-10
Aluminum	1.2E+04	µg/l	1.0E-03	N/A	0.2	2.37E-06
Antimony	2.2E+00	µg/l	1.0E-03	N/A	0.2	4.47E-10
Arsenic	2.4E+00	µg/l	1.0E-03	N/A	0.2	4.80E-10
Chromium	4.5E+01	µg/l	1.0E-03	N/A	0.2	9.00E-09
Iron	4.3E+04	µg/l	1.0E-03	N/A	0.2	8.63E-06
Manganese	1.5E+03	µg/l	1.0E-03	N/A	0.2	2.91E-07
Nickel	3.7E+01	µg/l	1.0E-04	N/A	0.2	7.43E-10
Vanadium	2.0E+01	µg/l	1.0E-03	N/A	0.2	3.99E-09

Inorganics: DAevent (mg/cn Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2 Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x E 2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Permeability constant and lag time calculated on Table 8.3c.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

Table 8.17b.CT Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 17, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Toluene	1.17E+02	µg/l	4.50E-02	3.20E-01	0.33	4.72E-06
Vinyl chloride	1.02E+03	µg/l	7.30E-03	2.10E-01	0.33	5.39E-06
cis-1,2-Dichloroethene	1.41E+03	µg/l	1.00E-02	3.40E-01	0.33	1.31E-05
4-Methylphenol	2.37E+01	µg/l	1.00E-02	4.00E-01	0.33	2.38E-07
1,3-Dinitrobenzene[1]	5.33E-01	µg/l	2.05E-03	9.28E-01	0.33	1.67E-09
2,4,6-Trinitrotoluene[1]	2.30E+00	µg/l	1.07E-03	2.12E+00	0.33	5.72E-09
RDX[1]	1.27E+00	µg/l	3.48E-04	1.98E+00	0.33	9.87E-10
Aluminum	1.19E+04	µg/l	1.00E-03	N/A	0.33	3.91E-06
Antimony	2.23E+00	µg/l	1.00E-03	N/A	0.33	7.37E-10
Arsenic	2.40E+00	µg/l	1.00E-03	N/A	0.33	7.92E-10
Chromium	4.50E+01	µg/l	1.00E-03	N/A	0.33	1.49E-08
Iron	4.32E+04	µg/l	1.00E-03	N/A	0.33	1.42E-05
Manganese	1.46E+03	µg/l	1.00E-03	N/A	0.33	4.81E-07
Nickel	3.71E+01	µg/l	1.00E-04	N/A	0.33	1.23E-09
Vanadium	1.99E+01	µg/l	1.00E-03	N/A	0.33	6.58E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
[1] Permeability constant and lag time calculated on Table 8.3c.RME Supplement.
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 8.18.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Groundwater - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Toluene	1.2E+02	µg/l	7.2E-03	mg/kg/shower	R	5.9E-04	mg/kg-day	N/A	N/A	N/A
	Vinyl chloride	1.0E+03	µg/l	7.3E-02	mg/kg/shower	R	6.0E-03	mg/kg-day	3.1E-02	1/mg/kg/day	1.9E-04
	cis-1,2-Dichloroethene	1.4E+03	µg/l	8.5E-02	mg/kg/shower	R	7.0E-03	mg/kg-day	N/A	N/A	N/A
	(Total)										1.9E-04
										Total Risk Across All Exposure Routes/Pathways	1.9E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - Not applicable
Route EPC value calculations shown on Table 8.18.ct Supplement

Table 8.18.CT Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 17, NDWIH

Chemical	Exposure Point Concentration Cwo (ug/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (ug/l)	S (ug/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Site 17, NDWIH	1.2E+02	9.2E+01	6.37E-03	1.3E+03	1.4E+01	1.3E+01	1.8E+01	5.3E+01	3.5E+02	**7.2E-03**
Vinyl chloride	1.0E+03	6.3E+01	8.19E-02	1.6E+03	1.7E+01	1.7E+01	2.3E+01	5.4E+02	3.6E+03	**7.3E-02**
cis-1,2-Dichloroethene	1.4E+03	9.7E+01	7.58E-03	1.3E+03	1.3E+01	1.3E+01	1.8E+01	6.3E+02	4.2E+03	**8.5E-02**

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5
sdt = shower droplet drop time	sec	2
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	20
SV = shower room air volume	m^3	3
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
BW = body weight	kg	70
Ds = duration of shower	min	12
Dt = total duration in shower room	min	15
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	see time series example on Table I-GW-5	
Equation 8:	**Einh =**	**If t>Ds** (((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual*. USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Current
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 17 Soil											
			Benzo(a)pyrene	3.41E-08	--	2.2E-08	5.7E-08	Benzo(a)pyrene	N/A	N/A	--	N/A	
			Benzo(b)fluoranthene	1.09E-08	--	7.2E-09	1.8E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	
			Aluminum	N/A	--	N/A		Aluminum	CNS	2.3E-03	--	1.1E-04	2.4E-03
			Arsenic	4.03E-07	--	6.1E-08	4.6E-07	Arsenic	Skin/Vascular	7.0E-03	--	1.1E-03	8.0E-03
			Chromium	N/A	--	N/A		Chromium	NOAEL	1.8E-03	--	3.6E-03	5.4E-03
			Iron	N/A	--	N/A		Iron	Gastrointestinal	4.2E-02	--	2.1E-03	4.4E-02
			Lead	N/A	--	N/A		Lead	N/A	N/A	--	N/A	
			Manganese	N/A	--	N/A		Manganese	CNS	7.6E-03	--	9.6E-03	1.7E-02
			Thallium	N/A	--	N/A		Thallium	Skin/Vascular	4.4E-03	--	2.2E-04	4.6E-03
			Vanadium	N/A	--	N/A		Vanadium	Kidney	6.6E-03	--	1.3E-02	1.9E-02
			(Total)	4.5E-07		9.1E-08	5.4E-07	(Total)		7.2E-02		3.0E-02	1.0E-01
			Total Risk Across Surface Soil				5.4E-07	Total Risk Across Surface Soil					1.0E-01
			Total Risk Across All Media and All Exposure Routes				5.4E-07	Total Hazard Index Across All Media and All Exposure Routes					1.0E-01

Total CNS HI =	2.0E-02
Total GI HI =	4.4E-02
Total NOAEL HI =	5.4E-03
Total Skin HI =	1.3E-02
Total Vascular HI =	1.3E-02
Total Kidney HI =	1.9E-02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Current
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 17 Soil											
			Benzo(a)pyrene	6.6E-08	--	6.2E-08	1.3E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	
			Benzo(b)fluoranthene	2.1E-08	--	2.0E-08	4.1E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	
			Aluminum	N/A	--	N/A		Aluminum	CNS	1.7E-03	--	1.2E-04	1.8E-03
			Arsenic	7.8E-07	--	1.7E-07	9.5E-07	Arsenic	Skin/Vascular	5.1E-03	--	1.1E-03	6.2E-03
			Chromium	N/A	--	N/A		Chromium	NOAEL	1.3E-03	--	3.7E-03	5.0E-03
			Iron	N/A	--	N/A		Iron	Gastrointestinal	3.1E-02	--	2.2E-03	3.3E-02
			Lead	N/A	--	N/A		Lead	N/A	N/A	--	N/A	
			Manganese	N/A	--	N/A		Manganese	CNS	5.5E-03	--	1.0E-02	1.6E-02
			Thallium	N/A	--	N/A		Thallium	Skin/Vascular	3.2E-03	--	2.3E-04	3.4E-03
			Vanadium	N/A	--	N/A		Vanadium	Kidney	4.8E-03	--	1.3E-02	1.8E-02
			(Total)	8.7E-07		2.5E-07	1.1E-06	(Total)		5.2E-02		3.1E-02	8.3E-02
			Total Risk Across Surface Soil				1.1E-06	Total Risk Across Surface Soil					8.3E-02
			Total Risk Across All Media and All Exposure Routes				1.1E-06	Total Hazard Index Across All Media and All Exposure Routes					8.3E-02

Total CNS HI =	1.7E-02
Total GI HI =	3.3E-02
Total NOAEL HI =	5.0E-03
Total Skin HI =	9.6E-03
Total Vascular HI =	9.6E-03
Total Kidney HI =	1.8E-02

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Toluene	Liver/Kidney	2.7E-02	--	8.6E-03	3.6E-02
								Vinyl chloride	Liver	2.7E+01	--	1.1E+00	2.9E+01
								cis-1,2-Dichloroethene	Blood	1.2E+01	--	8.3E-01	1.2E+01
								4-Methylphenol	CNS, RESP & Whole Body	3.4E-01	--	2.7E-02	3.7E-01
								1,3-Dinitrobenzene	Spleen	3.8E-01	--	9.4E-03	3.9E-01
								2,4,6-Trinitrotoluene	Liver	3.2E-01	--	6.1E-03	3.2E-01
								RDX	Prostrate	3.0E-02	--	1.8E-04	3.0E-02
								Aluminum	CNS	8.6E-01	--	1.7E-03	8.6E-01
								Antimony	Whole body/Blood	2.5E-01	--	3.3E-03	2.5E-01
								Arsenic	Skin/Vascular	3.7E-01	--	7.3E-04	3.7E-01
								Chromium	NOAEL	7.9E-01	--	6.3E-02	8.6E-01
								Iron	Gastrointestinal	6.5E+00	--	1.3E-02	6.5E+00
								Manganese	CNS	3.6E+00	--	1.8E-01	3.8E+00
								Nickel	Whole body	1.0E-01	--	5.0E-04	1.0E-01
								Vanadium	Kidney	1.3E+00	--	1.0E-01	1.4E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		5.4E+01		2.4E+00	5.6E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					5.6E+01
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
								Toluene	CNS	--	1.0E-01	--	1.0E-01
								Vinyl chloride	Liver	--	7.4E+00	--	7.4E+00
								cis-1,2-Dichloroethene	N/A	--	N/A	--	
			(Total)		0.0E+00		0.0E+00	(Total)			7.5E+00		7.5E+00
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					7.5E+00
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					6.4E+01

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
								Benzo(a)pyrene	N/A	N/A	--	N/A	
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
								Aluminum	CNS	1.1E-02	--	1.5E-03	1.3E-02
								Arsenic	Skin/Vascular	2.6E-02	--	1.0E-02	3.6E-02
								Chromium	NOAEL	7.4E-03	--	3.9E-02	4.7E-02
								Copper	Gastrointestinal	1.4E-03	--	1.8E-04	1.6E-03
								Iron	Gastrointestinal	1.3E-01	--	1.7E-02	1.5E-01
								Lead	N/A	N/A	--	N/A	
								Manganese	CNS	1.8E-02	--	6.1E-02	8.0E-02
								Thallium	Skin/Vascular	2.0E-02	--	2.6E-03	2.2E-02
								Vanadium	Kidney	3.3E-02	--	1.7E-01	2.0E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.5E-01		3.0E-01	5.4E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					5.4E-01
Soil*	Air	Emissions from Site 17 Soil											
								Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				0.0E+00	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					5.4E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					6.4E+01

Soil* is combined surface and subsurface soil.

Total Blood HI =	1.3E+01
Total Body HI =	7.2E-01
Total CNS HI =	5.2E+00
Total Gastrointestinal HI =	6.6E+00
Total Kidney HI =	1.7E+00
Total Liver HI =	3.6E+01
Total NOAEL HI =	9.0E-01
Total Prostrate =	3.0E-02
Total Respiratory HI =	3.7E-01
Total Skin HI =	4.2E-01
Total Spleen HI =	3.9E-01
Total Vascular HI =	4.2E-01
Total Endocrine HI =	0.0E+00

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Toluene	Liver/Kidney	6.4E-02	--	1.9E-02	8.3E-02
								Vinyl chloride	Liver	6.4E+01	--	2.5E+00	6.6E+01
								cis-1,2-Dichloroethene	Blood	2.7E+01	--	1.9E+00	2.9E+01
								4-Methylphenol	CNS, RESP & Whole Body	7.9E-01	--	6.0E-02	8.5E-01
								1,3-Dinitrobenzene	Spleen	8.9E-01	--	2.1E-02	9.2E-01
								2,4,6-Trinitrotoluene	Liver	7.4E-01	--	1.4E-02	7.6E-01
								RDX	Prostrate	7.0E-02	--	4.1E-04	7.1E-02
								Aluminum	CNS	2.0E+00	--	5.0E-03	2.0E+00
								Antimony	Whole body/Blood	5.8E-01	--	9.5E-03	5.8E-01
								Arsenic	Skin/Vascular	8.5E-01	--	2.1E-03	8.5E-01
								Chromium	NOAEL	1.9E+00	--	1.8E-01	2.0E+00
								Iron	Gastrointestinal	1.5E+01	--	3.7E-02	1.5E+01
								Manganese	CNS	8.4E+00	--	5.2E-01	8.9E+00
								Nickel	Whole body	2.3E-01	--	1.5E-03	2.4E-01
								Vanadium	Kidney	3.1E+00	--	3.0E-01	3.4E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.3E+02		5.6E+00	1.3E+02
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					1.3E+02
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					1.3E+02

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
								Benzo(a)pyrene	N/A	N/A	--	N/A	
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
								Aluminum	CNS	1.0E-01	--	1.9E-03	1.1E-01
								Arsenic	Skin/Vascular	2.4E-01	--	1.3E-02	2.5E-01
								Chromium	NOAEL	6.9E-02	--	5.2E-02	1.2E-01
								Copper	Gastrointestinal	1.3E-02	--	2.4E-04	1.3E-02
								Iron	Gastrointestinal	1.2E+00	--	2.2E-02	1.2E+00
								Lead	N/A	N/A	--	N/A	
								Manganese	CNS	1.7E-01	--	8.1E-02	2.5E-01
								Thallium	Skin/Vascular	1.8E-01	--	3.4E-03	1.9E-01
								Vanadium	Kidney	3.1E-01	--	2.2E-01	5.3E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.3E+00		4.0E-01	2.7E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					2.7E+00
Soil*	Air	Emissions from Site 17 Soil											
								Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				0.0E+00	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					2.7E+00
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.3E+02

Soil* is combined surface and subsurface soil.

Total Blood HI =	2.9E+01
Total Body HI =	1.7E+00
Total CNS HI =	1.2E+01
Total Gastrointestinal HI =	1.6E+01
Total Kidney HI =	4.0E+00
Total Liver HI =	6.7E+01
Total NOAEL HI =	2.2E+00
Total Prostrate =	7.1E-02
Total Respiratory HI =	8.5E-01
Total Skin HI =	1.3E+00
Total Spleen HI =	9.2E-01
Total Vascular HI =	1.3E+00
Total Endocrine HI =	0.0E+00

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Toluene	N/A	--	N/A							
			Vinyl chloride	6.1E-02	--	2.5E-03	6.3E-02						
			cis-1,2-Dichloroethene	N/A	--	N/A							
			4-Methylphenol	N/A	--	N/A							
			1,3-Dinitrobenzene	N/A	--	N/A							
			2,4,6-Trinitrotoluene	2.6E-06	--	4.9E-08	2.6E-06						
			RDX	5.4E-06	--	3.2E-08	5.5E-06						
			Aluminum	N/A	--	N/A							
			Antimony	N/A	--	N/A							
			Arsenic	9.0E-05	--	1.9E-07	9.0E-05						
			Chromium	N/A	--	N/A							
			Iron	N/A	--	N/A							
			Manganese	N/A	--	N/A							
			Nickel	N/A	--	N/A							
			Vanadium	N/A	--	N/A							
			(Total)	6.1E-02		2.5E-03	6.3E-02	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Tap water				6.3E-02	Total Hazard Index Across Tap water					0.0E+00
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
			Toluene	--	N/A	--							
			Vinyl chloride	--	2.2E-03	--	2.2E-03						
			cis-1,2-Dichloroethene	--	N/A	--							
			(Total)		2.2E-03		2.2E-03	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Vapors at Showerhead				2.2E-03	Total Hazard Index Across Vapors at Showerhead					0.0E+00
			Total Risk Across Shallow Groundwater				6.6E-02	Total Hazard Index Across Shallow Groundwater					0.0E+00

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
			Benzo(a)pyrene	2.5E-06	--	1.7E-06	4.2E-06						
			Benzo(b)fluoranthene	4.0E-07	--	2.7E-07	6.8E-07						
			Dibenz(a,h)anthracene	2.2E-06	--	1.5E-06	3.7E-06						
			Aluminum	N/A	--	N/A							
			Arsenic	1.3E-05	--	2.1E-06	1.5E-05						
			Chromium	N/A	--	N/A							
			Copper	N/A	--	N/A							
			Iron	N/A	--	N/A							
			Lead	N/A	--	N/A							
			Manganese	N/A	--	N/A							
			Thallium	N/A	--	N/A							
			Vanadium	N/A	--	N/A							
			(Total)	1.8E-05		5.5E-06	2.4E-05	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Soil				2.4E-05	Total Hazard Index Across Soil					0.0E+00
Soil*	Air	Emissions from Site 17 Soil											
			Trichloroethene	--	4.6E-09	--	4.6E-09						
			(Total)	0.0E+00	4.6E-09	0.0E+00	4.6E-09	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				4.6E-09	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				2.4E-05	Total Hazard Index Across Soil					0.0E+00
			Total Risk Across All Media and All Exposure Routes				6.6E-02	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

Soil* is combined surface and subsurface soil.

Groundwater - air exposure risks, calculated for adult only.

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Water											
			Toluene	--	--	N/A		Toluene	Liver/kidney	--	--	3.3E-04	3.3E-04
			Vinyl chloride	--	--	3.2E-05	3.2E-05	Vinyl chloride	Liver	--	--	5.3E-01	5.3E-01
			cis-1,2-Dichloroethene	--	--	N/A		cis-1,2-Dichloroethene	Blood	--	--	3.2E-02	3.2E-02
			4-Methylphenol	--	--	N/A		4-Methylphenol	CNS, RESP & Whole Body	--	--	9.4E-03	9.4E-03
			1,3-Dinitrobenzene	--	--	N/A		1,3-Dinitrobenzene	Spleen	--	--	2.5E-03	2.5E-03
			2,4,6-Trinitrotoluene	--	--	2.8E-10	2.8E-10	2,4,6-Trinitrotoluene	Liver	--	--	1.3E-03	1.3E-03
			RDX	--	--	1.9E-10	1.9E-10	RDX	Prostrate	--	--	4.0E-05	4.0E-05
			Aluminum	--	--	N/A		Aluminum	CNS	--	--	2.2E-03	2.2E-03
			Antimony	--	--	N/A		Antimony	Whole body/Blood	--	--	4.2E-03	4.2E-03
			Arsenic	--	--	6.0E-09	6.0E-09	Arsenic	Skin/Vascular	--	--	9.3E-04	9.3E-04
			Chromium	--	--	N/A		Chromium	NOAEL	--	--	1.2E-02	1.2E-02
			Iron	--	--	N/A		Iron	Gastrointestinal	--	--	1.6E-02	1.6E-02
			Manganese	--	--	N/A		Manganese	CNS	--	--	2.3E-01	2.3E-01
			Nickel	--	--	N/A		Nickel	Whole body	--	--	6.4E-04	6.4E-04
			Vanadium	--	--	N/A		Vanadium	Kidney	--	--	1.3E-01	1.3E-01
			(Total)	0.0E+00	0.0E+00	3.2E-05	3.2E-05	(Total)				9.8E-01	9.8E-01
			Total Risk Across Shallow Aquifer - Water				3.2E-05	Total Hazard Index Across Shallow Aquifer - Water					9.8E-01
Groundwater	Air	Shallow Aquifer-Volatilization											
			Toluene	--	N/A	--		Toluene	CNS	--	1.0E-02	--	1.0E-02
			Vinyl chloride	--	8.6E-06	--	8.6E-06	Vinyl chloride	Liver	--	7.0E-01	--	7.0E-01
			cis-1,2-Dichloroethene	--	N/A	--		cis-1,2-Dichloroethene	N/A	--	N/A	--	
			(Total)		8.6E-06		8.6E-06	(Total)			7.1E-01		7.1E-01
			Total Risk Across Shallow Aquifer - Volatilization				8.6E-06	Total Hazard Index Across Shallow Aquifer - Volatilization					7.1E-01
			Total Risk Across Shallow Groundwater				4.1E-05	Total Hazard Index Across Shallow Groundwater					1.7E+00

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
			Benzo(a)pyrene	1.1E-07	--	N/A	1.1E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	
			Benzo(b)fluoranthene	1.7E-08	--	N/A	1.7E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	
			Dibenz(a,h)anthracene	9.3E-08	--	N/A	9.3E-08	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
			Aluminum	N/A	--	N/A		Aluminum	CNS	3.8E-02	--	1.0E-03	3.9E-02
			Arsenic	5.6E-07	--	4.5E-08	6.1E-07	Arsenic	Skin/Vascular	8.8E-02	--	7.0E-03	9.5E-02
			Chromium	N/A	--	N/A		Chromium	NOAEL	3.8E-03	--	4.0E-03	7.9E-03
			Copper	N/A	--	N/A		Copper	Gastrointestinal	4.8E-03	--	1.3E-04	4.9E-03
			Iron	N/A	--	N/A		Iron	Gastrointestinal	4.4E-01	--	1.2E-02	4.5E-01
			Lead	N/A	--	N/A		Lead	N/A	N/A	--	N/A	
			Manganese	N/A	--	N/A		Manganese	CNS	6.3E-02	--	4.2E-02	1.1E-01
			Thallium	N/A	--	N/A		Thallium	Skin/Vascular	6.7E-02	--	1.8E-03	6.9E-02
			Vanadium	N/A	--	N/A		Vanadium	Kidney	1.1E-01	--	1.2E-01	2.3E-01
			(Total)	7.8E-07		4.5E-08	8.3E-07	(Total)		8.2E-01		1.8E-01	1.0E+00
			Total Risk Across Soil				8.3E-07	Total Hazard Index Across Soil					1.0E+00
Soil*	Air	Emissions from Site 17 Soil	Trichloroethene	--	1.2E-10	--	1.2E-10	Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	1.2E-10	0.0E+00	1.2E-10	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				1.2E-10	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				8.3E-07	Total Hazard Index Across Soil					1.0E+00
			Total Risk Across All Media and All Exposure Routes				4.2E-05	Total Hazard Index Across All Media and All Exposure Routes					2.7E+00

Soil* is combined surface and subsurface soil.

Total Blood HI =	3.6E-02
Total Body HI =	1.4E-02
Total CNS HI =	2.9E-01
Total Gastrointestinal HI =	4.7E-01
Total Kidney HI =	3.6E-01
Total Liver HI =	1.2E+00
Total NOAEL HI =	2.0E-02
Total Prostrate =	4.0E-05
Total Respiratory HI =	9.4E-03
Total Skin HI =	1.6E-01
Total Spleen HI =	2.5E-03
Total Vascular HI =	1.6E-01
Total Endocrine HI =	0.0E+00

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
			Benzo(a)pyrene	5.6E-07	--	N/A	5.6E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	
			Benzo(b)fluoranthene	9.0E-08	--	N/A	9.0E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	
			Dibenz(a,h)anthracene	4.8E-07	--	N/A	4.8E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
			Aluminum	N/A	--	N/A		Aluminum	CNS	7.9E-03	--	1.3E-03	9.2E-03
			Arsenic	2.9E-06	--	1.5E-06	4.4E-06	Arsenic	Skin/Vascular	1.8E-02	--	9.3E-03	2.8E-02
			Chromium	N/A	--	N/A		Chromium	NOAEL	5.3E-03	--	3.6E-02	4.1E-02
			Copper	N/A	--	N/A		Copper	Gastrointestinal	1.0E-03	--	1.7E-04	1.2E-03
			Iron	N/A	--	N/A		Iron	Gastrointestinal	9.2E-02	--	1.6E-02	1.1E-01
			Lead	N/A	--	N/A		Lead	N/A	N/A	--	N/A	
			Manganese	N/A	--	N/A		Manganese	CNS	1.3E-02	--	5.6E-02	6.9E-02
			Thallium	N/A	--	N/A		Thallium	Skin/Vascular	1.4E-02	--	2.4E-03	1.6E-02
			Vanadium	N/A	--	N/A		Vanadium	Kidney	2.4E-02	--	1.5E-01	1.8E-01
			(Total)	4.1E-06		1.5E-06	5.6E-06	(Total)		1.8E-01		2.8E-01	4.5E-01
			Total Risk Across Soil*				5.6E-06	Total Hazard Index Across Soil*					4.5E-01
Soil*	Air	Emissions from Site 17 Soil											
			Trichloroethene	--	1.6E-09	--	1.6E-09	Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	1.6E-09	0.0E+00	1.6E-09	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				1.6E-09	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				5.6E-06	Total Hazard Index Across Soil					4.5E-01
Total Risk Across All Media and All Exposure Routes							5.6E-06	Total Hazard Index Across All Media and All Exposure Routes					4.5E-01

Soil* is combined surface and subsurface soil.

Total CNS HI =	7.8E-02
Total GI HI =	1.1E-01
Total NOAEL HI =	4.1E-02
Total Skin HI =	4.4E-02
Total Vascular HI =	4.4E-02
Total Kidney HI =	1.8E-01
Total Liver HI =	0.0E+00
Total Endocrine HI =	0.0E+00

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
			Benzo(a)pyrene	5.7E-08	--	N/A	5.7E-08	Benzo(a)pyrene	N/A	N/A	--	N/A	
			Benzo(b)fluoranthene	9.2E-09	--	N/A	9.2E-09	Benzo(b)fluoranthene	N/A	N/A	--	N/A	
			Dibenz(a,h)anthracene	5.0E-08	--	N/A	5.0E-08	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
			Aluminum	N/A	--	N/A		Aluminum	CNS	2.3E-03	--	1.1E-04	2.4E-03
			Arsenic	3.0E-07	--	4.6E-08	3.5E-07	Arsenic	Skin/Vascular	5.2E-03	--	7.9E-04	6.0E-03
			Chromium	N/A	--	N/A		Chromium	NOAEL	1.5E-03	--	3.1E-03	4.6E-03
			Copper	N/A	--	N/A		Copper	Gastrointestinal	2.8E-04	--	1.4E-05	3.0E-04
			Iron	N/A	--	N/A		Iron	Gastrointestinal	2.6E-02	--	1.3E-03	2.8E-02
			Lead	N/A	--	N/A		Lead	N/A	N/A	--	N/A	
			Manganese	N/A	--	N/A		Manganese	CNS	3.8E-03	--	4.8E-03	8.5E-03
			Thallium	N/A	--	N/A		Thallium	Skin/Vascular	4.0E-03	--	2.0E-04	4.2E-03
			Vanadium	N/A	--	N/A		Vanadium	Kidney	6.8E-03	--	1.3E-02	2.0E-02
			(Total)	4.2E-07		4.6E-08	4.6E-07	(Total)		5.0E-02		2.3E-02	7.3E-02
			Total Risk Across Soil*				4.6E-07	Total Risk Across Soil*					7.3E-02
Soil*	Air	Emissions from Site 17 Soil											
			Trichloroethene	--	1.7E-11	--	1.7E-11	Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	1.7E-11	0.0E+00	1.7E-11	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				1.7E-11	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				4.6E-07	Total Hazard Index Across Soil					7.3E-02
Total Risk Across All Media and All Exposure Routes							4.6E-07	Total Hazard Index Across All Media and All Exposure Routes					7.3E-02

Soil* is combined surface and subsurface soil.

Total CNS HI =	1.1E-02
Total GI HI =	2.8E-02
Total NOAEL HI =	4.6E-03
Total Skin HI =	1.0E-02
Total Vascular HI =	1.0E-02
Total Kidney HI =	2.0E-02
Total Liver HI =	0.0E+00
Total Endocrine HI =	0.0E+00

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
			Benzo(a)pyrene	1.1E-07	--	N/A	1.1E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	
			Benzo(b)fluoranthene	1.8E-08	--	N/A	1.8E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	
			Dibenz(a,h)anthracene	9.7E-08	--	N/A	9.7E-08	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
			Aluminum	N/A	--	N/A		Aluminum	CNS	1.6E-03	--	1.2E-04	1.8E-03
			Arsenic	5.9E-07	--	1.3E-07	7.1E-07	Arsenic	Skin/Vascular	3.8E-03	--	8.3E-04	4.6E-03
			Chromium	N/A	--	N/A		Chromium	NOAEL	1.1E-03	--	3.2E-03	4.3E-03
			Copper	N/A	--	N/A		Copper	Gastrointestinal	2.1E-04	--	1.5E-05	2.2E-04
			Iron	N/A	--	N/A		Iron	Gastrointestinal	1.9E-02	--	1.4E-03	2.0E-02
			Lead	N/A	--	N/A		Lead	N/A	N/A	--	N/A	
			Manganese	N/A	--	N/A		Manganese	CNS	2.7E-03	--	5.0E-03	7.7E-03
			Thallium	N/A	--	N/A		Thallium	Skin/Vascular	2.9E-03	--	2.1E-04	3.1E-03
			Vanadium	N/A	--	N/A		Vanadium	Kidney	4.9E-03	--	1.4E-02	1.9E-02
			(Total)	8.1E-07		1.3E-07	9.4E-07	(Total)		3.6E-02		2.4E-02	6.1E-02
			Total Risk Across Soil*				9.4E-07	Total Risk Across Soil*					6.1E-02
Soil*	Air	Emissions from Site 17 Soil											
			Trichloroethene	--	2.0E-11	--	2.0E-11	Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	2.0E-11	0.0E+00	2.0E-11	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				2.0E-11	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				9.4E-07	Total Hazard Index Across Soil					6.1E-02
			Total Risk Across All Media and All Exposure Routes				9.4E-07	Total Hazard Index Across All Media and All Exposure Routes					6.1E-02

Soil* is combined surface and subsurface soil.

Total CNS HI =	9.5E-03
Total GI HI =	2.1E-02
Total NOAEL HI =	4.3E-03
Total Skin HI =	7.7E-03
Total Vascular HI =	7.7E-03
Total Kidney HI =	1.9E-02
Total Liver HI =	0.0E+00

TABLE 9.10.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Toluene	Liver/kidney	7.5E-03	--	3.0E-03	1.1E-02
								Vinyl chloride	Liver	4.3E+00	--	2.3E-01	4.6E+00
								cis-1,2-Dichloroethene	Blood	1.8E+00	--	1.7E-01	2.0E+00
								4-Methylphenol	CNS, RESP & Whole Body	6.1E-02	--	6.1E-03	6.7E-02
								1,3-Dinitrobenzene	Spleen	6.8E-02	--	2.1E-03	7.1E-02
								2,4,6-Trinitrotoluene	Liver	5.9E-02	--	1.5E-03	6.0E-02
								RDX	Prostrate	5.4E-03	--	4.2E-05	5.5E-03
								Aluminum	CNS	1.5E-01	--	3.9E-04	1.5E-01
								Antimony	Whole body/Blood	7.2E-02	--	1.2E-03	7.3E-02
								Arsenic	Skin/Vascular	1.0E-01	--	2.6E-04	1.0E-01
								Chromium	NOAEL	1.9E-01	--	2.0E-02	2.1E-01
								Iron	Gastrointestinal	1.8E+00	--	4.7E-03	1.8E+00
								Manganese	CNS	9.3E-01	--	6.0E-02	9.9E-01
								Nickel	Whole body	2.4E-02	--	1.5E-04	2.4E-02
								Vanadium	Kidney	2.6E-01	--	2.5E-02	2.8E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		9.9E+00		5.2E-01	1.0E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					1.0E+01
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
								Toluene	CNS	--	4.0E-02	--	4.0E-02
								Vinyl chloride	Liver	--	1.7E+00	--	1.7E+00
								cis-1,2-Dichloroethene	N/A	--	N/A	--	
			(Total)		0.0E+00		0.0E+00	(Total)			1.7E+00		1.7E+00
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					1.7E+00
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					1.2E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					2.3E+01

Soil* is combined surface and subsurface soil.

TABLE 9.10.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
												Total Blood HI =	2.1E+00
												Total Body HI =	1.6E-01
												Total CNS HI =	1.3E+00
												Total Gastrointestinal HI =	1.8E+00
												Total Kidney HI =	2.9E-01
												Total Liver HI =	6.3E+00
												Total NOAEL HI =	2.1E-01
												Total Prostrate =	5.5E-03
												Total Respiratory HI =	6.7E-02
												Total Skin HI =	1.0E-01
												Total Spleen HI =	7.1E-02
												Total Vascular HI =	1.0E-01

TABLE 9.11.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Toluene	Liver/kidney	2.5E-02	--	6.6E-03	3.1E-02
								Vinyl chloride	Liver	1.4E+01	--	5.0E-01	1.5E+01
								cis-1,2-Dichloroethene	Blood	6.0E+00	--	3.6E-01	6.4E+00
								4-Methylphenol	CNS, RESP & Whole Body	2.0E-01	--	1.3E-02	2.2E-01
								1,3-Dinitrobenzene	Spleen	2.3E-01	--	4.7E-03	2.3E-01
								2,4,6-Trinitrotoluene	Liver	2.0E-01	--	3.2E-03	2.0E-01
								RDX	Prostrate	1.8E-02	--	9.1E-05	1.8E-02
								Aluminum	CNS	5.1E-01	--	1.1E-03	5.1E-01
								Antimony	Whole body/Blood	2.4E-01	--	3.4E-03	2.4E-01
								Arsenic	Skin/Vascular	3.4E-01	--	7.3E-04	3.4E-01
								Chromium	NOAEL	6.4E-01	--	5.5E-02	7.0E-01
								Iron	Gastrointestinal	6.1E+00	--	1.3E-02	6.2E+00
								Manganese	CNS	3.1E+00	--	1.7E-01	3.3E+00
								Nickel	Whole body	7.9E-02	--	4.3E-04	8.0E-02
								Vanadium	Kidney	8.5E-01	--	7.0E-02	9.2E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		3.3E+01		1.2E+00	3.4E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					3.4E+01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					3.4E+01

TABLE 9.11.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
								Benzo(a)pyrene	N/A	N/A	--	N/A	
								Benzo(b)fluoranthene	N/A	N/A	--	N/A	
								Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
								Aluminum	CNS	3.2E-02	--	1.0E-03	3.3E-02
								Arsenic	Skin/Vascular	5.4E-02	--	5.1E-03	5.9E-02
								Chromium	NOAEL	2.0E-02	--	2.6E-02	4.6E-02
								Copper	Gastrointestinal	2.0E-03	--	6.3E-05	2.0E-03
								Iron	Gastrointestinal	2.7E-01	--	8.5E-03	2.8E-01
								Lead	N/A	N/A	--	N/A	
								Manganese	CNS	3.1E-02	--	2.5E-02	5.6E-02
								Thallium	Skin/Vascular	5.3E-02	--	1.7E-03	5.5E-02
								Vanadium	Kidney	9.7E-02	--	1.2E-01	2.2E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		5.6E-01		1.9E-01	7.4E-01
						Total Risk Across Soil	0.0E+00					Total Hazard Index Across Soil	7.4E-01
						Total Risk Across All Media and All Exposure Routes	0.0E+00					Total Hazard Index Across All Media and All Exposure Routes	3.5E+01
						Total Risk Across All Media and All Exposure Routes	0.0E+00					Total Hazard Index Across All Media and All Exposure Routes	6.9E+01

Soil* is combined surface and subsurface soil.

Total Blood HI =	6.6E+00
Total Body HI =	5.4E-01
Total CNS HI =	4.1E+00
Total Gastrointestinal HI =	6.4E+00
Total Kidney HI =	1.2E+00
Total Liver HI =	1.5E+01
Total NOAEL HI =	7.4E-01
Total Prostrate =	1.8E-02
Total Respiratory HI =	2.2E-01
Total Skin HI =	4.6E-01
Total Spleen HI =	2.3E-01
Total Vascular HI =	4.6E-01

TABLE 9.12.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Toluene	N/A	--	N/A							
			Vinyl chloride	7.5E-03	--	3.0E-04	7.9E-03						
			cis-1,2-Dichloroethene	N/A	--	N/A							
			4-Methylphenol	N/A	--	N/A							
			1,3-Dinitrobenzene	N/A	--	N/A							
			2,4,6-Trinitrotoluene	3.7E-07	--	6.9E-09	3.7E-07						
			RDX	7.4E-07	--	4.4E-09	7.4E-07						
			Aluminum	N/A	--	N/A							
			Antimony	N/A	--	N/A							
			Arsenic	1.9E-05	--	4.4E-08	1.9E-05						
			Chromium	N/A	--	N/A							
			Iron	N/A	--	N/A							
			Manganese	N/A	--	N/A							
			Nickel	N/A	--	N/A							
			Vanadium	N/A	--	N/A							
			(Total)	7.6E-03		3.0E-04	7.9E-03	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Tap water				7.9E-03	Total Hazard Index Across Tap water					0.0E+00
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
			Toluene	--	N/A	--							
			Vinyl chloride	--	1.9E-04	--	1.9E-04						
			cis-1,2-Dichloroethene	--	N/A	--							
			(Total)		1.9E-04		1.9E-04	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Vapors at Showerhead				1.9E-04	Total Hazard Index Across Vapors at Showerhead					0.0E+00
			Total Risk Across Shallow Groundwater				8.1E-03	Total Hazard Index Across Shallow Groundwater					0.0E+00
			Total Risk Across All Media and All Exposure Routes				8.1E-03	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 9.13.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total

TABLE 9.13.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 17 Soil											
			Benzo(a)pyrene	N/A	--	N/A	0.0E+00	Benzo(a)pyrene	N/A	N/A	--	N/A	
			Benzo(b)fluoranthene	N/A	--	N/A	0.0E+00	Benzo(b)fluoranthene	N/A	N/A	--	N/A	
			Dibenz(a,h)anthracene	N/A	--	N/A	0.0E+00	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	
			Aluminum	N/A	--	N/A	0.0E+00	Aluminum	CNS	3.1E-02	--	3.1E-04	3.1E-02
			Arsenic	N/A	--	N/A	0.0E+00	Arsenic	Skin/Vascular	5.2E-02	--	1.5E-03	5.3E-02
			Chromium	N/A	--	N/A	0.0E+00	Chromium	NOAEL	2.9E-03	--	1.2E-03	4.1E-03
			Copper	N/A	--	N/A	0.0E+00	Copper	Gastrointestinal	1.9E-03	--	1.9E-05	1.9E-03
			Iron	N/A	--	N/A	0.0E+00	Iron	Gastrointestinal	2.6E-01	--	2.6E-03	2.6E-01
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	
			Manganese	N/A	--	N/A	0.0E+00	Manganese	CNS	3.0E-02	--	7.6E-03	3.8E-02
			Thallium	N/A	--	N/A	0.0E+00	Thallium	Skin/Vascular	5.1E-02	--	5.1E-04	5.2E-02
			Vanadium	N/A	--	N/A	0.0E+00	Vanadium	Kidney	9.4E-02	--	3.6E-02	1.3E-01
			(Total)	0.0E+00		0.0E+00	0.0E+00	(Total)		5.2E-01		5.0E-02	5.7E-01
						Total Risk Across Soil	0.0E+00					Total Hazard Index Across Soil	5.7E-01
						Total Risk Across All Media and All Exposure Routes	0.0E+00					Total Hazard Index Across All Media and All Exposure Routes	5.7E-01

Soil* is combined surface and subsurface soil.

Total CNS HI =	6.9E-02
Total Gastrointestinal HI =	2.6E-01
Total Kidney HI =	1.3E-01
Total NOAEL HI =	4.1E-03
Total Skin HI =	1.0E-01
Total Vascular HI =	1.0E-01

TABLE 10.1.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Vinyl chloride	Liver	2.7E+01	--	1.1E+00	2.9E+01
								cis-1,2-Dichloroethene	Blood	1.2E+01	--	8.3E-01	1.2E+01
								4-Methylphenol	CNS, RESP & Whole Body	3.4E-01	--	2.7E-02	3.7E-01
								1,3-Dinitrobenzene	Spleen	3.8E-01	--	9.4E-03	3.9E-01
								2,4,6-Trinitrotoluene	Liver	3.2E-01	--	6.1E-03	3.2E-01
								Aluminum	CNS	8.6E-01	--	1.7E-03	8.6E-01
								Antimony	Whole body/Blood	2.5E-01	--	3.3E-03	2.5E-01
								Arsenic	Skin/vascular	3.7E-01	--	7.3E-04	3.7E-01
								Chromium	NOAEL	7.9E-01	--	6.3E-02	8.6E-01
								Iron	Gastrointestinal	6.5E+00	--	1.3E-02	6.5E+00
								Manganese	CNS	3.6E+00	--	1.8E-01	3.8E+00
								Nickel	Whole body	1.0E-01	--	5.0E-04	1.0E-01
								Vanadium	Kidney	1.3E+00	--	1.0E-01	1.4E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		5.4E+01		2.4E+00	5.6E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					5.6E+01
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
								Toluene	CNS	--	1.0E-01	--	1.0E-01
								Vinyl chloride	Liver	--	7.4E+00	--	7.4E+00
			(Total)		0.0E+00		0.0E+00	(Total)			7.5E+00		7.5E+00
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					7.0E+01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					5.6E+01

TABLE 10.1.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Air	Emissions from Site 17 Soil						Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)			0.0E+00		6.2E-01
			Total Risk Across Emissions from Soil				0.0E+00	Total Hazard Index Across Emissions from Soil					6.2E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					6.2E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					5.7E+01

Soil* is combined surface and subsurface soil.

Total Blood HI =	1.3E+01
Total Body HI =	7.2E-01
Total CNS HI =	5.1E+00
Total Gastrointestinal HI =	6.5E+00
Total Kidney HI =	1.4E+00
Total Liver HI =	3.6E+01
Total NOAEL HI =	8.6E-01
Total Respiratory HI =	3.7E-01
Total Skin HI =	3.7E-01
Total Spleen HI =	3.9E-01
Total Vascular HI =	3.7E-01
Total Endocrine HI =	0.0E+00

TABLE 10.2.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Vinyl chloride	Liver	6.4E+01	--	2.5E+00	6.6E+01
								cis-1,2-Dichloroethene	Blood	2.7E+01	--	1.9E+00	2.9E+01
								4-Methylphenol	CNS, RESP & Whole Body	7.9E-01	--	6.0E-02	8.5E-01
								1,3-Dinitrobenzene	Spleen	8.9E-01	--	2.1E-02	9.2E-01
								2,4,6-Trinitrotoluene	Liver	7.4E-01	--	1.4E-02	7.6E-01
								Aluminum	CNS	2.0E+00	--	5.0E-03	2.0E+00
								Antimony	Whole body/Blood	5.8E-01	--	9.5E-03	5.8E-01
								Arsenic	Skin/vascular	8.5E-01	--	2.1E-03	8.5E-01
								Chromium	NOAEL	1.9E+00	--	1.8E-01	2.0E+00
								Iron	Gastrointestinal	1.5E+01	--	3.7E-02	1.5E+01
								Manganese	CNS	8.4E+00	--	5.2E-01	8.9E+00
								Nickel	Whole body	2.3E-01	--	1.5E-03	2.4E-01
								Vanadium	Kidney	3.1E+00	--	3.0E-01	3.4E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.3E+02		5.6E+00	1.3E+02
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					1.3E+02
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					1.3E+02
Soil*	Soil	Site 17 Soil											
								Aluminum	CNS	1.0E-01	--	1.9E-03	1.1E-01
								Arsenic	Skin/vascular	2.4E-01	--	1.3E-02	2.5E-01
								Chromium	NOAEL	6.9E-02	--	5.2E-02	1.5E+02
								Iron	Gastrointestinal	1.2E+00	--	2.2E-02	1.3E+02
								Manganese	CNS	1.7E-01	--	8.1E-02	2.5E-01
								Thallium	Skin/vascular	1.8E-01	--	3.4E-03	1.9E-01
								Vanadium	Kidney	3.1E-01		2.2E-01	1.4E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.3E+00		4.0E-01	2.8E+02
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					2.8E+02

TABLE 10.2.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Air	Emissions from Site 17 Soil						Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				0.0E+00	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					2.8E+02
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					4.1E+02

Soil* is combined surface and subsurface soil.

Total Blood HI =	2.9E+01
Total Body HI =	1.7E+00
Total CNS HI =	1.2E+01
Total Gastrointestinal HI =	1.5E+02
Total Kidney HI =	4.9E+00
Total Liver HI =	6.7E+01
Total NOAEL HI =	1.5E+02
Total Respiratory HI =	8.5E-01
Total Skin HI =	1.3E+00
Total Spleen HI =	9.2E-01
Total Vascular HI =	1.3E+00
Total Endocrine HI =	0.0E+00

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Vinyl chloride	6.1E-02	--	2.5E-03	6.3E-02						
			2,4,6-Trinitrotoluene	2.6E-06	--	4.9E-08	2.6E-06						
			RDX	5.4E-06	--	3.2E-08	5.5E-06						
			Arsenic	9.0E-05	--	1.9E-07	9.0E-05						
			(Total)	6.1E-02		2.5E-03	6.3E-02	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Tap water				6.3E-02	Total Hazard Index Across Tap water					0.0E+00
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
			Vinyl chloride	--	2.2E-03	--	2.2E-03						
			cis-1,2-Dichloroethene	--	N/A	--							
			(Total)		2.2E-03		2.2E-03	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Vapors at Showerhead				2.2E-03	Total Hazard Index Across Vapors at Showerhead					0.0E+00
			Total Risk Across Shallow Groundwater				6.6E-02	Total Hazard Index Across Shallow Groundwater					0.0E+00
Soil*	Air	Emissions from Site 17 Soil											
			Trichloroethene	--	4.6E-09	--	4.6E-09						
			(Total)	0.0E+00	4.6E-09	0.0E+00	4.6E-09	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				4.6E-09	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				4.6E-09	Total Hazard Index Across Soil					0.0E+00
			Total Risk Across All Media and All Exposure Routes				6.6E-02	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 10.4.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Water						Vinyl chloride	Liver	--	--	5.3E-01	5.3E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)				5.3E-01	5.3E-01
			Total Risk Across Shallow Aquifer - Water				0.0E+00	Total Hazard Index Across Shallow Aquifer - Water					5.3E-01
Groundwater	Air	Shallow Aquifer-Volatilization						Vinyl chloride	Liver	--	7.0E-01	--	7.0E-01
			(Total)		0.0E+00		0.0E+00	(Total)			7.0E-01		7.0E-01
			Total Risk Across Shallow Aquifer - Volatilization				0.0E+00	Total Hazard Index Across Shallow Aquifer - Volatilization					7.0E-01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					1.2E+00
Soil*	Soil	Site 17 Soil						Iron	Gastrointestinal	4.4E-01	--	1.2E-02	4.5E-01
								Manganese	CNS	6.3E-02	--	4.2E-02	1.1E-01
								Vanadium	Kidney	1.1E-01	--	1.2E-01	2.3E-01
			(Total)	0.0E+00		0.0E+00	0.0E+00	(Total)		6.2E-01		1.7E-01	7.9E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					7.9E-01
Soil*	Air	Emissions from Site 17 Soil		--	1.2E-10	--	1.2E-10	Trichloroethene	CNS, Liver, Endocrine system	--	N/A	--	0.0E+00
			(Total)	0.0E+00	1.2E-10	0.0E+00	1.2E-10	(Total)			0.0E+00		0.0E+00
			Total Risk Across Emissions from Soil				1.2E-10	Total Hazard Index Across Emissions from Soil					0.0E+00
			Total Risk Across Soil				1.2E-10	Total Hazard Index Across Soil					7.9E-01
			Total Risk Across All Media and All Exposure Routes				1.2E-10	Total Hazard Index Across All Media and All Exposure Routes					1.2E+00

Soil* is combined surface and subsurface soil.

	1.2E+00
Total Liver HI =	1.2E+00
Total Gastrointestinal HI =	4.5E-01
Total CNS HI =	1.2E+00
Total Kidney HI =	2.3E-01
Total Endorcrine HI =	0.0E+00

TABLE 10.5.CT
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water						Vinyl chloride	Liver	4.3E+00	--	2.3E-01	4.6E+00
								cis-1,2-Dichloroethene	Blood	1.8E+00	--	1.7E-01	2.0E+00
								Aluminum	CNS	1.5E-01	--	3.9E-04	1.5E-01
								Arsenic	Skin/vascular	1.0E-01	--	2.6E-04	1.0E-01
								Chromium	NOAEL	1.9E-01	--	2.0E-02	2.1E-01
								Iron	Gastrointestinal	1.8E+00	--	4.7E-03	1.8E+00
								Manganese	CNS	9.3E-01	--	6.0E-02	9.9E-01
								Vanadium	Kidney	2.6E-01		2.5E-02	2.8E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		9.6E+00		4.8E-01	9.9E+00
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					9.9E+00
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead						Vinyl chloride	Liver	--	1.7E+00	--	1.7E+00
			(Total)		0.0E+00		0.0E+00	(Total)			1.7E+00		1.7E+00
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					1.7E+00
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					1.2E+01
Soil*	Air	Emissions from Site 17 Soil						Trichloroethene	CNS, Liver, Endocrine system	--	#REF!	--	#REF!
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)			#REF!		#REF!
			Total Risk Across Emissions from Soil				0.0E+00	Total Hazard Index Across Emissions from Soil					#REF!
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					#REF!
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.2E+01

Soil* is combined surface and subsurface soil.

Total Blood HI =	2.0E+00
Total CNS HI =	1.1E+00
Total Gastrointestinal HI =	1.8E+00
Total Liver HI =	6.2E+00
Total NOAEL HI =	2.1E-01
Total Skin HI =	1.0E-01
Total Vascular HI =	1.0E-01
Total Kidney HI =	1.7E+00

TABLE 10.6.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Vinyl chloride	Liver	1.4E+01	--	5.0E-01	1.5E+01
								cis-1,2-Dichloroethene	Blood	6.0E+00	--	3.6E-01	6.4E+00
								4-Methylphenol	CNS, RESP & Whole Body	2.0E-01	--	1.3E-02	2.2E-01
								1,3-Dinitrobenzene	Spleen	2.3E-01	--	4.7E-03	2.3E-01
								2,4,6-Trinitrotoluene	Liver	2.0E-01	--	3.2E-03	2.0E-01
								Aluminum	CNS	5.1E-01	--	1.1E-03	5.1E-01
								Antimony	Whole body/Blood	2.4E-01	--	3.4E-03	2.4E-01
								Arsenic	Skin/vascular	3.4E-01	--	7.3E-04	3.4E-01
								Chromium	NOAEL	6.4E-01	--	5.5E-02	7.0E-01
								Iron	Gastrointestinal	6.1E+00	--	1.3E-02	6.2E+00
								Manganese	CNS	3.1E+00	--	1.7E-01	3.3E+00
								Vanadium	Kidney	8.5E-01	--	7.0E-02	9.2E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		3.3E+01		1.2E+00	3.4E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					3.4E+01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					3.4E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.4E+01

Soil* is combined surface and subsurface soil.

Total Blood HI =	6.6E+00
Total Body HI =	4.6E-01
Total CNS HI =	4.1E+01
Total Gastrointestinal HI =	3.5E+01
Total Kidney HI =	9.2E-01
Total Liver HI =	1.5E+01
Total NOAEL HI =	4.6E-01
Total Respiratory HI =	2.2E-01
Total Skin HI =	3.4E-01
Total Spleen HI =	2.3E-01
Total Vascular HI =	3.4E-01

TABLE 10.7.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 17, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Vinyl chloride	7.5E-03	--	3.0E-04	7.9E-03						
			Arsenic	1.9E-05	--	4.4E-08	1.9E-05						
			(Total)	7.6E-03		3.0E-04	7.9E-03	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Tap water				7.9E-03	Total Hazard Index Across Tap water					0.0E+00
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
			Vinyl chloride	--	1.9E-04	--	1.9E-04						
			(Total)		1.9E-04		1.9E-04	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Vapors at Showerhead				1.9E-04	Total Hazard Index Across Vapors at Showerhead					0.0E+00
			Total Risk Across Shallow Groundwater				8.1E-03	Total Hazard Index Across Shallow Groundwater					0.0E+00
			Total Risk Across All Media and All Exposure Routes				8.1E-03	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 21, NDWIH

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	Site 21 Surface Soil	Trespasser/Visitor	Adolescent	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
					Adult	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Site workers may contact site surface soil.
						Ingestion	On-site	Quant	Site workers may contact site surface soil.
		Air	Emissions from Site 21 Soil	Trespasser/Visitor	Adolescent	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale emissions from soil.
					Adult	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale emissions from soil.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Site workers may be exposed to vapors or fugitive dust from Site 21 soils during maintenance activities, site inspections, or daily duties.
Future	Groundwater	Groundwater	Shallow Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child/Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
			Shallow Aquifer - Water	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers may contact groundwater while performing construction or excavation activities.
						Ingestion	On-site	None	Incidental ingestion of groundwater by construction workers would be minimal during construction or excavation activities.
		Air	Shallow Aquifer - Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Inhalation	On-site	None	Children are assumed not to shower.
					Child/Adult	Inhalation	On-site	None	Adult will be used to evaluate child/adult since children are assumed not to shower.
			Shallow Aquifer - Volatilization	Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors from groundwater while performing construction or excavation activities.

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
1634-04-4	Methyl-tert-butyl ether (MTBE)	0.013	J	0.013	J	MG/KG	IS21SS070001	1/17	0.011 - 0.018	0.013	N/A	N/A	2.8	SSL	NO	NTX
100-42-5	Styrene	0.0015	J	0.0015	J	MG/KG	IS21SS040001	1/17	0.011 - 0.018	0.0015	N/A	1,564 N	5.7	SSL	NO	BSL
108-88-3	Toluene	0.0026	J	0.0063	J	MG/KG	IS21SS090001	2/17	0.011 - 0.018	0.0063	N/A	1,564 N	0.879	SSL	NO	BSL
1330-20-7	Xylene, total	0.0018	J	0.0018	J	MG/KG	IS21SS110001	1/17	0.011 - 0.018	0.0018	N/A	15,643 N	17	SSL	NO	BSL
120-12-7	Anthracene	0.045	J	0.045	J	MG/KG	IS21SS050001	1/17	0.37 - 0.58	0.045	N/A	2,346 N	0.0000218	SSL	NO	BSL
56-55-3	Benzo(a)anthracene	0.072	J	0.26	J	MG/KG	IS21SS050001	11/17	0.37 - 0.58	0.26	N/A	0.875 C	1.46	SSL	NO	BSL
50-32-8	Benzo(a)pyrene	0.045	J	0.081	J	MG/KG	IS21SS050001	7/17	0.37 - 0.58	0.081	N/A	0.0875 C	0.374	SSL	NO	BSL
205-99-2	Benzo(b)fluoranthene	0.049	J	0.38	J	MG/KG	IS21SS120001	12/17	0.37 - 0.58	0.38	N/A	0.875 C	4.51	SSL	NO	BSL
207-08-9	Benzo(k)fluoranthene	0.042	J	0.17	J	MG/KG	IS21SS050001	10/17	0.37 - 0.58	0.17	N/A	8.75 C	45.1	SSL	NO	BSL
218-01-9	Chrysene	0.087	J	0.33	J	MG/KG	IS21SS120001	11/17	0.37 - 0.58	0.33	N/A	87.5 C	146	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.041	J	0.048	J	MG/KG	IS21SS120001	2/17	0.37 - 0.58	0.048	N/A	0.0875 C	139	SSL	NO	BSL
84-66-2	Diethylphthalate	0.076	J	1.2		MG/KG	IS21SS120001	2/17	0.37 - 0.58	1.2	N/A	6,257 N	45.3	SSL	NO	BSL
206-44-0	Fluoranthene	0.046	J	0.53		MG/KG	IS21SS050001	13/17	0.37 - 0.58	0.53	N/A	313 N	625	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.047	J	0.081	J	MG/KG	IS21SS120001	6/17	0.37 - 0.58	0.081	N/A	0.875 C	12.7	SSL	NO	BSL
85-01-8	Phenanthrene	0.063	J	0.34	J	MG/KG	IS21SS120001	10/17	0.37 - 0.58	0.34	N/A	235 N	N/A		NO	BSL
129-00-0	Pyrene	0.059	J	0.28	J	MG/KG	IS21SS120001	11/17	0.37 - 0.58	0.28	N/A	235 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.043	J	0.076	J	MG/KG	IS21SS010001	11/17	0.37 - 0.58	0.076	N/A	45.6 C	2890	SSL	NO	BSL
7790-98-9	Ammonium perchlorate	0.081	J	0.081	J	MG/KG	IS21SS130001P	1/17	0.0046 - 0.0046	0.081	N/A	21 N	N/A		NO	BSL
2691-41-0	HMX	0.19	J	0.19	J	MG/KG	IS21SS060001	1/17	0.5 - 0.5	0.19	N/A	391 N	N/A		NO	BSL
556-88-7	Nitroguanidine	0.068	J	0.068	J	MG/KG	IS21SS060001	1/17	0.1 - 0.1	0.068	N/A	N/A	N/A		NO	NTX
7429-90-5	Aluminum	3,820		9,830		MG/KG	IS21SS010001	17/17	4.2 - 6.6	9830	N/A	7,821 N	N/A		YES	ASL
7440-38-2	Arsenic	3.6		51.8		MG/KG	IS21SS140001	17/17	0.81 - 1.3	51.8	N/A	0.426 C	0.0261	SSL	YES	ASL
7440-39-3	Barium	24.8	J	67.6	J	MG/KG	IS21SS010001	17/17	0.09 - 0.14	67.6	N/A	548 N	211	SSL	NO	BSL
7440-41-7	Beryllium	0.066	J	0.066	J	MG/KG	IS21SS130001P	1/17	0.045 - 0.07	0.066	N/A	15.6 N	120	SSL	NO	BSL
7440-43-9	Cadmium	0.15	J	1.5		MG/KG	IS21SS020001	10/17	0.09 - 0.14	1.5	N/A	3.91 N	5.5	SSL	NO	BSL
7440-70-2	Calcium	208	J	4,870		MG/KG	IS21SS050001	17/17	1.9 - 2.9	4870	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	10.4		36.6		MG/KG	IS21SS030001	17/17	0.45 - 0.7	36.6	N/A	23.5 N	4.2	SSL	YES	ASL
7440-48-4	Cobalt	2.2	J	7.9	J	MG/KG	IS21SS010001	17/17	0.5 - 0.78	7.9	N/A	469 N	N/A		NO	BSL
7440-50-8	Copper	7.1	K	48.1	K	MG/KG	IS21SS130001	17/17	0.43 - 0.67	48.1	N/A	313 N	1050	SSL	NO	BSL
57-12-5	Cyanide	0.18		0.66		MG/KG	IS21SS150001	12/17	0.56 - 0.88	0.66	N/A	156 N	14.7	SSL	NO	BSL
7439-89-6	Iron	9,310		29,500		MG/KG	IS21SS040001	17/17	6.2 - 9.6	29500	N/A	2,346 N	N/A		YES	ASL
7439-92-1	Lead	10.5		57.1		MG/KG	IS21SS010001	17/17	0.29 - 0.46	57.1	N/A	400	N/A		NO	BSL
7439-95-4	Magnesium	534	J	1,630		MG/KG	IS21SS050001	17/17	3 - 4.7	1630	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	32.6		398		MG/KG	IS21SS150001	17/17	0.09 - 0.14	398	N/A	156 N	95.2	SSL	YES	ASL
7439-97-6	Mercury	0.06	J	1.5		MG/KG	IS21SS060001	14/17	0.056 - 0.088	1.5	N/A	2.35 N	N/A		NO	BSL
7440-02-0	Nickel	5.2	J	19.2		MG/KG	IS21SS140001	17/17	0.43 - 0.67	19.2	N/A	156 N	N/A		NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-09-7	Potassium	317	J	720	J	MG/KG	IS21SS040001	17/17	11.8 - 18.5	720	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	1.1	L	2.7	L	MG/KG	IS21SS140001	3/17	0.97 - 1.5	2.7	N/A	39.1 N	1.9	SSL	NO	BSL
7440-22-4	Silver	16.5		16.5		MG/KG	IS21SS140001	1/17	0.7 - 1.1	16.5	N/A	39.1 N	3.1	SSL	NO	BSL
7440-23-5	Sodium	107	J	271	J	MG/KG	IS21SS170001	5/17	98.9 - 155	271	N/A	N/A	N/A		NO	NUT
7440-62-2	Vanadium	18.7		65.1		MG/KG	IS21SS140001	17/17	0.32 - 0.49	65.1	N/A	54.8 N	511	SSL	YES	ASL
7440-66-6	Zinc	15.5	J	134	J	MG/KG	IS21SS100001	17/17	0.14 - 0.21	134	N/A	2,346 N	1360	SSL	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table, October 27, 1999, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for technical-BHC used as surrogate for delta-BHC.
RBC value for endosulfan used as surrogate for endosulfan I, endosulfan II, and endosulfan sulfate.
RBC value for endrin used as surrogate for endrin aldehyde.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for chlordane used as surrogate for gamma-chlordane.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
Ammonium perchlorate screening toxicity value calculated using provisional RfD (see text).

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 21 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
1634-04-4	Methyl-tert-butyl ether (MTBE)	9.8E-12	J	9.8E-12	J	MG/M^3	IS21SS070001	1/19	(6)	9.8E-12	N/A	3.10E-01 N	N/A	N/A	NO	BSL
100-42-5	Styrene	8.6E-08	J	8.6E-08	J	MG/M^3	IS21SS040001	1/18	(6)	8.6E-08	N/A	1.0E-01 N	N/A	N/A	NO	BSL
108-88-3	Toluene	5.0E-07	J	1.2E-06	J	MG/M^3	IS21SS090001	1/18	(6)	1.2E-06	N/A	4.2E-02 N	N/A	N/A	NO	BSL
1330-20-7	Xylene, total	2.4E-07	J	2.4E-07	J	MG/M^3	IS21SS110001	1/18	(6)	2.4E-07	N/A	7.3E-01 N	N/A	N/A	NO	BSL
120-12-7	Anthracene	4.4E-08	J	4.4E-08	J	MG/M^3	IS21SS050001	1/19	(6)	4.4E-08	N/A	1.1E-01 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	5.5E-11	J	2.0E-10	J	MG/M^3	IS21SS050001	11/19	(6)	2.0E-10	N/A	8.6E-06 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	3.4E-11	J	6.1E-11	J	MG/M^3	IS21SS050001	7/19	(6)	6.1E-11	N/A	2.0E-06 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	3.7E-11	J	2.9E-10	J	MG/M^3	IS21SS120001	12/19	(6)	2.9E-10	N/A	8.6E-06 C	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	3.2E-11	J	1.3E-10	J	MG/M^3	IS21SS050001	10/19	(6)	1.3E-10	N/A	8.6E-05 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	6.6E-11	J	2.5E-10	J	MG/M^3	IS21SS120001	11/19	(6)	2.5E-10	N/A	8.6E-04 C	N/A	N/A	NO	BSL
53-70-3	Dibenz(a,h)anthracene	3.1E-11	J	3.6E-11	J	MG/M^3	IS21SS120001	2/19	(6)	3.6E-11	N/A	8.6E-07 C	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	5.8E-11	J	9.1E-10		MG/M^3	IS21SS120001	2/19	(6)	9.1E-10	N/A	2.9E-01 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	3.5E-11	J	4.0E-10		MG/M^3	IS21SS050001	13/19	(6)	4.0E-10	N/A	1.5E-01 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	3.6E-11	J	6.1E-11	J	MG/M^3	IS21SS120001	6/19	(6)	6.1E-11	N/A	8.6E-06 C	N/A	N/A	NO	BSL
85-01-8	Phenanthrene	4.8E-11	J	2.6E-10	J	MG/M^3	IS21SS120001	10/19	(6)	2.6E-10	N/A	1.1E-02 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	1.2E-08	J	5.7E-08	J	MG/M^3	IS21SS120001	11/19	(6)	5.7E-08	N/A	1.1E-02 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	3.3E-11	J	5.8E-11	J	MG/M^3	IS21SS010001	11/19	(6)	5.8E-11	N/A	4.5E-04 C	N/A	N/A	NO	BSL
7790-98-9	Ammonium perchlorate	6.1E-11	J	6.1E-11	J	MG/M^3	IS21SS130001P	1/20	(6)	6.1E-11	N/A	N/A	N/A	N/A	NO	NTX
2691-41-0	HMX	1.4E-10	J	1.4E-10	J	MG/M^3	IS21SS060001	1/20	(6)	1.4E-10	N/A	1.8E-02 N	N/A	N/A	NO	BSL
556-88-7	Nitroguanidine	5.2E-11	J	5.2E-11	J	MG/M^3	IS21SS060001	1/20	(6)	5.2E-11	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	2.9E-06		7.4E-06		MG/M^3	IS21SS200001	20/20	(6)	7.4E-06	N/A	3.7E-04 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	2.7E-09		3.9E-08		MG/M^3	IS21SS140001	20/20	(6)	3.9E-08	N/A	4.1E-07 C	N/A	N/A	NO	BSL
7440-39-3	Barium	1.9E-08	J	5.1E-08	J	MG/M^3	IS21SS010001	20/20	(6)	5.1E-08	N/A	5.1E-05 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	5.0E-11	J	5.0E-11	J	MG/M^3	IS21SS130001P	1/20	(6)	5.0E-11	N/A	7.5E-08 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	1.1E-10	J	1.1E-09		MG/M^3	IS21SS020001	11/20	(6)	1.1E-09	N/A	9.9E-07 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	1.6E-07	J	3.7E-06		MG/M^3	IS21SS050001	20/20	(6)	3.7E-06	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	7.9E-09		2.8E-08		MG/M^3	IS21SS030001	20/20	(6)	2.8E-08	N/A	1.5E-07 N	N/A	N/A	NO	BSL
7440-48-4	Cobalt	1.7E-09	J	6.0E-09	J	MG/M^3	IS21SS010001	20/20	(6)	6.0E-09	N/A	2.2E-02 N	N/A	N/A	NO	BSL
7440-50-8	Copper	5.4E-09	K	3.6E-08	K	MG/M^3	IS21SS130001	20/20	(6)	3.6E-08	N/A	1.5E-02 N	N/A	N/A	NO	BSL
57-12-5	Cyanide	1.4E-10		5.0E-10		MG/M^3	IS21SS190001	15/20	(6)	5.0E-10	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7439-89-6	Iron	7.1E-06		2.2E-05		MG/M^3	IS21SS040001	20/20	(6)	2.2E-05	N/A	1.1E-01 N	N/A	N/A	NO	BSL
7439-92-1	Lead	8.0E-09		4.3E-08		MG/M^3	IS21SS010001	20/20	(6)	4.3E-08	N/A	N/A	N/A	N/A	NO	NTX
7439-95-4	Magnesium	4.0E-07	J	1.2E-06		MG/M^3	IS21SS050001	20/20	(6)	1.2E-06	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	2.5E-08		3.0E-07		MG/M^3	IS21SS150001	20/20	(6)	3.0E-07	N/A	5.2E-06 N	N/A	N/A	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 21 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7439-97-6	Mercury	4.5E-11	J	1.14E-09		MG/M^3	IS21SS060001	16/20	(6)	1.1E-09	N/A	3.1E-05 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	3.9E-09	J	1.5E-08		MG/M^3	IS21SS140001	20/20	(6)	1.5E-08	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	2.4E-07	J	5.5E-07	J	MG/M^3	IS21SS040001	20/20	(6)	5.5E-07	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	8.3E-10	L	2.0E-09	L	MG/M^3	IS21SS140001	3/20	(6)	2.0E-09	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-22-4	Silver	1.3E-08		1.3E-08		MG/M^3	IS21SS140001	1/20	(6)	1.3E-08	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	8.1E-08	J	2.1E-07	J	MG/M^3	IS21SS170001	5/20	(6)	2.1E-07	N/A	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	1.4E-08		4.9E-08		MG/M^3	IS21SS140001	20/20	(6)	4.9E-08	N/A	2.6E-03 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	1.2E-08	J	1.0E-07	J	MG/M^3	IS21SS100001	20/20	(6)	1.0E-07	N/A	1.1E-01 N	N/A	N/A	NO	BSL

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.2.A.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table, October 5, 2000, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for mercuric chloride used for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(6) See Table 2.1 for surface soil data detection limits, concentrations converted from surface soil data to air concentrations.

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 21, NDWIH

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
Methyl-tert-butyl ether (MTBE)	7.40E-02	2.40E-02	N/A	1.12E01	6.72E-02	N/A	
Styrene	7.10E-02	1.13E-01	8.00E-06	7.76E+02	4.66E+00	3.10E+02	
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E00	5.26E+02	
Xylene, total	7.80E-02	2.76E-01	8.75E-06	3.86E+02	2.32E00	1.75E+02	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
106-46-7	1,4-Dichlorobenzene	1.3	J	1.3	J	UG/L	IS21MW020900	1/3	10 - 10	1.3	N/A	0.473 C	75	PMCL	YES	ASL
67-64-1	Acetone	2.7	J	2.7	J	UG/L	IS21MW010900	1/3	10 - 10	2.7	N/A	60.8 N	N/A		NO	BSL
108-90-7	Chlorobenzene	2.2	J	2.2	J	UG/L	IS21MW020900	1/3	10 - 10	2.2	N/A	10.6 N	N/A		NO	BSL
108-88-3	Toluene	1.4	J	1.4	J	UG/L	IS21MW020900	1/3	10 - 10	1.4	N/A	74.7 N	1000	PMCL	NO	BSL
99-35-4	1,3,5-Trinitrobenzene	0.19	J	0.19	J	UG/L	IS21MW020900	1/3	0.2 - 0.2	0.19	N/A	110 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	0.053	J	0.053	J	UG/L	IS21MW010900	1/3	0.2 - 0.2	0.053	N/A	0.365 N	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	0.098	J	0.13	J	UG/L	IS21MW020900	2/3	0.2 - 0.2	0.13	N/A	7.3 N	N/A		NO	BSL
7790-98-9	Ammonium perchlorate	2	J	2	J	UG/L	IS21MW010900	1/3	0.23 - 0.23	2	N/A	1 N	N/A		YES	ASL
7429-90-5	Aluminum	705		705		UG/L	IS21MW030900P	1/3	18.8 - 19.9	705	N/A	3,650 N	50 - 200	SMCL	NO	BSL
7440-39-3	Barium	33.3	J	113	J	UG/L	IS21MW020900	3/3	0.15 - 0.4	113	N/A	256 N	2000	PMCL	NO	BSL
7440-43-9	Cadmium	0.74	J	0.74	J	UG/L	IS21MW030900	1/3	0.25 - 0.4	0.74	N/A	1.83 N	5	PMCL	NO	BSL
7440-70-2	Calcium	1,890	J	34,400		UG/L	IS21MW020900	3/3	7.7 - 8.2	34400	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	7	J	7	J	UG/L	IS21MW030900	1/3	1.1 - 2	7	N/A	11.0 N	100	PMCL	NO	BSL
7440-48-4	Cobalt	8.9	J	179		UG/L	IS21MW020900	3/3	0.83 - 2.2	179	N/A	219 N	N/A		NO	BSL
7440-50-8	Copper	7.3	J	28.9		UG/L	IS21MW030900P	3/3	1.3 - 1.9	28.9	N/A	146 N	1000	SMCL	NO	BSL
7439-89-6	Iron	335		16,300		UG/L	IS21MW020900	2/3	16 - 27.3	16300	N/A	1,095 N	300	SMCL	YES	ASL
7439-92-1	Lead	4		4		UG/L	IS21MW030900P	1/3	1.3 - 1.9	4	N/A	15	15	AL	NO	BSL
7439-95-4	Magnesium	1,050	J	34,600		UG/L	IS21MW030900P	3/3	13.4 - 14.2	34600	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	64.6	J	24,700		UG/L	IS21MW020900	3/3	0.15 - 0.4	24700	N/A	73 N	50	SMCL	YES	ASL
7440-02-0	Nickel	46.9		67.5		UG/L	IS21MW030900	2/3	1.9 - 2	67.5	N/A	73 N	N/A		NO	BSL
7440-09-7	Potassium	2,080	J	8,460		UG/L	IS21MW020900	3/3	19.5 - 52.4	8460	N/A	N/A	N/A		NO	NUT
7440-22-4	Silver	2.4	J	2.4	J	UG/L	IS21MW020900	1/3	1.1 - 3.1	2.4	N/A	18.3 N	100	SMCL	NO	BSL
7440-23-5	Sodium	12,100		82,600		UG/L	IS21MW020900	3/3	244 - 439	82600	N/A	N/A	N/A		NO	NUT
7440-28-0	Thallium	6.2	J	6.2	J	UG/L	IS21MW010900	1/3	5.3 - 6.8	6.2	N/A	0.256 N	2	PMCL	YES	ASL
7440-66-6	Zinc	49.9	J	209		UG/L	IS21MW020900	3/3	0.6 - 1.2	209	N/A	1,095 N	5000	SMCL	NO	BSL

[1] Minimum/Maximum detected concentration. Used filtered metals data since order of magnitude difference between filtered and unfiltered samples.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 5, 2000, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for mercuric chloride used for mercury.
Lead screening toxicity value is 15 ug/L, the EPA Safe Drinking Water Act action level for lead.
Ammonium perchlorate screening toxicity value calculated using provisional RfD (see text).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

Below Screening Level (BSL)

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
106-46-7	1,4-Dichlorobenzene	1.3	J	1.3	J	UG/L	IS21MW020900	1/3	10 - 10	1.3	N/A	0.473 C	75	PMCL	YES	ASL
67-64-1	Acetone	2.7	J	2.7	J	UG/L	IS21MW010900	1/3	10 - 10	2.7	N/A	60.8 N	N/A		NO	BSL
108-90-7	Chlorobenzene	2.2	J	2.2	J	UG/L	IS21MW020900	1/3	10 - 10	2.2	N/A	10.6 N	N/A		NO	BSL
108-88-3	Toluene	1.4	J	1.4	J	UG/L	IS21MW020900	1/3	10 - 10	1.4	N/A	74.7 N	1000	PMCL	NO	BSL
99-35-4	1,3,5-Trinitrobenzene	0.19	J	0.19	J	UG/L	IS21MW020900	1/3	0.2 - 0.2	0.19	N/A	110 N	N/A		NO	BSL
99-65-0	1,3-Dinitrobenzene	0.053	J	0.053	J	UG/L	IS21MW010900	1/3	0.2 - 0.2	0.053	N/A	0.365 N	N/A		NO	BSL
121-14-2	2,4-Dinitrotoluene	0.098	J	0.13	J	UG/L	IS21MW020900	2/3	0.2 - 0.2	0.13	N/A	7.3 N	N/A		NO	BSL
7790-98-9	Ammonium perchlorate	2	J	2	J	UG/L	IS21MW010900	1/3	0.23 - 0.23	2	N/A	1 N	N/A		YES	ASL
7429-90-5	Aluminum	190	J	5,180	J	UG/L	IS21MW030900	3/3	18.8 - 19.9	5180	N/A	3,650 N	50 - 200	SMCL	YES	ASL
7440-38-2	Arsenic	3.6	J	3.6	J	UG/L	IS21MW030900	1/3	3.2 - 3.6	3.6	N/A	0.0446 C	5	PMCL	YES	ASL
7440-39-3	Barium	35.2	J	108	J	UG/L	IS21MW020900	3/3	0.15 - 0.4	108	N/A	256 N	2000	PMCL	NO	BSL
7440-43-9	Cadmium	0.76	J	0.76	J	UG/L	IS21MW030900	1/3	0.25 - 0.4	0.76	N/A	1.83 N	5	PMCL	NO	BSL
7440-70-2	Calcium	1,720	J	29,700	J	UG/L	IS21MW020900	3/3	7.7 - 8.2	29700	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	83.2	J	103	J	UG/L	IS21MW020900	2/3	1.1 - 2	103	N/A	11.0 N	100	PMCL	YES	ASL
7440-48-4	Cobalt	9.5	J	161	J	UG/L	IS21MW020900	3/3	0.83 - 2.2	161	N/A	219 N	N/A		NO	BSL
7440-50-8	Copper	5.3	J	47.5	J	UG/L	IS21MW030900	3/3	1.3 - 1.9	47.5	N/A	146 N	1000	SMCL	NO	BSL
57-12-5	Cyanide	1.7	L	1.7	L	UG/L	IS21MW020900 IS21MW030900	2/3	10 - 10	1.7	N/A	73 N	200	PMCL	NO	BSL
7439-89-6	Iron	97.3	L	24,200	L	UG/L	IS21MW020900	3/3	16 - 27.3	24200	N/A	1,095 N	300	SMCL	YES	ASL
7439-92-1	Lead	3.9	L	9	L	UG/L	IS21MW030900	2/3	1.3 - 1.9	9	N/A	15	15	AL	NO	BSL
7439-95-4	Magnesium	1,090	L	31,100	L	UG/L	IS21MW030900	3/3	13.4 - 14.2	31100	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	66.5	L	23,100	L	UG/L	IS21MW020900	3/3	0.15 - 0.4	23100	N/A	73 N	50	SMCL	YES	ASL
7439-97-6	Mercury	0.1		0.12	J	UG/L	IS21MW030900P	2/3	0.1 - 0.1	0.12	N/A	1.10 N	2	PMCL	NO	BSL
7440-02-0	Nickel	6.8		85.7	J	UG/L	IS21MW020900	3/3	1.9 - 2	85.7	N/A	73 N	N/A		YES	ASL
7440-09-7	Potassium	2,120		7,590	J	UG/L	IS21MW020900	3/3	19.5 - 52.4	7590	N/A	N/A	N/A		NO	NUT
7440-22-4	Silver	1.3		1.3	J	UG/L	IS21MW020900	1/3	1.1 - 3.1	1.3	N/A	18.3 N	100	SMCL	NO	BSL
7440-23-5	Sodium	12,400		72,700	J	UG/L	IS21MW020900	3/3	244 - 439	72700	N/A	N/A	N/A		NO	NUT
7440-62-2	Vanadium	6.5	J	12.5	J	UG/L	IS21MW030900	2/3	0.76 - 1.4	12.5	N/A	25.6 N	N/A		NO	BSL
7440-66-6	Zinc	30.7	J	164	J	UG/L	IS21MW020900	3/3	0.6 - 1.2	164	N/A	1,095 N	5000	PMCL	NO	BSL

[1] Minimum/Maximum detected concentration. Unfiltered results for metals since construction worker expected to directly contact groundwater.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 5, 2000, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for mercuric chloride used for mercury.
Lead screening toxicity value is 15 ug/L, the EPA Safe Drinking Water Act action level for lead.
Ammonium perchlorate screening toxicity value calculated using provisional RfD (see text).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

Below Screening Level (BSL)

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
106-46-7	1,4-Dichlorobenzene	1.3	J	1.3	J	UG/L	IS21MW020900	1/3	10 - 10	1.3	N/A	0.473 C	75	PMCL	YES	ASL
67-64-1	Acetone	2.7	J	2.7	J	UG/L	IS21MW010900	1/3	10 - 10	2.7	N/A	60.8 N	N/A		NO	BSL
108-90-7	Chlorobenzene	2.2	J	2.2	J	UG/L	IS21MW020900	1/3	10 - 10	2.2	N/A	10.6 N	N/A		NO	BSL
108-88-3	Toluene	1.4	J	1.4	J	UG/L	IS21MW020900	1/3	10 - 10	1.4	N/A	74.7 N	1000	PMCL	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 5, 2000, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
106-46-7	1,4-Dichlorobenzene	1.3	J	1.3	J	UG/L	IS21MW020900	1/3	10 - 10	1.3	N/A	0.473 C	75	PMCL	YES	ASL
67-64-1	Acetone	2.7	J	2.7	J	UG/L	IS21MW010900	1/3	10 - 10	2.7	N/A	60.8 N	N/A		NO	BSL
108-90-7	Chlorobenzene	2.2	J	2.2	J	UG/L	IS21MW020900	1/3	10 - 10	2.2	N/A	10.6 N	N/A		NO	BSL
108-88-3	Toluene	1.4	J	1.4	J	UG/L	IS21MW020900	1/3	10 - 10	1.4	N/A	74.7 N	1000	PMCL	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 5, 2000, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards
AL = Action Level, Safe Drinking Water Act, Summer 2000.

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	MG/KG	6,218	6,877	9,830		MG/KG	6,963	95% UCL-T	W-Test (4)	6,063	Mean-T	W-Test (4)
Arsenic	MG/KG	14.6	19.7	51.8		MG/KG	22.7	95% UCL-T	W-Test (1)	11.1	Mean-T	W-Test (1)
Chromium	MG/KG	14.7	17.3	36.6		MG/KG	16.8	95% UCL-T	W-Test (4)	14.0	Mean-T	W-Test (4)
Iron	MG/KG	16,442	18,835	29,500		MG/KG	19,029	95% UCL-T	W-Test (1)	15,678	Mean-T	W-Test (1)
Manganese	MG/KG	138	184	398		MG/KG	221	95% UCL-T	W-Test (1)	106	Mean-T	W-Test (1)
Vanadium	MG/KG	29.3	34.2	65.1		MG/KG	34.1	95% UCL-T	W-Test (1)	27.7	Mean-T	W-Test (1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,4-Dichlorobenzene	UG/L	3.77	7.37	1.30	J	UG/L	1.30	Max.	W-test (5)	1.30	Max	W-Test (6,2)
Ammonium perchlorate	UG/L	0.74	2.6	2.0	J	UG/L	2.0	Max.	W-test (5)	0.74	Mean-N	W-Test (6)
Iron	UG/L	5,550	21,248	16,300	L	UG/L	16,300	Max.	W-test (5)	5,550	Mean-N	W-Test (6)
Manganese	UG/L	7,959	32,153	24,700	L	UG/L	24,700	Max.	W-test (5)	7,959	Mean-N	W-Test (6)
Thallium	UG/L	4.08	7.24	6.20	J	UG/L	6.20	Max.	W-test (5)	4.08	Mean-N	W-Test (6)

Full statistics for data included in Appendix. Used filtered metals data since order of magnitude difference between filtered and unfiltered samples.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,4-Dichlorobenzene	UG/L	3.77	7.37	1.30	J	UG/L	1.30	Max	W-Test (5)	1.30	Max	W-Test (6,2)
Ammonium perchlorate	UG/L	0.74	2.6	2.0	J	UG/L	2.0	Max.	W-test (5)	0.74	Mean-N	W-Test (6)
Aluminum	UG/L	2,477	6,727	5,180	J	UG/L	5,180	Max	W-Test (5)	2,477	Mean-N	W-Test (6)
Arsenic	UG/L	2.33	4.19	3.60	J	UG/L	3.60	Max	W-Test (5)	2.33	Mean-N	W-Test (6)
Chromium	UG/L	62.4	154	103	J	UG/L	103	Max	W-Test (5)	62.4	Mean-N	W-Test (6)
Iron	UG/L	10,372	31,341	24,200	L	UG/L	24,200	Max	W-Test (5)	10,372	Mean-N	W-Test (6)
Manganese	UG/L	7,959	30,072	23,100	L	UG/L	23,100	Max	W-Test (5)	7,959	Mean-N	W-Test (6)
Nickel	UG/L	59.0	135	85.7	J	UG/L	85.7	Max	W-Test (5)	59.0	Mean-N	W-Test (6)

Full statistics for data included in Appendix. Unfiltered results for metals since construction worker expected to directly contact groundwater.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,4-Dichlorobenzene	UG/L	3.77	7.37	1.30	J	UG/L	1.30	Max	W-Test (5)	1.3	Max	W-Test (6,2)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Volatilization

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,4-Dichlorobenzene	UG/L	3.77	7.37	1.30	J	UG/L	1.30	Max	W-Test (5)	1.3	Max	W-Test (6,2)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997, (4)	3,700	EPA, 1997, (4)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (5)	0.11	EPA, 1997, (5)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) Surface area is 25% of total surface area for 12-15 year old male. 95th percentile for total surface area is 1.85 m^2, 50th percentile for total surface area is 1.49 m^2.

(5) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (2)	5,700	EPA, 1997, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area is based on trespasser wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.

(3) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997, (2)	0.32	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) SSAF based on maximum adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 21 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	1.0	EPA, 1997 (5)	1.0	EPA, 1997 (5)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	9	(3)	9	(3)	
	BW	Body Weight	kg	51	EPA, 1997,(4)	51	EPA, 1997,(4)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Professional Judgment assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 9 year old and 18 year old male body weight.

(5) Inhalation rate based on child, aged 10 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 21 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997 (3)	0.6	EPA, 1997 (3)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Inhalation rate based on average adult at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 21 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.1	EPA, 1997 (2)	2.1	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	2409	EPA, 1989	

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate based on average adult at a moderate activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	20,000	EPA, 1992, (1)	18,000	EPA, 1997b, (1)	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	x CF1 x CF2
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm2, with a mean of 20,000 cm2; the mean is used.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	1	EPA, 1997a	1	EPA, 1997a	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	x CF1 x CF2
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	CDI (mg/kg-day) =
	DAevent-A	Dermally Absorbed Dose per Event, Adult	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x EF x 1/AT
	DAevent-C	Dermally Absorbed Dose per Event, Child	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	
	DA-Adj	Dermally Absorbed Dose, Age-adjusted	mg-year/event-kg	calculated		calculated		DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics:
	ET-A	Exposure Time, Adult	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	DAevent-A (mg/cm2-event) =
	ET-C	Exposure Time, Child	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET-A x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	DAevent-C (mg/cm2-event) =
	SA-A	Skin Surface Area, Adult	cm^2	20,000	EPA, 1992	18,000	EPA, 1997b	PC x CW x ET-C x CF1 x CF2
	SA-C	Skin Surface Area, Child	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	Organics:
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	DAevent-A (mg/cm2-event) =
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	2 x PC x CW x (sqrt((6 x t x ET-A)/3.1415)) x CF1 x CF2
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	DAevent-C (mg/cm2-event) =
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	2 x PC x CW x (sqrt((6 x t x ET-C)/3.1415)) x CF1 x CF2
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W-A	Ingestion Rate of Water, Adult	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
	IR-W-C	Ingestion Rate of Water, Child	liters/day	1	EPA, 1997a	1	EPA, 1997a	
	IR-W-Adj	Ingestion Rate of Water, Age-adjusted	liter-year/kg-day	1.09	calculated	0.58	calculated	IR-W-Adj (liter-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-W-C / BW-C) + (ED-A x IR-W-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table ----		see Table ----	chem. specific	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-day	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-day) =
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	PC x CW x ET x CF1 x CF2
	t*	Time to Reach Steady-state	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	B	Ratio of Permeability of Stratum Corneum to Epidermis	dimensionless	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Organics :
	ET	Exposure Time	hr/day	8	(1)	4	(1)	ET<t*: DAevent (mg/cm2-day) =
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (2)	2,000	EPA, 1992, (2)	x CF1 x CF2
	EF	Exposure Frequency	days/year	42	(3)	42	(3)	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	ET>t*: DAevent (mg/cm2-day) =
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	x CF1 x CF2
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgment based on construction activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(3) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Air

Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

Receptor Population: Resident

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	InhExp	Inhalation Exposure per Shower	mg/kg-shower	see Table …	see Table …	see Table …	see Table …	Foster & Chrostowski Shower Inhalation Model for InhExp
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	InhExp x EF x ED x 1/AT
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA. 1989	3,285	EPA. 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3	see Table --		see Table --		Two-Film Volatilization Model for CA
	IN	Inhalation Rate	m^3/hour	1.7	EPA, 1997	1.7	EPA, 1997	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	
	EF	Exposure Frequency	days/year	42	(2)	42	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1993	CA x IN x ET x EF x ED x 1/BW x 1/AT
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA. 1989	365	EPA. 1989	

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 21, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
1,4-Dichlorobenzene	Chronic	3.0E-02	mg/kg-day	0.5	1.5E-02	mg/kg-day	Liver	1000	NCEA	04/29/1997
	Subchronic	N/A								
Ammonium perchlorate	Chronic	3.0E-05	mg/kg-day	0.5	1.5E-05	mg/kg-day	Thyroid		NCEA	
	Subchronic									
Aluminum	Chronic	1.0E+00	mg/kg-day	0.27	2.7E-01	mg/kg-day	CNS	100	NCEA	08/26/1996
	Subchronic	N/A								
Arsenic	Chronic	3.0E-04	mg/kg-day	0.95	2.9E-04	mg/kg-day	Skin/vascular	3/1	IRIS	03/15/2001
	Subchronic	3.0E-04	mg/kg-day	0.95	2.9E-04	mg/kg-day	Skin/vascular	3/1	HEAST	07/98
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	0.01	3.0E-05	mg/kg-day	NOAEL	300/3	IRIS	03/15/2001
	Subchronic	2.0E-02	mg/kg-day	0.01	2.0E-04	mg/kg-day	NOAEL	100	HEAST	07/98
Iron	Chronic	3.0E-01	mg/kg-day	0.2	6.0E-02	mg/kg-day	Gastrointestinal	1	NCEA	07/23/1996
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	0.35	7.0E-03	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								
Manganese (food)	Chronic	1.4E-01	mg/kg-day	0.05	7.0E-03	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								
Nickel	Chronic	2.0E-02	mg/kg-day	0.10	2.0E-03	mg/kg-day	Whole body	300	IRIS	03/12/2001
	Subchronic	2.0E-02	mg/kg-day	0.10	2.0E-03	mg/kg-day	Whole body	300	HEAST	07/98
Thallium	Chronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin/vascular	3	EPA Region III	10/05/2000
	Subchronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin	3	HEAST	07/97
Vanadium	Chronic	7.0E-03	mg/kg-day	0.02	1.4E-04	mg/kg-day	Lifetime	100	HEAST	07/97
	Subchronic	7.0E-03	mg/kg-day	0.02	1.4E-04	mg/kg-day	Lifetime	100	HEAST	07/97

N/A = Not Applicable or Not Available.

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation*, April 8, 1999.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals - 20%.

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

RESP = Respiratory System

CNS = Central Nervous System

NOAEL = No adverse effect level

TABLE 5.2

Site 21, NDWIH

Site 21, NSWC Indian Head

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
1,4-Dichlorobenzene	Chronic	8.0E-01	mg/m^3	2.29E-01	mg/kg-day	Liver	100	IRIS	03/15/2001
	Subchronic	2.50E+00	mg/m3	7.14E-01	mg/kg-day	Liver	30	HEAST	07/98
Ammonium perchlorate	Chronic	N/A							
Aluminum	Chronic	3.50E-03	mg/m^3	1.00E-03	mg/kg-day	CNS	300	RBC	10/05/2000
	Subchronic	N/A							
Arsenic	Chronic	N/A							
Chromium (VI)	Chronic	1.1E-04	mg/m^3	3.0E-05	mg/kg-day	Respiratory	300	IRIS	03/12/2001
	Subchronic	1.05E-03	mg/m^3	3.00E-04	mg/kg-day	NOAEL	100	NCEA	11/18/1997
Iron	Chronic	N/A							
	Chronic	5.01E-05	mg/m^3	1.43E-05	mg/kg-day	CNS	1000	IRIS	03/15/2001
Manganese	Subchronic	N/A							
Nickel	Chronic	N/A							
Thallium	Chronic	N/A							
Vanadium	Chronic	N/A							

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 21, NDWIH

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
1,4-Dichlorobenzene	2.4E-02	90%	2.7E-02	$(mg/kg\text{-}day)^{-1}$	C	HEAST	07/97
Ammonium perchlorate	N/A						
Aluminum	N/A					NCEA	08/26/1996
Arsenic	1.5E+00	0.95	1.6E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/01
Chromium (hexavalent)	N/A				D	IRIS	03/08/01
Iron	N/A					NCEA	07/23/1996
Manganese	N/A				D	IRIS	03/08/01
Nickel	N/A						
Thallium	N/A					RBC	10/05/00
Vanadium	N/A						

N/A-Not available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

EPA Carcinogen Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation* , April 8, 1999.

Dermal carcinogenicity should not be assessed for the carcinogenic PAHs, as these chemicals may act directly at the point of contact.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals - 20%.

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide article date provided by NCEA.

For RBC values, provide the date of last change in the Tables.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 21, NDWIH

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
1,4-Dichlorobenzene								
Ammonium perchlorate	N/A							
Aluminum	N/A						NCEA	08/26/96
Arsenic	4.3E-03	$(ug/m3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/01
Chromium (hexavalent)	1.2E-02	$(ug/m3)^{-1}$	3500	4.2E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/01
Iron	N/A						NCEA	07/23/96
Manganese	N/A					D	IRIS	03/08/01
Nickel	N/A							
Thallium	N/A						RBC	10/05/00
Vanadium	N/A						HEAST	1991

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

N/A = Not Available

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

D - Not classifiable as a human carcinogen

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.9E-03
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	6.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-02
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	4.7E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.6E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	5.3E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.8E-02
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	6.2E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Vanadium	3.41E+01	mg/kg	3.41E+01	mg/kg	M	9.5E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.4E-03
	(Total)												4.7E-02
Dermal Absorption	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	9.8E-05	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	3.6E-04
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	1.0E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	3.6E-03
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	2.4E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	7.9E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	2.7E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	4.5E-03
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	3.1E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	4.5E-04
	Vanadium	3.41E+01	mg/kg	3.41E+01	mg/kg	M	4.8E-07	mg/kg-day	1.4E-04	mg/kg-day	N/A	N/A	3.4E-03
	(Total)												2.0E-02
												Total Hazard Index Across All Exposure Routes/Pathways	6.7E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	1.4E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.4E-03
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	4.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	3.4E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.1E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	3.9E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-02
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	4.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.2E-03
	Vanadium	3.41E+01	mg/kg	3.41E+01	mg/kg	M	6.9E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	9.9E-04
	(Total)												3.4E-02
Dermal Absorption	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	1.0E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	3.8E-04
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	1.1E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	3.8E-03
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	2.5E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	8.3E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	2.8E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	4.7E-03
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	3.3E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	4.7E-04
	Vanadium	3.41E+01	mg/kg	3.41E+01	mg/kg	M	5.0E-07	mg/kg-day	1.4E-04	mg/kg-day	N/A	N/A	3.6E-03
	(Total)												2.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.5E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	6.8E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	6.8E-03
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	2.2E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.4E-02
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	1.6E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.5E-03
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	1.9E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.2E-02
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	2.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.1E-02
	Vanadium	3.41E+01	mg/kg	3.41E+01	mg/kg	M	3.3E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	4.8E-03
	(Total)												1.6E-01
Dermal Absorption	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	1.2E-03	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	4.3E-03
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	1.2E-05	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	4.2E-02
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	2.8E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	9.3E-02
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	3.2E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	5.3E-02
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	3.7E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	5.2E-03
	Vanadium	3.41E+01	mg/kg	3.41E+01	mg/kg	M	5.7E-06	mg/kg-day	1.4E-04	mg/kg-day	N/A	N/A	4.0E-02
	(Total)												2.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.0E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.4.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	3.6E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	1.2E-03
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	5.5E-05	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.8E+00
	Iron	1.6E+04	µg/l	1.6E+04	µg/l	M	4.5E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E+00
	Manganese	2.5E+04	µg/l	2.5E+04	µg/l	M	6.8E-01	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.4E+01
	Thallium	6.2E+00	µg/l	6.2E+00	µg/l	M	1.7E-04	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.4E+00
													4.0E+01
Dermal Absorption	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	2.3E-05	mg/kg-day	1.5E-02	mg/kg-day	N/A	N/A	1.5E-03
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	1.1E-07	mg/kg-day	1.5E-05	mg/kg-day	N/A	N/A	7.3E-03
	Iron	1.6E+04	µg/l	1.6E+04	µg/l	M	8.9E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Manganese	2.5E+04	µg/l	2.5E+04	µg/l	M	1.4E-03	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.9E-01
	Thallium	6.2E+00	µg/l	6.2E+00	µg/l	M	3.4E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.9E-03
													2.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.0E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.4.RME Supplement
N/A - not available or not applicable.

Table 7.4.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
1,4-Dichlorobenzene	1.3E+00	µg/l	6.2E-02	6.9E-01	0.2	8.28E-08
Ammonium perchlorate	2.0E+00	µg/l	1.0E-03	N/A	0.2	4.00E-10
Iron	1.6E+04	µg/l	1.0E-03	N/A	0.2	3.26E-06
Manganese	2.5E+04	µg/l	1.0E-03	N/A	0.2	4.94E-06
Thallium	6.2E+00	µg/l	1.0E-03	N/A	0.2	1.24E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.5.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	8.3E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	2.8E-03
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	1.3E-04	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	4.3E+00
	Iron	1.6E+04	µg/l	1.6E+04	µg/l	M	1.0E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.5E+00
	Manganese	2.5E+04	µg/l	2.5E+04	µg/l	M	1.6E+00	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.9E+01
	Thallium	6.2E+00	µg/l	6.2E+00	µg/l	M	4.0E-04	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.7E+00
	(Total)												9.2E+01
Dermal Absorption	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	5.1E-05	mg/kg-day	1.5E-02	mg/kg-day	N/A	N/A	3.4E-03
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	3.2E-07	mg/kg-day	1.5E-05	mg/kg-day	N/A	N/A	2.1E-02
	Iron	1.6E+04	µg/l	1.6E+04	µg/l	M	2.6E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	4.3E-02
	Manganese	2.5E+04	µg/l	2.5E+04	µg/l	M	3.9E-03	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	5.6E-01
	Thallium	6.2E+00	µg/l	6.2E+00	µg/l	M	9.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.4E-02
	(Total)												6.4E-01
							Total Hazard Index Across All Exposure Routes/Pathways						9.3E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.5.RME Supplement
N/A - not available or not applicable.

Table 7.5.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
1,4-Dichlorobenzene	1.3E+00	µg/l	6.2E-02	6.9E-01	0.33	1.06E-07
Ammonium perchlorate	2.0E+00	µg/l	1.0E-03	N/A	0.33	6.60E-10
Iron	1.6E+04	µg/l	1.0E-03	N/A	0.33	5.38E-06
Manganese	2.5E+04	µg/l	1.0E-03	N/A	0.33	8.15E-06
Thallium	6.2E+00	µg/l	1.0E-03	N/A	0.33	2.05E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.6.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	5.9E-06	mg/kg-day	1.5E-02	mg/kg-day	N/A	N/A	3.9E-04
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	1.4E-07	mg/kg-day	1.5E-05	mg/kg-day	N/A	N/A	9.3E-03
	Aluminum	5.2E+03	µg/l	5.2E+03	µg/l	M	3.6E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	1.3E-03
	Arsenic	3.6E+00	µg/l	3.6E+00	µg/l	M	2.5E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	8.8E-04
	Chromium	1.0E+02	µg/l	1.0E+02	µg/l	M	7.2E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.6E-02
	Iron	2.4E+04	µg/l	2.4E+04	µg/l	M	1.7E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	2.8E-02
	Manganese	2.3E+04	µg/l	2.3E+04	µg/l	M	1.6E-03	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	2.3E-01
	Nickel	8.6E+01	µg/l	8.6E+01	µg/l	M	6.0E-07	mg/kg-day	2.0E-03	mg/kg-day	N/A	N/A	3.0E-04
	(Total)												3.1E-01
							Total Hazard Index Across All Exposure Routes/Pathways						3.1E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
Dermal absorption per event calculated in Table 7.6.RME Supplement
N/A - not available or not applicable.

Table 7.6.RME Supplement
Calculation of DAevent
Shallow Aquifer - Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,4-Dichlorobenzene	1.3E+00	µg/l	6.2E-02	6.9E-01	8	6.72E-07	3.3E+00	2.5E-01	3
Ammonium perchlorate	2.0E+00	µg/l	1.0E-03	N/A	8	1.60E-08	N/A	N/A	2
Aluminum	5.2E+03	µg/l	1.0E-03	N/A	8	4.14E-05	N/A	N/A	1
Arsenic	3.6E+00	µg/l	1.0E-03	N/A	8	2.88E-08	N/A	N/A	1
Chromium	1.0E+02	µg/l	1.0E-03	N/A	8	8.24E-07	N/A	N/A	1
Iron	2.4E+04	µg/l	1.0E-03	N/A	8	1.94E-04	N/A	N/A	1
Manganese	2.3E+04	µg/l	1.0E-03	N/A	8	1.85E-04	N/A	N/A	1
Nickel	8.6E+01	µg/l	1.0E-04	N/A	8	6.86E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
ET<t*: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B)) x 0.001 mg/ug x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,4-Dichlorobenzene	1.3E+00	µg/l	6.4E-05	mg/kg/shower	R	6.2E-05	mg/kg-day	2.3E-01	mg/kg-day	8.0E-01	mg/m^3	2.7E-04
	(Total)												2.7E-04
												Total Hazard Index Across All Exposure Routes/Pathways	2.7E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic Inhalation.
N/A - Not applicable; metals are not volatile.
Route EPC value calculations shown on Table 7.7.RME Supplement

Table 7.7.RME Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 21, Indian Head NSWC

Site 21, NDWIH	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law dimensionless	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
1,4-Dichlorobenzene	1.3E+00	1.5E+02	1.0E-01	2.9E-03	1.05E+03	1.09E+01	1.01E+01	1.36E+01	4.74E-01	3.16E+00	6.45E-05

Variables	Units	Exposure Assumptions	Source
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1	NA
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2	NA
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3	NA
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4	NA
Tl = Calibration temp. of water	K (20C +273)	293	F&C
Ts = Shower water temperature	k (45C)	318	F&C
Us = water viscosity at Ts	centipoise	0.596	F&C
Ul = water viscosity at Tl	cp	1.002	F&C
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5	NA
sdt = shower droplet drop time	sec	2	F&C
d = shower droplet diameter	mm	1	F&C
FR = shower water flow rate	l/min	20	F&C
SV = shower room air volume	m^3	3	F&C
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6	NA
VR = ventilation rate	l/min	13.8	USEPA, 1991
BW = body weight	kg	70	USEPA, 1991
Ds = duration of shower	min	12	USEPA, 1989
Dt = total duration in shower room	min	15	
R = air exchange rate	min^{-1}	0.0083	F&C
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7	NA
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8	NA

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	see time series example on Table I-GW-5	
Equation 8:	**Einh =**	**If t>Ds** (((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 7.8.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,4-Dichlorobenzene	1.3E+00	µg/l	3.0E-04	mg/m^3	R	6.8E-06	mg/kg-day	2.3E-01	N/A	8.0E-01	mg/m^3	3.0E-05
	(Total)												3.0E-05
												Total Hazard Index Across All Exposure Routes/Pathways	3.0E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
N/A - Not applicable; NV - Not volatile
Route EPC value calculations shown on Table 7.8.RME Supplement

Table 7.8.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Scenario
Site 21, NDWIH

Chemical	Cw	MW	K_H	k_l	k_g	K_v	ER	ERa	Ca
	(μg/L)	(mol/gram)	(unitless)	(cm/hr)	(cm/hr)	(cm/hr)	(mg/hr-cm^2)	(g/sec-m^2)	(mg/m^3)
1,4-Dichlorobenzene	1.30E+00	1.5E+02	9.96E-02	3.01E+00	1.82E+03	2.96E+00	3.84E-06	1.07E-08	3.03E-04

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H * K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 $ER = Kv * Cw * L/1000\ cm^3 * mg/1000\ \mu g$

Equation 5 $ERa = ER * g/1000\ mg * hr/60\ min * min/60\ sec * 10000\ cm^2/m^2$

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch) Length = 20 m, Width = 3 m	(m^2)	60
ERa = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

TABLE 7.9.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	1.7E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	5.6E-04
	Ammonium perchlorate	7.4E-01	µg/l	7.4E-01	µg/l	M	9.5E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	3.2E-01
	Iron	5.6E+03	µg/l	5.6E+03	µg/l	M	7.1E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.4E-01
	Manganese	8.5E+03	µg/l	8.5E+03	µg/l	M	1.1E-01	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.5E+00
	Thallium	4.1E+00	µg/l	4.1E+00	µg/l	M	5.2E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	7.5E-01
	(Total)												6.8E+00
Dermal Absorption	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	1.4E-05	mg/kg-day	1.5E-02	mg/kg-day	N/A	N/A	9.1E-04
	Ammonium perchlorate	7.4E-01	µg/l	7.4E-01	µg/l	M	2.4E-08	mg/kg-day	1.5E-05	mg/kg-day	N/A	N/A	1.6E-03
	Iron	5.6E+03	µg/l	5.6E+03	µg/l	M	1.8E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Manganese	8.5E+03	µg/l	8.5E+03	µg/l	M	2.8E-04	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	4.0E-02
	Thallium	4.1E+00	µg/l	4.1E+00	µg/l	M	1.3E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.9E-03
	(Total)												4.8E-02
							Total Hazard Index Across All Exposure Routes/Pathways						6.8E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.9.CT Supplement
N/A - not available or not applicable.

Table 7.9.CT Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
1,4-Dichlorobenzene	1.3E+00	µg/l	6.2E-02	6.9E-01	0.2	8.28E-08
Ammonium perchlorate	7.4E-01	µg/l	1.0E-03	N/A	0.2	1.48E-10
Iron	5.6E+03	µg/l	1.0E-03	N/A	0.2	1.11E-06
Manganese	8.5E+03	µg/l	1.0E-03	N/A	0.2	1.70E-06
Thallium	4.1E+00	µg/l	1.0E-03	N/A	0.2	8.17E-10

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.10.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	5.6E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	1.9E-03
	Ammonium perchlorate	7.4E-01	µg/l	7.4E-01	µg/l	M	3.2E-05	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.1E+00
	Iron	5.6E+03	µg/l	5.6E+03	µg/l	M	2.4E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.9E-01
	Manganese	8.5E+03	µg/l	8.5E+03	µg/l	M	3.6E-01	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E+01
	Thallium	4.1E+00	µg/l	4.1E+00	µg/l	M	1.7E-04	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.5E+00
	(Total)												2.3E+01
Dermal Absorption	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	3.0E-05	mg/kg-day	1.5E-02	mg/kg-day	N/A	N/A	2.0E-03
	Ammonium perchlorate	7.4E-01	µg/l	7.4E-01	µg/l	M	#VALUE!	mg/kg-day	1.5E-05	mg/kg-day	N/A	N/A	#VALUE!
	Iron	5.6E+03	µg/l	5.6E+03	µg/l	M	5.1E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	8.5E-03
	Manganese	8.5E+03	µg/l	8.5E+03	µg/l	M	7.8E-04	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.1E-01
	Thallium	4.1E+00	µg/l	4.1E+00	µg/l	M	3.7E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.3E-03
	(Total)												#VALUE!
							Total Hazard Index Across All Exposure Routes/Pathways						#VALUE!

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Dermal absorption per event calculated in Table 7.10.CT Supplement
N/A - not available or not applicable.

Table 7.10.CT Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
1,4-Dichlorobenzene	1.3E+00	µg/l	6.2E-02	6.9E-01	0.33	1.06E-07
Ammonium perchlorate	7.4E-01	µg/l	1.0E-03	N/A	0.33	#VALUE!
Iron	5.6E+03	µg/l	1.0E-03	N/A	0.33	1.83E-06
Manganese	8.5E+03	µg/l	1.0E-03	N/A	0.33	2.81E-06
Thallium	4.1E+00	µg/l	1.0E-03	N/A	0.33	1.35E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	2.5E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	8.1E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.2E-06
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	6.0E-07	mg/kg-day	N/A	N/A	N/A
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	6.8E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	7.9E-06	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.49E+01	mg/kg	5.49E+01	mg/kg	M	2.0E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										1.2E-06
Dermal Absorption											
	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	1.3E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	1.3E-07	mg/kg-day	1.6E+00	1/mg/kg/day	2.1E-07
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	3.1E-08	mg/kg-day	N/A	N/A	N/A
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	3.5E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	4.0E-07	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.49E+01	mg/kg	5.49E+01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										2.1E-07
										Total Risk Across All Exposure Routes/Pathways	1.4E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.

N/A - not applicable.

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	4.9E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	1.6E-06	mg/kg-day	1.5E+00	1/mg/kg/day	2.4E-06
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	1.3E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.49E+01	mg/kg	5.49E+01	mg/kg	M	3.8E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										2.4E-06
Dermal Absorption											
	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	3.5E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	3.7E-07	mg/kg-day	1.6E+00	1/mg/kg/day	5.8E-07
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	8.5E-08	mg/kg-day	N/A	N/A	N/A
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	9.6E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.49E+01	mg/kg	5.49E+01	mg/kg	M	2.8E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										5.8E-07
										Total Risk Across All Exposure Routes/Pathways	3.0E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.

N/A - not applicable.

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 21 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	2.4E-03	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	7.9E-06	mg/kg-day	1.5E+00	1/mg/kg/day	1.2E-05
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	5.9E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	6.6E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	7.7E-05	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.49E+01	mg/kg	5.49E+01	mg/kg	M	1.9E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										1.2E-05
Dermal Absorption											
	Aluminum	6.96E+03	mg/kg	6.96E+03	mg/kg	M	4.1E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	2.27E+01	mg/kg	2.27E+01	mg/kg	M	4.3E-06	mg/kg-day	1.6E+00	1/mg/kg/day	6.8E-06
	Chromium	1.68E+01	mg/kg	1.68E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.90E+04	mg/kg	1.90E+04	mg/kg	M	1.1E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.21E+02	mg/kg	2.21E+02	mg/kg	M	1.3E-05	mg/kg-day	N/A	N/A	N/A
	Vanadium	5.49E+01	mg/kg	5.49E+01	mg/kg	M	3.3E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										6.8E-06
										Total Risk Across All Exposure Routes/Pathways	1.9E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.

N/A - not applicable.

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	1.9E-05	mg/kg-day	2.4E-02	1/mg/kg/day	4.7E-07
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	3.0E-05	mg/kg-day	N/A	N/A	N/A
	Iron	1.6E+04	µg/l	1.6E+04	µg/l	M	2.4E-01	mg/kg-day	N/A	N/A	N/A
	Manganese	2.5E+04	µg/l	2.5E+04	µg/l	M	3.7E-01	mg/kg-day	N/A	N/A	N/A
	Thallium	6.2E+00	µg/l	6.2E+00	µg/l	M	9.3E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										4.7E-07
Dermal Absorption											
	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	1.2E-05	mg/kg-day	2.7E-02	1/mg/kg/day	3.2E-07
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	2.2E-04	mg/kg-day	N/A	N/A	N/A
	Iron	1.6E+04	µg/l	1.6E+04	µg/l	M	6.4E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.5E+04	µg/l	2.5E+04	µg/l	M	4.6E-04	mg/kg-day	N/A	N/A	N/A
	Thallium	6.2E+00	µg/l	6.2E+00	µg/l	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										3.2E-07
										Total Risk Across All Exposure Routes/Pathways	7.9E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Tables 8.4a.RME Supplement and 8.4b.RME Supplement.
N/A - not applicable.

Table 8.4a.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer - Tap Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
1,4-Dichlorobenzene	1.3E+00	µg/l	6.2E-02	6.9E-01	0.2	8.28E-08
Ammonium perchlorate	2.0E+00	µg/l	1.0E-03	N/A	0.2	4.00E-10
Iron	1.6E+04	µg/l	1.0E-03	N/A	0.2	3.26E-06
Manganese	2.5E+04	µg/l	1.0E-03	N/A	0.2	4.94E-06
Thallium	6.2E+00	µg/l	1.0E-03	N/A	0.2	1.24E-09

Inorganics: DAevent (mg/cn Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2 Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x E 2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD,

Table 8.4b.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer - Tap Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
1,4-Dichlorobenzene	1.3E+00	µg/l	6.20E-02	6.90E-01	0.33	1.06E-07
Ammonium perchlorate	2.0E+00	µg/l	1.00E-03	N/A	0.33	6.60E-10
Iron	1.6E+04	µg/l	1.00E-03	N/A	0.33	5.38E-06
Manganese	2.5E+04	µg/l	1.00E-03	N/A	0.33	8.15E-06
Thallium	6.2E+00	µg/l	1.00E-03	N/A	0.33	2.05E-09

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
Permeability constants and lag time for ammonium perchlorate calculated based on molecular weight of 117.49 and log Kow of
N/A - not available or not applicable.

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	1,4-Dichlorobenzene	1.3E+00	µg/l	1.3E+00	µg/l	M	8.4E-08	mg/kg-day	2.7E-02	1/mg/kg/day	2.2E-09
	Ammonium perchlorate	2.0E+00	µg/l	2.0E+00	µg/l	M	2.0E-09	mg/kg-day	N/A	1/mg/kg/day	N/A
	Aluminum	5.2E+03	µg/l	5.2E+03	µg/l	M	5.2E-06	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.6E+00	µg/l	3.6E+00	µg/l	M	3.6E-09	mg/kg-day	1.6E+00	1/mg/kg/day	5.7E-09
	Chromium	1.0E+02	µg/l	1.0E+02	µg/l	M	1.0E-07	mg/kg-day	N/A	N/A	N/A
	Iron	2.4E+04	µg/l	2.4E+04	µg/l	M	2.4E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.3E+04	µg/l	2.3E+04	µg/l	M	2.3E-05	mg/kg-day	N/A	N/A	N/A
	Nickel	8.6E+01	µg/l	8.6E+01	µg/l	M	8.5E-09	mg/kg-day	N/A	N/A	N/A
	(Total)										8.0E-09
							Total Risk Across All Exposure Routes/Pathways				8.0E-09

N/A - not applicable.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Dermal absorption per event calculated in Tables 8.5.RME Supplement.

Table 8.5.RME Supplement
Calculation of DAevent
Shallow Aquifer - Water
Site 21, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,4-Dichlorobenzene	1.3E+00	µg/l	6.2E-02	6.9E-01	8	6.72E-07	3.3E+00	2.5E-01	3
Ammonium perchlorate	2.0E+00	µg/l	1.0E-03	N/A	8	1.60E-08	N/A	N/A	1
Aluminum	5.2E+03	µg/l	1.0E-03	N/A	8	4.14E-05	N/A	N/A	1
Arsenic	3.6E+00	µg/l	1.0E-03	N/A	8	2.88E-08	N/A	N/A	1
Chromium	1.0E+02	µg/l	1.0E-03	N/A	8	8.24E-07	N/A	N/A	1
Iron	2.4E+04	µg/l	1.0E-03	N/A	8	1.94E-04	N/A	N/A	1
Manganese	2.3E+04	µg/l	1.0E-03	N/A	8	1.85E-04	N/A	N/A	1
Nickel	8.6E+01	µg/l	1.0E-04	N/A	8	6.86E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B)) x 0.001 l/cm3 (eq 3)

Notes:
Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
Permeability constants and lag time for ammonium perchlorate calculated based on molecular weight of 117.49 and log Kow of 4.28.
N/A - not available or not applicable.

TABLE 8.6.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,4-Dichlorobenzene (Total)	1.3E+00	µg/l	6.4E-05	mg/kg/shower	R	2.1E-05	mg/kg-day	N/A	N/A	N/A 0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - Not available.

Table 8.6.RME Supplement
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 21, Indian Head NSWC

Chemical	Exposure Point Concentration Cwo (mg/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (mg/l)	S (mg/m^3 - min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Site 21, NDWIH	1.3E+00	1.5E+02	2.89E-03	1.0E+03	1.1E+01	1.0E+01	1.4E+01	4.7E-01	3.2E+00	**6.4E-05**

Variables	Units	Exposure Assumptions	Source
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1	NA
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2	NA
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3	NA
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4	NA
Tl = Calibration temp. of water	K (20C +273)	293	F&C
Ts = Shower water temperature	k (45C)	318	F&C
Us = water viscosity at Ts	centipoise	0.596	F&C
Ul = water viscosity at Tl	cp	1.002	F&C
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5	NA
sdt = shower droplet drop time	sec	2	F&C
d = shower droplet diameter	mm	1	F&C
FR = shower water flow rate	l/min	20	F&C
SV = shower room air volume	m^3	3	F&C
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6	NA
VR = ventilation rate	l/min	13.8	USEPA, 1991
BW = body weight	kg	70	USEPA, 1991
Ds = duration of shower	min	12	USEPA, 1989
Dt = total duration in shower room	min	15	
R = air exchange rate	min^{-1}	0.0083	F&C
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7	NA
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8	NA

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$	
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$	
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$	
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{0.5}))$	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	**Einh =**	**If t>Ds**	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual*. USEPA/540/1-86/060, October 1986.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

F&C. Foster, S. A. and P. C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. ICF-Clement Associates, Inc. Washington, D.C.

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 21, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,4-Dichlorobenzene	1.3E+00	µg/l	3.0E-04	mg/m^3	R	8.5E-07	mg/kg-day	N/A	N/A	N/A
											0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - Not available.

Table 8.7.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Senario
Site 21, NDWIH

Chemical	Cw (μg/L)	MW (mol/gram)	K_H (unitless)	k_l (cm/hr)	k_g (cm/hr)	K_v (cm/hr)	ER (mg/hr)	ERa (g/sec-m^2)	Ca (mg/m^3)
1,4-Dichlorobenzene	1.3E+00	1.5E+02	9.96E-02	3.01E+00	1.82E+03	2.96E+00	3.84E-06	1.07E-08	3.03E-04

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 $ER = Kv * Cw * L/1000\ cm^3 * mg/1000\ \mu g$

Equation 5 $ERa = ER * g/1000\ mg * hr/60\ min * min/60\ sec * 10000\ cm^2/m^2$

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(μg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch) Length = 20 m, Width = 3 m	(m^2)	60
Era = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(mg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 21 Surface Soil											
			Aluminum	N/A	--	N/A		Aluminum	CNS	1.9E-03	--	3.6E-04	2.3E-03
			Arsenic	1.2E-06	--	2.1E-07	1.4E-06	Arsenic	Skin/vascular	2.1E-02	--	3.6E-03	2.5E-02
			Chromium	N/A	--	N/A		Chromium	NOAEL	1.6E-03	--	7.9E-03	9.5E-03
			Iron	N/A	--	N/A		Iron	Gastrointestinal	1.8E-02	--	4.5E-03	2.2E-02
			Manganese	N/A	--	N/A		Manganese	CNS	3.1E-03	--	4.5E-04	3.5E-03
			Vanadium	N/A	--	N/A		Vanadium	Lifetime	1.4E-03	--	3.4E-03	4.8E-03
			(Total)	1.2E-06		2.1E-07	1.4E-06	(Total)		4.7E-02		2.0E-02	6.7E-02
			Total Risk Across Surface Soil				1.4E-06	Total Risk Across Surface Soil					6.7E-02
Total Risk Across All Media and All Exposure Routes							1.4E-06	Total Hazard Index Across All Media and All Exposure Routes					6.7E-02

Total CNS HI =	5.8E-03
Total GI HI =	2.2E-02
Total Lifetime HI =	4.8E-03
Total NOAEL HI =	9.5E-03
Total Skin HI =	2.5E-02
Total Vascular HI =	2.5E-02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 21 Surface Soil											
			Aluminum	N/A	--	N/A		Aluminum	CNS	1.4E-03	--	3.8E-04	1.8E-03
			Arsenic	2.37E-06	--	5.8E-07	3.0E-06	Arsenic	Skin/vascular	1.5E-02	--	3.8E-03	1.9E-02
			Chromium	N/A	--	N/A		Chromium	NOAEL	1.1E-03	--	8.3E-03	9.4E-03
			Iron	N/A	--	N/A		Iron	Gastrointestinal	1.3E-02	--	4.7E-03	1.8E-02
			Manganese	N/A	--	N/A		Manganese	CNS	2.2E-03	--	4.7E-04	2.7E-03
			Vanadium	N/A	--	N/A		Vanadium	Lifetime	9.9E-04	--	3.6E-03	4.6E-03
			(Total)	2.4E-06		5.8E-07	3.0E-06	(Total)		3.4E-02		2.1E-02	5.5E-02
			Total Risk Across Surface Soil				3.0E-06	Total Risk Across Surface Soil					5.5E-02
Total Risk Across All Media and All Exposure Routes							3.0E-06	Total Hazard Index Across All Media and All Exposure Routes					5.5E-02

Total CNS HI =	4.5E-03
Total GI HI =	1.8E-02
Total Lifetime HI =	4.6E-03
Total NOAEL HI =	9.4E-03
Total Skin HI =	1.9E-02
Total Vascular HI =	1.9E-02

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 21 Surface Soil											
			Aluminum	N/A	--	N/A		Aluminum	CNS	6.8E-03	--	4.3E-03	1.1E-02
			Arsenic	1.19E-05	--	6.8E-06	1.9E-05	Arsenic	Skin/vascular	7.4E-02	--	4.2E-02	1.2E-01
			Chromium	N/A	--	N/A		Chromium	NOAEL	5.5E-03	--	9.3E-02	9.8E-02
			Iron	N/A	--	N/A		Iron	Gastrointestinal	6.2E-02	--	5.3E-02	1.1E-01
			Manganese	N/A	--	N/A		Manganese	CNS	1.1E-02	--	5.2E-03	1.6E-02
			Vanadium	N/A	--	N/A		Vanadium	Lifetime	4.8E-03	--	4.0E-02	4.5E-02
			(Total)	1.2E-05		6.8E-06	1.9E-05	(Total)		1.6E-01		2.4E-01	4.0E-01
			Total Risk Across Surface Soil				1.9E-05	Total Risk Across Surface Soil					4.0E-01
			Total Risk Across All Media and All Exposure Routes				1.9E-05	Total Hazard Index Across All Media and All Exposure Routes					4.0E-01

Total CNS HI =	2.7E-02
Total GI HI =	1.1E-01
Total Lifetime HI =	4.5E-02
Total NOAEL HI =	9.8E-02
Total Skin HI =	1.2E-01
Total Vascular HI =	1.2E-01

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water						1,4-Dichlorobenzene	Liver	1.2E-03	--	1.5E-03	2.7E-03
								Ammonium perchlorate	Thyroid	1.8E+00	--	7.3E-03	1.8E+00
								Iron	Gastrointestinal	1.5E+00	--	1.5E-02	1.5E+00
								Manganese	CNS	3.4E+01	--	1.9E-01	3.4E+01
								Thallium	Skin/vascular	2.4E+00	--	4.9E-03	2.4E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		4.0E+01		2.2E-01	4.0E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					4.0E+01
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead						1,4-Dichlorobenzene	Liver	--	2.7E-04	--	2.7E-04
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)			2.7E-04		2.7E-04
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					2.7E-04
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					4.0E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					4.0E+01

Total CNS HI =	3.4E+01
Total Gastrointestinal HI =	1.5E+00
Total Liver HI =	3.0E-03
Total Skin HI =	2.4E+00
Total Vascular HI =	2.4E+00

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								1,4-Dichlorobenzene	Liver	2.8E-03	--	3.4E-03	6.2E-03
								Ammonium perchlorate	Thyroid	4.3E+00	--	2.1E-02	4.3E+00
								Iron	Gastrointestinal	3.5E+00	--	4.3E-02	3.5E+00
								Manganese	CNS	7.9E+01	--	5.6E-01	8.0E+01
								Thallium	Skin/vascular	5.7E+00	--	1.4E-02	5.7E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		9.2E+01		6.4E-01	9.3E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					9.3E+01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					9.3E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					9.3E+01

Total CNS HI =	8.0E+01
Total Gastrointestinal HI =	3.5E+00
Total Liver HI =	6.2E-03
Total Skin HI =	5.7E+00
Total Vascular HI =	5.7E+00

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			1,4-Dichlorobenzene	4.7E-07	--	3.2E-07	7.9E-07						
			Ammonium perchlorate	N/A	--	N/A							
			Iron	N/A	--	N/A							
			Manganese	N/A	--	N/A							
			Thallium	N/A	--	N/A							
			(Total)	4.7E-07		3.2E-07	7.9E-07	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Tap water				7.9E-07	Total Hazard Index Across Tap water					0.0E+00
Groundwater	Air	Shallow Aquifer- Water Vapors at Showerhead											
			1,4-Dichlorobenzene	--	N/A	--							
			(Total)		0.0E+00		0.0E+00	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					0.0E+00
			Total Risk Across Shallow Groundwater				7.9E-07	Total Hazard Index Across Shallow Groundwater					0.0E+00
			Total Risk Across All Media and All Exposure Routes				7.9E-07	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Water											
			1,4-Dichlorobenzene	--	--	2.2E-09	2.2E-09	1,4-Dichlorobenzene	Liver	--	--	3.9E-04	3.9E-04
			Ammonium perchlorate	--	--	N/A		Ammonium perchlorate	Thyroid	--	--	9.3E-03	9.3E-03
			Aluminum	--	--	N/A		Aluminum	CNS	--	--	1.3E-03	1.3E-03
			Arsenic	--	--	5.7E-09	5.7E-09	Arsenic	Skin/vascular	--	--	8.8E-04	8.8E-04
			Chromium	--	--	N/A		Chromium	NOAEL	--	--	3.6E-02	3.6E-02
			Iron	--	--	N/A		Iron	Gastrointestinal	--	--	2.8E-02	2.8E-02
			Manganese	--	--	N/A		Manganese	CNS	--	--	2.3E-01	2.3E-01
			Nickel	--	--	N/A		Nickel	Whole body	--	--	3.0E-04	3.0E-04
			(Total)	0.0E+00		8.0E-09	8.0E-09	(Total)				3.1E-01	3.1E-01
			Total Risk Across Shallow Aquifer - Water				8.0E-09	Total Hazard Index Across Shallow Aquifer - Water					3.1E-01
Groundwater	Air	Shallow Aquifer-Volatilization											
			1,4-Dichlorobenzene	--	N/A	--		1,4-Dichlorobenzene	Liver	--	3.0E-05	--	3.0E-05
			(Total)		0.0E+00		0.0E+00	(Total)			3.0E-05		3.0E-05
			Total Risk Across Shallow Aquifer - Volatilization				0.0E+00	Total Hazard Index Across Shallow Aquifer - Volatilization					3.0E-05
			Total Risk Across Shallow Groundwater				8.0E-09	Total Hazard Index Across Shallow Groundwater					3.1E-01
			Total Risk Across All Media and All Exposure Routes				8.0E-09	Total Hazard Index Across All Media and All Exposure Routes					3.1E-01

Total CNS HI =	2.3E-01
Total Gastrointestinal HI =	2.8E-02
Total Liver HI =	4.2E-04
Total NOAEL HI =	3.6E-02
Total Skin HI =	8.8E-04
Total Vascular HI =	8.8E-04
Total Whole Body HI =	3.0E-04

TABLE 9.8.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								1,4-Dichlorobenzene	Liver	5.6E-04	--	9.1E-04	1.5E-03
								Ammonium perchlorate	Thyroid	3.2E-01	--	2.7E+00	3.0E+00
								Iron	Gastrointestinal	2.4E-01	--	3.1E-03	2.4E-01
								Manganese	CNS	5.5E+00	--	4.0E-02	5.5E+00
								Thallium	Skin/vascular	7.5E-01	--	1.9E-03	7.5E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		6.8E+00		2.8E+00	9.5E+00
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					9.5E+00
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					9.5E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					9.5E+00

Total CNS HI =	5.5E+00
Total Gastrointestinal HI =	2.4E-01
Total Liver HI =	1.5E-03
Total Skin HI =	7.5E-01
Total Vascular HI =	7.5E-01

TABLE 9.9.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								1,4-Dichlorobenzene	Liver	1.9E-03	--	2.0E-03	3.8E-03
								Ammonium perchlorate	Thyroid	1.1E+00	--	#VALUE!	#VALUE!
								Iron	Gastrointestinal	7.9E-01	--	8.5E-03	8.0E-01
								Manganese	CNS	1.8E+01	--	1.1E-01	1.8E+01
								Thallium	Skin/vascular	2.5E+00	--	5.3E-03	2.5E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.3E+01		#VALUE!	#VALUE!
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					#VALUE!
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					#VALUE!
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					#VALUE!

Total CNS HI =	1.8E+01
Total Gastrointestinal HI =	8.0E-01
Total Liver HI =	3.8E-03
Total Skin HI =	2.5E+00
Total Vascular HI =	2.5E+00

TABLE 10.1.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water						Ammonium perchlorate	Thyroid	1.8E+00	--	1.8E-01	2.0E+00
								Iron	Gastrointestinal	1.5E+00	--	1.5E-02	1.5E+00
								Manganese	CNS	3.4E+01	--	1.9E-01	3.4E+01
								Thallium	Skin/vascular	2.4E+00	--	4.9E-03	2.4E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		3.7E+01		3.9E-01	3.8E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					3.8E+01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					3.8E+01
		Total Risk Across All Media and All Exposure Routes					0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.8E+01

Total CNS HI =	3.4E+01
Total Gastrointestinal HI =	1.5E+00
Total Skin HI =	2.4E+00
Total Vascular HI =	2.4E+00
Total Thyroid HI =	2.0E+00

TABLE 10.2.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Ammonium perchlorate	Thyroid	4.3E+00	--	3.2E-01	4.6E+00
								Iron	Gastrointestinal	3.5E+00		4.3E-02	3.5E+00
								Manganese	CNS	7.9E+01	--	5.6E-01	8.0E+01
								Thallium	Skin/vascular	5.7E+00	--	1.4E-02	5.7E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		9.2E+01		9.4E-01	9.3E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					9.3E+01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					9.3E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					9.3E+01

Total CNS HI =	8.0E+01
Total Gastrointestinal HI =	3.5E+00
Total Skin HI =	5.7E+00
Total Vascular HI =	5.7E+00
Total Thyroid HI =	4.6E+00

TABLE 10.3.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
								Ammonium perchlorate	Thyroid	3.2E-01	--	4.0E-02	3.6E-01
								Iron	Gastrointestinal	2.4E-01	--	3.1E-03	2.4E-01
								Manganese	CNS	5.5E+00	--	4.0E-02	5.5E+00
								Thallium	Skin/vascular	7.5E-01	--	1.9E-03	7.5E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		6.4E+00		4.5E-02	6.5E+00
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					6.5E+00
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					6.5E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					6.5E+00

Total CNS HI =	5.5E+00
Total Gastrointestinal HI =	2.4E-01
Total Skin HI =	7.5E-01
Total Vascular HI =	7.5E-01
Total Thyroid HI =	3.6E-01

TABLE 10.4.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY EXPOSURE

Site 21, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water						Ammonium perchlorate	Thyroid	1.1E+00	--	8.7E-02	1.1E+00
								Iron	Gastrointestinal	7.9E-01	--	8.5E-03	8.0E-01
								Manganese	CNS	1.8E+01	--	1.1E-01	1.8E+01
								Thallium	Skin/vascular	2.5E+00	--	5.3E-03	2.5E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.3E+01		2.1E-01	2.3E+01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					2.3E+01
			Total Risk Across Shallow Groundwater				0.0E+00	Total Hazard Index Across Shallow Groundwater					2.3E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					2.3E+01

Total CNS HI =	1.8E+01
Total Gastrointestinal HI =	8.0E-01
Total Skin HI =	2.5E+00
Total Vascular HI =	2.5E+00
Total Thyroid HI =	1.1E+00

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 25, NDWIH

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Site 25 Surface Soil	Trespasser/Visitor	Adolescent	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
					Adult	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact site surface soil.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Site workers may be exposed to surface soil during maintenance activities, site inspections, or daily duties.
						Ingestion	On-site	Quant	Site workers may be exposed to surface soil during maintenance activities, site inspections, or daily duties.
		Air	Emissions from Site 25 Soil	Trespasser/Visitor	Adolescent	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale vapors and/or fugitive dust from soil.
					Adult	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale vapors and/or fugitive dust from soil.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Site workers may inhale vapors and/or fugitive dust from soil during maintenance activities, site inspections, or daily duties.
Future	Groundwater	Groundwater	Shallow Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child/Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
			Shallow Aquifer - Excavation Pit	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers may contact groundwater while performing construction or excavation activities.
						Ingestion	On-site	None	Incidental ingestion of groundwater by construction workers would be minimal during construction or excavation activities.
		Air	Shallow Aquifer -Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child	Inhalation	On-site	None	Children are assumed not to shower.
					Child/Adult	Inhalation	On-site	None	Adult will be used to evaluate child/adult since children are assumed not to shower.
			Shallow Aquifer - Water Vapors at Excavation	Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors from groundwater while performing constructio or excavation activities.
	Soil*	Soil	Site 25 Soil	Resident	Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 25, NDWIH

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil*	Soil	Site 25 Soil	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction worker may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Construction worker may be exposed to surface and subsurface soil during excavation activities.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Site workers may be exposed to surface and subsurface soil during maintenance activities, site inspections, or daily duties.
						Ingestion	On-site	Quant	Site workers may be exposed to surface and subsurface soil during maintenance activities, site inspections, or daily duties.
				Trespasser/Visitor	Adolescent	Dermal Absorption	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
					Adult	Dermal Absorption	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
						Ingestion	On-site	Quant	Trespasser/visitor may be exposed to surface and subsurface soil during excavation activities.
		Air	Emissions from Site 25 Soil	Resident	Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors and/or fugitive dust from soil during excavation activities.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Site workers may be exposed to vapors and/or fugitive dust from Site 25 soils during maintenance activities, site inspections, or daily duties.
				Trespasser/Visitor	Adolescent	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors and/or fugitive dust from Site 25 soils.
					Adult	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors and/or fugitive dust from Site 25 soils.

* Surface and subsurface soil

Table 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source [5]	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
67-64-1	Acetone	0.0026	J	0.0089	J	MG/KG	IS25SS010001P	3/20	0.011 - 0.018	0.0089	N/A	7,000 N	2.2	SSL	NO	BSL
79-20-9	Methyl acetate	0.0021	J	0.0021	J	MG/KG	IS25SS170001	1/20	0.011 - 0.018	0.0021	N/A	7,821 N	2.48	SSL	NO	BSL
75-09-2	Methylene chloride	0.0019	J	0.0019	J	MG/KG	IS25SS040001 IS25SS050001	2/20	0.011 - 0.018	0.0019	N/A	85.2 C	0.019	SSL	NO	BSL
108-88-3	Toluene	0.0015	J	0.0015	J	MG/KG	IS25SS150001	1/20	0.011 - 0.018	0.0015	N/A	1,564 N	0.879	SSL	NO	BSL
91-57-6	2-Methylnaphthalene	0.044	J	0.044	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.044	N/A	156 N	2.2	SSL	NO	BSL
83-32-9	Acenaphthene	0.37	J	0.37	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.37	N/A	469 N	10.5	SSL	NO	BSL
208-96-8	Acenaphthylene	0.09	J	0.09	J	MG/KG	IS25SS080001	1/20	0.37 - 1.7	0.09	N/A	2,346 N	N/A		NO	BSL
98-86-2	Acetophenone	0.045	J	0.1	J	MG/KG	IS25SS130001	6/20	0.37 - 1.7	0.1	N/A	782 N	0.32	SSL	NO	BSL
120-12-7	Anthracene	0.054	J	0.44		MG/KG	IS25SS1800012	2/20	0.37 - 1.7	0.44	N/A	2,346 N	46.6	SSL	NO	BSL
100-52-7	Benzaldehyde	0.055	J	2.4		MG/KG	IS25SS200001	3/20	0.37 - 1.7	2.4	N/A	782 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	0.049	J	1.3		MG/KG	IS25SS1800012	7/20	0.37 - 1.7	1.3	N/A	0.875 C	1.46	SSL	YES	ASL
50-32-8	Benzo(a)pyrene	0.045	J	0.4	J	MG/KG	IS25SS080001	9/20	0.37 - 1.7	0.4	N/A	0.0875 C	0.374	SSL	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.05	J	1.2		MG/KG	IS25SS1800012	11/20	0.37 - 1.7	1.2	N/A	0.875 C	4.51	SSL	YES	ASL
191-24-2	Benzo(g,h,i)perylene	0.051	J	0.21	J	MG/KG	IS25SS080001	6/20	0.37 - 1.7	0.21	N/A	235 N	N/A		NO	BSL
207-08-9	Benzo(k)fluoranthene	0.047	J	0.71		MG/KG	IS25SS1800012	10/20	0.37 - 1.7	0.71	N/A	8.75 C	45.1	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	0.07	J	0.07	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.07	N/A	1,564 N	1680	SSL	NO	BSL
86-74-8	Carbazole	0.2	J	0.2	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.2	N/A	31.9 C	0.467	SSL	NO	BSL
218-01-9	Chrysene	0.054	J	1.2		MG/KG	IS25SS1800012	12/20	0.37 - 1.7	1.2	N/A	87.5 C	146	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	0.086	J	0.54	J	MG/KG	IS25SS030001	2/20	0.37 - 1.7	0.54	N/A	782 N	496	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.081	J	0.22	J	MG/KG	IS25SS1800012	2/20	0.37 - 1.7	0.22	N/A	0.0875 C	1.4	SSL	YES	ASL
132-64-9	Dibenzofuran	0.18	J	0.18	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.18	N/A	16 N	0.38	SSL	NO	BSL
84-66-2	Diethylphthalate	0.17	J	0.53		MG/KG	IS25SS070001	2/20	0.37 - 1.7	0.53	N/A	6,257 N	45.3	SSL	NO	BSL
131-11-3	Dimethyl phthalate	0.096	J	0.096	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.096	N/A	78,214 N	N/A		NO	BSL
206-44-0	Fluoranthene	0.039	J	2.3		MG/KG	IS25SS1800012	15/20	0.37 - 1.7	2.3	N/A	313 N	625	SSL	NO	BSL
86-73-7	Fluorene	0.29	J	0.29	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.29	N/A	313 N	13.5	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.046	J	0.26	J	MG/KG	IS25SS080001	9/20	0.37 - 1.7	0.26	N/A	0.875 C	12.7	SSL	NO	BSL
91-20-3	Naphthalene	0.092	J	0.092	J	MG/KG	IS25SS1800012	1/20	0.37 - 1.7	0.092	N/A	156 N	0.0154	SSL	NO	BSL
85-01-8	Phenanthrene	0.045	J	2.3		MG/KG	IS25SS1800012	9/20	0.37 - 1.7	2.3	N/A	235 N	N/A		NO	BSL
129-00-0	Pyrene	0.061	J	0.99		MG/KG	IS25SS1800012	14/20	0.37 - 1.7	0.99	N/A	235 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.34	J	17		MG/KG	IS25SS030001	5/20	0.37 - 2.3	17	N/A	45.6 C	2890	SSL	NO	BSL
7429-90-5	Aluminum	3,710		13,600		MG/KG	IS25SS020001	20/20	4.5 - 6.7	13600	N/A	7,821 N	N/A		YES	ASL
7440-36-0	Antimony	1.5	K	2.1	L	MG/KG	IS25SS010001	2/20	0.7 - 1.5	2.1	N/A	3.13 N	1.32	SSL	NO	BSL
7440-38-2	Arsenic	3.7		23.8		MG/KG	IS25SS1800012	20/20	0.72 - 1.3	23.8	N/A	0.426 C	0.0261	SSL	YES	ASL
7440-39-3	Barium	25.8	J	111		MG/KG	IS25SS070001	20/20	0.034 - 0.14	111	N/A	548 N	211	SSL	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source [5]	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
7440-43-9	Cadmium	0.092	J	47.2		MG/KG	IS25SS030001	20/20	0.056 - 0.14	47.2	N/A	7.80 N	5.5	SSL	YES	ASL
7440-70-2	Calcium	1,130	J	3,410	J	MG/KG	IS25SS010001	14/20	1.7 - 2.9	3410	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	8.5		124		MG/KG	IS25SS030001	20/20	0.25 - 0.71	124	N/A	23.5 N	4.2	SSL	YES	ASL
7440-48-4	Cobalt	2.6	J	13.2	J	MG/KG	IS25SS1900012	20/20	0.19 - 0.78	13.2	N/A	160 N	N/A		NO	BSL
7440-50-8	Copper	6.1		108		MG/KG	IS25SS030001	19/20	0.29 - 0.68	108	N/A	313 N	1100	SSL	NO	BSL
57-12-5	Cyanide	0.22	J	0.22	J	MG/KG	IS25SS1800012	1/20	0.56 - 0.89	0.22	N/A	156 N	14.7	SSL	NO	BSL
7439-89-6	Iron	8,880		24,400		MG/KG	IS25SS020001	20/20	3.6 - 9.7	24400	N/A	2,346 N	N/A		YES	ASL
7439-92-1	Lead	10.5	K	174	K	MG/KG	IS25SS030001	20/20	0.31 - 0.53	174	N/A	400	N/A		NO	BSL
7439-95-4	Magnesium	477	J	6,680		MG/KG	IS25SS1900012	17/20	3.2 - 4.8	6680	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	156		971		MG/KG	IS25SS070001	20/20	0.034 - 0.14	971	N/A	156 N	95.2	SSL	YES	ASL
7439-97-6	Mercury	0.064	J	0.39		MG/KG	IS25SS020001	16/20	0.056 - 0.089	0.39	N/A	2.35 N	N/A		NO	BSL
7440-02-0	Nickel	3.1	J	120		MG/KG	IS25SS1900012	20/20	0.45 - 0.68	120	N/A	156 N	N/A		NO	BSL
7440-09-7	Potassium	247	J	748	J	MG/KG	IS25SS010001	20/20	4.4 - 18.7	748	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	1.1	L	2.3		MG/KG	IS25SS1800012	5/19	0.9 - 1.5	2.3	N/A	39.1 N	1.9	SSL	NO	BSL
7440-22-4	Silver	0.9	J	201		MG/KG	IS25SS1800012	9/19	0.25 - 1.1	201	N/A	39.1 N	3.1	SSL	YES	ASL
7440-28-0	Thallium	1.9	J	1.9	J	MG/KG	IS25SS160001	1/19	1.3 - 1.9	1.9	N/A	0.548 N	0.364	SSL	YES	ASL
7440-62-2	Vanadium	13.7		72.8		MG/KG	IS25SS010001P	20/20	0.17 - 0.5	72.8	N/A	2.3 N	22	SSL	YES	ASL
7440-66-6	Zinc	44.2	J	529	J	MG/KG	IS25SS030001	10/20	0.14 - 0.33	529	N/A	2,346 N	1360	SSL	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Residential Soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for anthracene used as surrogate for acenaphthylene.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] SSL = EPA Region III Soil Screening Levels, based on a Dilution and
Attenuation Factor of 20. Cancer benchmark value = 1E-06, adjusted HQ=0.1
[6] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
67-64-1	Acetone	1.6E-07	J	5.5E-07	J	MG/M3	IS25SS010001P	3/20	NA	5.5E-07	N/A	3.3E-01 N	2.2E+00	SSL	NO	BSL
79-20-9	Methyl acetate*	1.6E-12	J	1.6E-12	J	MG/M3	IS25SS170001	1/20	NA	1.6E-12	N/A	3.7E-01 N	2.5E+00	SSL	NO	BSL
75-09-2	Methylene chloride	5.9E-07	J	5.9E-07	J	MG/M3	IS25SS040001 IS25SS050001	2/20	NA	5.9E-07	N/A	3.8E-03 C	1.9E-02	SSL	NO	BSL
108-88-3	Toluene	2.9E-07	J	2.9E-07	J	MG/M3	IS25SS150001	1/20	NA	2.9E-07	N/A	4.2E-02 N	8.8E-01	SSL	NO	BSL
91-57-6	2-Methylnaphthalene	5.9E-07	J	5.9E-07	J	MG/M3	IS25SS1800012	1/20	NA	5.9E-07	N/A	7.3E-03 N	2.2E+00	SSL	NO	BSL
83-32-9	Acenaphthene	1.3E-06	J	1.3E-06	J	MG/M3	IS25SS1800012	1/20	NA	1.3E-06	N/A	2.2E-02 N	1.1E+01	SSL	NO	BSL
208-96-8	Acenaphthylene	6.8E-11	J	6.8E-11	J	MG/M3	IS25SS080001	1/20	NA	6.8E-11	N/A	3.3E-01 N	N/A		NO	BSL
98-86-2	Acetophenone*	3.4E-11	J	7.6E-11	J	MG/M3	IS25SS130001	6/20	NA	7.6E-11	N/A	3.7E-02 N	3.2E-01	SSL	NO	BSL
120-12-7	Anthracene	5.3E-08	J	4.3E-07		MG/M3	IS25SS1800012	2/20	NA	4.3E-07	N/A	1.1E-01 N	4.7E+01	SSL	NO	BSL
100-52-7	Benzaldehyde	4.2E-11	J	1.8E-09		MG/M3	IS25SS200001	3/20	NA	1.8E-09	N/A	3.7E-02 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	3.7E-11	J	9.8E-10		MG/M3	IS25SS1800012	7/20	NA	9.8E-10	N/A	8.6E-06 C	1.5E+00	SSL	NO	BSL
50-32-8	Benzo(a)pyrene	3.4E-11	J	3.0E-10	J	MG/M3	IS25SS080001	9/20	NA	3.0E-10	N/A	2.0E-06 C	3.7E-01	SSL	NO	BSL
205-99-2	Benzo(b)fluoranthene	3.8E-11	J	9.1E-10		MG/M3	IS25SS1800012	11/20	NA	9.1E-10	N/A	8.6E-06 C	4.5E+00	SSL	NO	BSL
191-24-2	Benzo(g,h,i)perylene*	3.9E-11	J	1.6E-10	J	MG/M3	IS25SS080001	6/20	NA	1.6E-10	N/A	1.1E+01 N	N/A		NO	BSL
207-08-9	Benzo(k)fluoranthene	3.6E-11	J	5.4E-10		MG/M3	IS25SS1800012	10/20	NA	5.4E-10	N/A	8.6E-05 C	4.5E+01	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	5.3E-11	J	5.3E-11	J	MG/M3	IS25SS1800012	1/20	NA	5.3E-11	N/A	7.3E-02 N	1.7E+03	SSL	NO	BSL
86-74-8	Carbazole	1.5E-10	J	1.5E-10	J	MG/M3	IS25SS1800012	1/20	NA	1.5E-10	N/A	3.1E-04 C	4.7E-01	SSL	NO	BSL
218-01-9	Chrysene	4.1E-11	J	9.1E-10		MG/M3	IS25SS1800012	12/20	NA	9.1E-10	N/A	8.6E-04 C	1.5E+02	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	6.5E-11	J	4.1E-10	J	MG/M3	IS25SS030001	2/20	NA	4.1E-10	N/A	3.7E-02 N	5.0E+02	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	6.1E-11	J	1.7E-10	J	MG/M3	IS25SS1800012	2/20	NA	1.7E-10	N/A	2.9E-04 C	1.4E+00	SSL	NO	BSL
132-64-9	Dibenzofuran	3.1E-07	J	6.9E-07	J	MG/M3	IS25SS1800012	1/20	NA	6.9E-07	N/A	7.3E-04 N	3.8E-01	SSL	NO	BSL
84-66-2	Diethylphthalate	1.3E-10	J	4.0E-10		MG/M3	IS25SS070001	2/20	NA	4.0E-10	N/A	2.9E-01 N	4.5E+01	SSL	NO	BSL
131-11-3	Dimethyl phthalate	7.3E-11	J	7.3E-11	J	MG/M3	IS25SS1800012	1/20	NA	7.3E-11	N/A	3.7E+00 N	N/A		NO	BSL
206-44-0	Fluoranthene	3.0E-11	J	1.7E-09		MG/M3	IS25SS1800012	15/20	NA	1.7E-09	N/A	1.5E-02 N	6.3E+02	SSL	NO	BSL
86-73-7	Fluorene	4.4E-07	J	4.4E-07	J	MG/M3	IS25SS1800012	1/20	NA	4.4E-07	N/A	1.5E-02 N	1.4E+01	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	3.5E-11	J	2.0E-10	J	MG/M3	IS25SS080001	9/20	NA	2.0E-10	N/A	8.6E-06 C	1.3E+01	SSL	NO	BSL
91-20-3	Naphthalene	1.3E-06	J	1.3E-06	J	MG/M3	IS25SS1800012	1/20	NA	1.3E-06	N/A	3.3E-04 N	1.5E-02	SSL	NO	BSL
85-01-8	Phenanthrene	3.4E-11	J	1.7E-09		MG/M3	IS25SS1800012	9/20	NA	1.7E-09	N/A	1.1E-02 N	N/A		NO	BSL
129-00-0	Pyrene	1.2E-08	J	2.0E-07		MG/M3	IS25SS1800012	14/20	NA	2.0E-07	N/A	1.1E-02 N	6.8E+01	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	2.6E-10	J	1.3E-08		MG/M3	IS25SS030001	5/20	NA	1.3E-08	N/A	4.5E-04 C	2.9E+03	SSL	NO	BSL
7429-90-5	Aluminum	2.8E-06		1.0E-05		MG/M3	IS25SS020001	20/20	NA	1.0E-05	N/A	3.7E-04 N	N/A		NO	BSL
7440-36-0	Antimony	1.1E-09	K	1.6E-09	L	MG/M3	IS25SS010001	2/20	NA	1.6E-09	N/A	1.5E-04 N	1.3E+00	SSL	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-38-2	Arsenic	2.8E-09		1.8E-08		MG/M3	IS25SS1800012	20/20	NA	1.8E-08	N/A	4.1E-07 C	2.6E-02	SSL	NO	BSL
7440-39-3	Barium	2.0E-08	J	8.4E-08		MG/M3	IS25SS070001	20/20	NA	8.4E-08	N/A	5.1E-05 N	2.1E+02	SSL	NO	BSL
7440-43-9	Cadmium	7.0E-11	J	3.6E-08		MG/M3	IS25SS030001	20/20	NA	3.6E-08	N/A	9.9E-07 C	5.5E+00	SSL	NO	BSL
7440-70-2	Calcium	8.6E-07	J	2.6E-06	J	MG/M3	IS25SS010001	14/20	NA	2.6E-06	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	6.4E-09		9.4E-08		MG/M3	IS25SS030001	20/20	NA	9.4E-08	N/A	1.5E-07 C	4.2E+00	SSL	NO	BSL
7440-48-4	Cobalt	2.0E-09	J	1.0E-08	J	MG/M3	IS25SS1900012	20/20	NA	1.0E-08	N/A	6.4E-08 N	N/A		NO	BSL
7440-50-8	Copper	4.6E-09		8.2E-08		MG/M3	IS25SS030001	19/20	NA	8.2E-08	N/A	1.5E-02 N	1.1E+03	SSL	NO	BSL
57-12-5	Cyanide	1.7E-10	J	1.7E-10	J	MG/M3	IS25SS1800012	1/20	NA	1.7E-10	N/A	7.3E-03 N	1.5E+01	SSL	NO	BSL
7439-89-6	Iron	6.7E-06		1.8E-05		MG/M3	IS25SS020001	20/20	NA	1.8E-05	N/A	1.1E-01 N	N/A		NO	BSL
7439-92-1	Lead	8.0E-09	K	1.3E-07	K	MG/M3	IS25SS030001	20/20	NA	1.3E-07	N/A	N/A	N/A		NO	NTX
7439-95-4	Magnesium	3.6E-07	J	5.1E-06		MG/M3	IS25SS1900012	17/20	NA	5.1E-06	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	1.2E-07		7.4E-07		MG/M3	IS25SS070001	20/20	NA	7.4E-07	N/A	5.2E-06 N	9.5E+01	SSL	NO	BSL
7439-97-6	Mercury	4.8E-11	J	3.0E-10		MG/M3	IS25SS020001	16/20	NA	3.0E-10	N/A	3.1E-05 N	N/A		NO	BSL
7440-02-0	Nickel	2.3E-09	J	9.1E-08		MG/M3	IS25SS1900012	20/20	NA	9.1E-08	N/A	7.3E-03 N	N/A		NO	BSL
7440-09-7	Potassium	1.9E-07	J	5.7E-07	J	MG/M3	IS25SS010001	20/20	NA	5.7E-07	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	8.3E-10	L	1.7E-09		MG/M3	IS25SS1800012	5/19	NA	1.7E-09	N/A	1.8E-03 N	1.9E+00	SSL	NO	BSL
7440-22-4	Silver	6.8E-10	J	1.5E-07		MG/M3	IS25SS1800012	9/19	NA	1.5E-07	N/A	1.8E-03 N	3.1E+00	SSL	NO	BSL
7440-28-0	Thallium	1.4E-09	J	1.4E-09	J	MG/M3	IS25SS160001	1/19	NA	1.4E-09	N/A	2.6E-05 N	3.6E-01	SSL	NO	BSL
7440-62-2	Vanadium	1.0E-08		5.5E-08		MG/M3	IS25SS010001P	20/20	NA	5.5E-08	N/A	1.1E-04 N	2.2E+01	SSL	NO	BSL
7440-66-6	Zinc	3.3E-08	J	4.0E-07	J	MG/M3	IS25SS030001	10/20	NA	4.0E-07	N/A	1.1E-01 N	1.4E+03	SSL	NO	BSL

* Unable to calculate VF due to lack of physico-chemical data.

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.2.A.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Ambient Air, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for anthracene used as surrogate for acenaphthylene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 25, NDWIH
Site 25, Indian Head NSWC

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	
Methyl acetate	N/A						
Methylene Chloride	1.01E-01	8.98E-02	1.17E-05	1.17E+01	7.02E-02	1.30E+04	
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E00	5.26E+02	
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	
Acetophenone	N/A	4.99E-04	N/A	4.68E+01	2.81E-01	1.66E+03	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Dibenzofuran	6.19E-02	3.98E-03		5.48E+03	3.29E+01	5.65E+00	
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential [5] ARAR/TBC Source	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
76-13-1	1,1,2-Trichloro-1,2,2- trifluoroethane	3.60	J	3.60	J	UG/L	IS25MW021000	1/2	10 - 10	3.6	N/A	5,938 N	N/A	N/A	NO	BSL
7429-90-5	Aluminum	292		292		UG/L	IS25MW011000	1/2	19.9 - 19.9	292	N/A	3,650 N	50 - 200	SMCL	NO	BSL
7440-39-3	Barium	98.8	J	352		UG/L	IS25MW011000	2/2	0.15 - 0.15	352	N/A	256 N	2000	PMCL	YES	ASL
7440-41-7	Beryllium	2.40	J	2.40	J	UG/L	IS25MW011000	1/2	0.08 - 0.08	2.4	N/A	7.30 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	9,460		11,300		UG/L	IS25MW011000	2/2	7.7 - 7.7	11300	N/A	N/A	N/A	N/A	NO	NUT
7440-48-4	Cobalt	28.5	J	64.7		UG/L	IS25MW011000	2/2	0.83 - 0.83	64.7	N/A	73 N	N/A	N/A	NO	BSL
7440-50-8	Copper	4.00	J	4.00	J	UG/L	IS25MW011000	1/2	1.3 - 1.3	4	N/A	146 N	1000	SMCL	NO	BSL
7439-89-6	Iron	111		1,160		UG/L	IS25MW021000	2/2	16 - 16	1160	N/A	1,100 N	300	SMCL	YES	ASL
7439-95-4	Magnesium	5,380		11,400		UG/L	IS25MW011000	2/2	14.2 - 14.2	11400	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	343		2,040		UG/L	IS25MW011000	2/2	0.15 - 0.15	2040	N/A	73 N	50	SMCL	YES	ASL
7440-02-0	Nickel	5.00	J	28.8	J	UG/L	IS25MW011000	2/2	2 - 2	28.8	N/A	73 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	3,160	J	5,540		UG/L	IS25MW021000	2/2	19.5 - 19.5	5540	N/A	N/A	N/A	N/A	NO	NUT
7440-23-5	Sodium	23,100		120,000		UG/L	IS25MW011000	2/2	244 - 244	120000	N/A	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	0.940	J	0.940	J	UG/L	IS25MW021000	1/2	0.76 - 0.76	0.94	N/A	1.1 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	77.7		77.7		UG/L	IS25MW011000	1/2	1.2 - 1.2	77.7	N/A	1,095 N	5000	SMCL	NO	BSL

[1] Minimum/Maximum detected concentration. Since total metals and dissolved metals yielded similar results, total metal data were used for the risk assessment.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Primary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 141, Subpart G
Secondary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 143
[6] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Excavation Pit

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential [5] ARAR/TBC Source	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
76-13-1	1,1,2-Trichloro-1,2,2- trifluoroethane	3.60	J	3.60	J	UG/L	IS25MW021000	1/2	10 - 10	3.6	N/A	5,938 N	N/A	N/A	NO	BSL
7429-90-5	Aluminum	292		292		UG/L	IS25MW011000	1/2	19.9 - 19.9	292	N/A	3,650 N	50 - 200	SMCL	NO	BSL
7440-39-3	Barium	98.8	J	352		UG/L	IS25MW011000	2/2	0.15 - 0.15	352	N/A	256 N	2000	PMCL	YES	ASL
7440-41-7	Beryllium	2.40	J	2.40	J	UG/L	IS25MW011000	1/2	0.08 - 0.08	2.4	N/A	7.30 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	9,460		11,300		UG/L	IS25MW011000	2/2	7.7 - 7.7	11300	N/A	N/A	N/A	N/A	NO	NUT
7440-48-4	Cobalt	28.5	J	64.7		UG/L	IS25MW011000	2/2	0.83 - 0.83	64.7	N/A	73 N	N/A	N/A	NO	BSL
7440-50-8	Copper	4.00	J	4.00	J	UG/L	IS25MW011000	1/2	1.3 - 1.3	4	N/A	146 N	1000	SMCL	NO	BSL
7439-89-6	Iron	111		1,160		UG/L	IS25MW021000	2/2	16 - 16	1160	N/A	1,100 N	300	SMCL	YES	ASL
7439-95-4	Magnesium	5,380		11,400		UG/L	IS25MW011000	2/2	14.2 - 14.2	11400	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	343		2,040		UG/L	IS25MW011000	2/2	0.15 - 0.15	2040	N/A	73 N	50	SMCL	YES	ASL
7440-02-0	Nickel	5.00	J	28.8	J	UG/L	IS25MW011000	2/2	2 - 2	28.8	N/A	73 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	3,160	J	5,540		UG/L	IS25MW021000	2/2	19.5 - 19.5	5540	N/A	N/A	N/A	N/A	NO	NUT
7440-23-5	Sodium	23,100		120,000		UG/L	IS25MW011000	2/2	244 - 244	120000	N/A	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	0.940	J	0.940	J	UG/L	IS25MW021000	1/2	0.76 - 0.76	0.94	N/A	1.1 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	77.7		77.7		UG/L	IS25MW011000	1/2	1.2 - 1.2	77.7	N/A	1,095 N	5000	SMCL	NO	BSL

[1] Minimum/Maximum detected concentration. Unfiltered results for metals since construction worker expected to directly contact groundwater.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
[5] Primary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 141, Subpart G
Secondary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 143
[6] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential [5] ARAR/TBC Source	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
76-13-1	1,1,2-Trichloro-1,2,2- trifluoroethane	3.60	J	3.60	J	UG/L	IS25MW021000	1/2	10 - 10	3.6	N/A	5,938 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
[5] Primary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 141, Subpart G
Secondary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 143
[6] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Water Vapors at Excavation

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential [5] ARAR/TBC Source	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
76-13-1	1,1,2-Trichloro-1,2,2- trifluoroethane	3.60	J	3.60	J	UG/L	IS25MW021000	1/2	10 - 10	3.6	N/A	5,938 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Tap Water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
[5] Primary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 141, Subpart G
Secondary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 143
[6] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Maximum Contaminant Level, Primary Drinking Water Standards
SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards

Table 2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
67-64-1	Acetone	0.0026	J	0.0089	J	MG/KG	IS25SS010001P	3/26	0.011 - 0.018	0.0089	N/A	7,000 N	2.2	SSL	NO	BSL
79-20-9	Methyl acetate	0.0021	J	0.0021	J	MG/KG	IS25SS170001	1/26	0.011 - 0.018	0.0021	N/A	7,821 N	2.48	SSL	NO	BSL
75-09-2	Methylene chloride	0.0019	J	0.0019	J	MG/KG	IS25SS040001 IS25SS050001	2/26	0.011 - 0.018	0.0019	N/A	85.2 C	0.019	SSL	NO	BSL
127-18-4	Tetrachloroethene	0.0018	J	0.0018	J	MG/KG	IS25SB200203	1/26	0.011 - 0.018	0.0018	N/A	1.2 C	0.004	SSL	NO	BSL
108-88-3	Toluene	0.0015	J	0.0015	J	MG/KG	IS25SS150001	1/26	0.011 - 0.018	0.0015	N/A	1,564 N	0.879	SSL	NO	BSL
79-01-6	Trichloroethene	0.0031	J	0.0031	J	MG/KG	IS25SB200203	1/26	0.011 - 0.018	0.0031	N/A	1.6 C	0.00026	SSL	NO	BSL
91-57-6	2-Methylnaphthalene	0.044	J	0.044	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.044	N/A	156 N	2.2	SSL	NO	BSL
83-32-9	Acenaphthene	0.37	J	0.37	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.37	N/A	469 N	10.5	SSL	NO	BSL
208-96-8	Acenaphthylene	0.09	J	0.09	J	MG/KG	IS25SS080001	1/26	0.37 - 1.7	0.09	N/A	2,346 N	N/A		NO	BSL
98-86-2	Acetophenone	0.045	J	0.1	J	MG/KG	IS25SS130001	6/26	0.37 - 1.7	0.1	N/A	782 N	0.32	SSL	NO	BSL
120-12-7	Anthracene	0.054	J	0.44		MG/KG	IS25SS1800012	2/26	0.37 - 1.7	0.44	N/A	2,346 N	46.6	SSL	NO	BSL
100-52-7	Benzaldehyde	0.055	J	2.4		MG/KG	IS25SS200001	3/26	0.37 - 1.7	2.4	N/A	782 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	0.049	J	1.3		MG/KG	IS25SS1800012	7/26	0.37 - 1.7	1.3	N/A	0.875 C	1.46	SSL	YES	ASL
50-32-8	Benzo(a)pyrene	0.045	J	0.4	J	MG/KG	IS25SS080001	9/26	0.37 - 1.7	0.4	N/A	0.0875 C	0.374	SSL	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.05	J	1.2		MG/KG	IS25SS1800012	11/26	0.37 - 1.7	1.2	N/A	0.875 C	4.51	SSL	YES	ASL
191-24-2	Benzo(g,h,i)perylene	0.051	J	0.21	J	MG/KG	IS25SS080001	6/26	0.37 - 1.7	0.21	N/A	235 N	N/A		NO	BSL
207-08-9	Benzo(k)fluoranthene	0.047	J	0.71		MG/KG	IS25SS1800012	10/26	0.37 - 1.7	0.71	N/A	8.75 C	45.1	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	0.07	J	0.07	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.07	N/A	1,564 N	1680	SSL	NO	BSL
86-74-8	Carbazole	0.2	J	0.2	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.2	N/A	31.9 C	0.467	SSL	NO	BSL
218-01-9	Chrysene	0.054	J	1.2		MG/KG	IS25SS1800012	12/26	0.37 - 1.7	1.2	N/A	87.5 C	146	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	0.086	J	0.54	J	MG/KG	IS25SS030001	2/26	0.37 - 1.7	0.54	N/A	782 N	496	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.081	J	0.22	J	MG/KG	IS25SS1800012	2/26	0.37 - 1.7	0.22	N/A	0.0875 C	1.4	SSL	YES	ASL
132-64-9	Dibenzofuran	0.18	J	0.18	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.18	N/A	16 N	0.38	SSL	NO	BSL
84-66-2	Diethylphthalate	0.17	J	0.53		MG/KG	IS25SS070001	2/26	0.37 - 1.7	0.53	N/A	6,257 N	45.3	SSL	NO	BSL
131-11-3	Dimethyl phthalate	0.096	J	0.096	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.096	N/A	78,214 N	N/A		NO	BSL
206-44-0	Fluoranthene	0.039	J	2.3		MG/KG	IS25SS1800012	15/26	0.37 - 1.7	2.3	N/A	313 N	625	SSL	NO	BSL
86-73-7	Fluorene	0.29	J	0.29	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.29	N/A	313 N	13.5	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.046	J	0.26	J	MG/KG	IS25SS080001	9/26	0.37 - 1.7	0.26	N/A	0.875 C	12.7	SSL	NO	BSL
91-20-3	Naphthalene	0.092	J	0.092	J	MG/KG	IS25SS1800012	1/26	0.37 - 1.7	0.092	N/A	156 N	0.0154	SSL	NO	BSL
85-01-8	Phenanthrene	0.045	J	2.3		MG/KG	IS25SS1800012	9/26	0.37 - 1.7	2.3	N/A	235 N	N/A		NO	BSL
129-00-0	Pyrene	0.061	J	0.99		MG/KG	IS25SS1800012	15/26	0.37 - 1.7	0.99	N/A	235 N	68.2	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.34	J	17		MG/KG	IS25SS030001	5/26	0.37 - 2.3	17	N/A	45.6 C	2890	SSL	NO	BSL
7429-90-5	Aluminum	3,710		15,000		MG/KG	IS25SB180203	26/26	4.5 - 6.7	15000	N/A	7,821 N	N/A		YES	ASL
7440-36-0	Antimony	0.76	K	2.1	L	MG/KG	IS25SS010001	7/26	0.7 - 1.5	2.1	N/A	3.13 N	1.32	SSL	NO	BSL

Table 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-38-2	Arsenic	3.7		23.8		MG/KG	IS25SS1800012	26/26	0.72 - 1.3	23.8	N/A	0.426 C	0.0261	SSL	YES	ASL
7440-39-3	Barium	23	J	111		MG/KG	IS25SS070001	26/26	0.034 - 0.14	111	N/A	548 N	211	SSL	NO	BSL
7440-43-9	Cadmium	0.092	J	47.2		MG/KG	IS25SS030001	26/26	0.056 - 0.14	47.2	N/A	7.80 N	5.5	SSL	YES	ASL
7440-70-2	Calcium	333	J	3,410	J	MG/KG	IS25SS010001	15/26	1.7 - 2.9	3410	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	8.5		124		MG/KG	IS25SS030001	26/26	0.25 - 0.71	124	N/A	23.5 N	4.2	SSL	YES	ASL
7440-48-4	Cobalt	2.6	J	13.2	J	MG/KG	IS25SS1900012	26/26	0.19 - 0.78	13.2	N/A	160 N	N/A		NO	BSL
7440-50-8	Copper	6.1	J	108		MG/KG	IS25SS030001	25/26	0.29 - 0.68	108	N/A	313 N	1100	SSL	NO	BSL
57-12-5	Cyanide	0.22	J	0.22	J	MG/KG	IS25SS1800012	1/26	0.56 - 0.89	0.22	N/A	156 N	14.7	SSL	NO	BSL
7439-89-6	Iron	8,880		30,100		MG/KG	IS25SB010203	26/26	3.6 - 9.7	30100	N/A	2,346 N	N/A		YES	ASL
7439-92-1	Lead	10.3	K	174	K	MG/KG	IS25SS030001	26/26	0.31 - 0.53	174	N/A	400	N/A		NO	BSL
7439-95-4	Magnesium	349	J	6,680		MG/KG	IS25SS1900012	23/26	3.2 - 4.8	6680	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	71.4		971		MG/KG	IS25SS070001	26/26	0.034 - 0.14	971	N/A	156 N	95.2	SSL	YES	ASL
7439-97-6	Mercury	0.064	J	0.39		MG/KG	IS25SS020001	18/26	0.056 - 0.089	0.39	N/A	2.35 N	N/A		NO	BSL
7440-02-0	Nickel	3.1	J	120		MG/KG	IS25SS1900012	26/26	0.45 - 0.68	120	N/A	156 N	N/A		NO	BSL
7440-09-7	Potassium	247	J	748	J	MG/KG	IS25SS010001	24/26	4.4 - 18.7	748	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	1.1	K, L	2.3		MG/KG	IS25SS1800012	11/25	0.9 - 1.5	2.3	N/A	39.1 N	1.9	SSL	NO	BSL
7440-22-4	Silver	0.9	J	201		MG/KG	IS25SS1800012	11/25	0.25 - 1.1	201	N/A	39.1 N	3.1	SSL	YES	ASL
7440-28-0	Thallium	1.9	J	1.9	J	MG/KG	IS25SS160001	1/25	1.3 - 1.9	1.9	N/A	0.548 N	0.364	SSL	YES	ASL
7440-62-2	Vanadium	13.7		72.8		MG/KG	IS25SS010001P	26/26	0.17 - 0.5	72.8	N/A	2.3 N	22	SSL	YES	ASL
7440-66-6	Zinc	23.2	J	529	J	MG/KG	IS25SS030001	16/26	0.14 - 0.33	529	N/A	2,346 N	1360	SSL	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Residential Soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
Residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for anthracene used as surrogate for acenaphthylene.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.

[5] SSL = EPA Region III Soil Screening Levels, based on a Dilution and Attenuation Factor of 20. Cancer benchmark value = 1E-06, adjusted HQ=0.1

[6] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
N! = Use of non-cancer value for screening since it is more conservative

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
67-64-1	Acetone	1.6E-07	J	5.5E-07	J	MG/M3	IS25SS010001P	3/26	N/A	5.5E-07	N/A	3.3E-01 N	2.2E+00	SSL	NO	BSL
79-20-9	Methyl acetate**	1.6E-12	J	1.6E-12	J	MG/M3	IS25SS170001	1/26	N/A	1.6E-12	N/A	3.7E-01 N	2.5E+00	SSL	NO	BSL
75-09-2	Methylene chloride	5.9E-07	J	5.9E-07	J	MG/M3	IS25SS040001 IS25SS050001	2/26	N/A	5.9E-07	N/A	3.8E-03 C	1.9E-02	SSL	NO	BSL
127-18-4	Tetrachloroethene	5.4E-07	J	5.4E-07	J	MG/M3	IS25SB200203	1/26	N/A	5.4E-07	N/A	3.10E-04 C	4.7E-03	SSL	NO	BSL
108-88-3	Toluene	2.9E-07	J	2.9E-07	J	MG/M3	IS25SS150001	1/26	N/A	2.9E-07	N/A	4.2E-02 N	8.8E-01	SSL	NO	BSL
79-01-6	Trichloroethene	7.3E-07	J	7.3E-07	J	MG/M3	IS25SB200203	1/26	N/A	7.3E-07	N/A	1.60E-05 C	2.6E-04	SSL	NO	BSL
91-57-6	2-Methylnaphthalene	5.9E-07	J	5.9E-07	J	MG/M3	IS25SS1800012	1/26	N/A	5.9E-07	N/A	7.3E-03 N	2.2E+00	SSL	NO	BSL
83-32-9	Acenaphthene	1.3E-06	J	1.3E-06	J	MG/M3	IS25SS1800012	1/26	N/A	1.3E-06	N/A	2.2E-02 N	1.1E+01	SSL	NO	BSL
208-96-8	Acenaphthylene	6.8E-11	J	6.8E-11	J	MG/M3	IS25SS080001	1/26	N/A	6.8E-11	N/A	3.3E-01 N	N/A		NO	BSL
98-86-2	Acetophenone**	3.4E-11	J	7.6E-11	J	MG/M3	IS25SS130001	6/26	N/A	7.6E-11	N/A	3.7E-02 N	3.2E-01	SSL	NO	BSL
120-12-7	Anthracene	5.3E-08	J	4.3E-07		MG/M3	IS25SS1800012	2/26	N/A	4.3E-07	N/A	1.1E-01 N	4.7E+01	SSL	NO	BSL
100-52-7	Benzaldehyde	4.2E-11	J	1.8E-09		MG/M3	IS25SS200001	3/26	N/A	1.8E-09	N/A	3.7E-02 N	N/A		NO	BSL
56-55-3	Benzo(a)anthracene	3.7E-11	J	9.8E-10		MG/M3	IS25SS1800012	7/26	N/A	9.8E-10	N/A	8.6E-06 C	1.5E+00	SSL	NO	BSL
50-32-8	Benzo(a)pyrene	3.4E-11	J	3.0E-10	J	MG/M3	IS25SS080001	9/26	N/A	3.0E-10	N/A	2.0E-06 C	3.7E-01	SSL	NO	BSL
205-99-2	Benzo(b)fluoranthene	3.8E-11	J	9.1E-10		MG/M3	IS25SS1800012	11/26	N/A	9.1E-10	N/A	8.6E-06 C	4.5E+00	SSL	NO	BSL
191-24-2	Benzo(g,h,i)perylene	3.9E-11	J	1.6E-10	J	MG/M3	IS25SS080001	6/26	N/A	1.6E-10	N/A	1.1E+01 N	N/A		NO	BSL
207-08-9	Benzo(k)fluoranthene	3.6E-11	J	5.4E-10		MG/M3	IS25SS1800012	10/26	N/A	5.4E-10	N/A	8.6E-05 C	4.5E+01	SSL	NO	BSL
85-68-7	Butylbenzylphthalate	5.3E-11	J	5.3E-11	J	MG/M3	IS25SS1800012	1/26	N/A	5.3E-11	N/A	7.3E-02 N	1.7E+03	SSL	NO	BSL
86-74-8	Carbazole	1.5E-10	J	1.5E-10	J	MG/M3	IS25SS1800012	1/26	N/A	1.5E-10	N/A	3.1E-04 C	4.7E-01	SSL	NO	BSL
218-01-9	Chrysene	4.1E-11	J	9.1E-10		MG/M3	IS25SS1800012	12/26	N/A	9.1E-10	N/A	8.6E-04 C	1.5E+02	SSL	NO	BSL
84-74-2	Di-n-butylphthalate	6.5E-11	J	4.1E-10	J	MG/M3	IS25SS030001	2/26	N/A	4.1E-10	N/A	3.7E-02 N	5.0E+02	SSL	NO	BSL
53-70-3	Dibenz(a,h)anthracene	6.1E-11	J	1.7E-10	J	MG/M3	IS25SS1800012	2/26	N/A	1.7E-10	N/A	2.9E-04 C	1.4E+00	SSL	NO	BSL
132-64-9	Dibenzofuran	6.9E-07	J	6.9E-07	J	MG/M3	IS25SS1800012	1/26	N/A	6.9E-07	N/A	7.3E-04 N	3.8E-01	SSL	NO	BSL
84-66-2	Diethylphthalate	1.3E-10	J	4.0E-10		MG/M3	IS25SS070001	2/26	N/A	4.0E-10	N/A	2.9E-01 N	4.5E+01	SSL	NO	BSL
131-11-3	Dimethyl phthalate	7.3E-11	J	7.3E-11	J	MG/M3	IS25SS1800012	1/26	N/A	7.3E-11	N/A	3.7E+00 N	N/A		NO	BSL
206-44-0	Fluoranthene	3.0E-11	J	1.7E-09		MG/M3	IS25SS1800012	15/26	N/A	1.7E-09	N/A	1.5E-02 N	6.3E+02	SSL	NO	BSL
86-73-7	Fluorene	4.4E-07	J	4.4E-07	J	MG/M3	IS25SS1800012	1/26	N/A	4.4E-07	N/A	1.5E-02 N	1.4E+01	SSL	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	3.5E-11	J	2.0E-10	J	MG/M3	IS25SS080001	9/26	N/A	2.0E-10	N/A	8.6E-06 C	1.3E+01	SSL	NO	BSL
91-20-3	Naphthalene	1.3E-06	J	1.3E-06	J	MG/M3	IS25SS1800012	1/26	N/A	1.3E-06	N/A	3.3E-04 N	1.5E-02	SSL	NO	BSL
85-01-8	Phenanthrene	3.4E-11	J	1.7E-09		MG/M3	IS25SS1800012	9/26	N/A	1.7E-09	N/A	1.1E-02 N	N/A		NO	BSL
129-00-0	Pyrene	1.2E-08	J	2.0E-07		MG/M3	IS25SS1800012	15/26	N/A	2.0E-07	N/A	1.1E-02 N	6.8E+01	SSL	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	2.6E-10	J	1.3E-08		MG/M3	IS25SS030001	5/26	N/A	1.3E-08	N/A	4.5E-04 C	2.9E+03	SSL	NO	BSL
7429-90-5	Aluminum	2.8E-06		1.1E-05		MG/M3	IS25SB180203	26/26	N/A	1.1E-05	N/A	3.7E-04 N	N/A		NO	BSL
7440-36-0	Antimony	5.8E-10	K	1.6E-09	L	MG/M3	IS25SS010001	7/26	N/A	1.6E-09	N/A	1.5E-04 N	1.3E+00	SSL	NO	BSL

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-38-2	Arsenic	2.8E-09		1.8E-08		MG/M3	IS25SS1800012	26/26	N/A	1.8E-08	N/A	4.1E-07 C	2.6E-02	SSL	NO	BSL
7440-39-3	Barium	1.7E-08	J	8.4E-08		MG/M3	IS25SS070001	26/26	N/A	8.4E-08	N/A	5.1E-05 N	2.1E+02	SSL	NO	BSL
7440-43-9	Cadmium	7.0E-11	J	3.6E-08		MG/M3	IS25SS030001	26/26	N/A	3.6E-08	N/A	9.9E-07 C	5.5E+00	SSL	NO	BSL
7440-70-2	Calcium	2.5E-07	J	2.6E-06	J	MG/M3	IS25SS010001	15/26	N/A	2.6E-06	N/A	N/A	N/A		NO	NUT
7440-47-3	Chromium	6.4E-09		9.4E-08		MG/M3	IS25SS030001	26/26	N/A	9.4E-08	N/A	1.5E-07 C	4.2E+00	SSL	NO	BSL
7440-48-4	Cobalt	2.0E-09	J	1.0E-08	J	MG/M3	IS25SS1900012	26/26	N/A	1.0E-08	N/A	6.4E-08 N	N/A		NO	BSL
7440-50-8	Copper	4.6E-09	J	8.2E-08		MG/M3	IS25SS030001	25/26	N/A	8.2E-08	N/A	1.5E-02 N	1.1E+03	SSL	NO	BSL
57-12-5	Cyanide	1.7E-10	J	1.7E-10	J	MG/M3	IS25SS1800012	1/26	N/A	1.7E-10	N/A	7.3E-03 N	1.5E+01	SSL	NO	BSL
7439-89-6	Iron	6.7E-06		2.3E-05		MG/M3	IS25SB010203	26/26	N/A	2.3E-05	N/A	1.1E-01 N	N/A		NO	BSL
7439-92-1	Lead	7.8E-09	K	1.3E-07	K	MG/M3	IS25SS030001	26/26	N/A	1.3E-07	N/A	N/A	N/A		NO	NTX
7439-95-4	Magnesium	2.6E-07	J	5.1E-06		MG/M3	IS25SS1900012	23/26	N/A	5.1E-06	N/A	N/A	N/A		NO	NUT
7439-96-5	Manganese	5.4E-08		7.4E-07		MG/M3	IS25SS070001	26/26	N/A	7.4E-07	N/A	5.2E-06 N	9.5E+01	SSL	NO	BSL
7439-97-6	Mercury	4.8E-11	J	3.0E-10		MG/M3	IS25SS020001	18/26	N/A	3.0E-10	N/A	3.1E-05 N	N/A		NO	BSL
7440-02-0	Nickel	2.3E-09	J	9.1E-08		MG/M3	IS25SS1900012	26/26	N/A	9.1E-08	N/A	7.3E-03 N	N/A		NO	BSL
7440-09-7	Potassium	1.9E-07	J	5.7E-07	J	MG/M3	IS25SS010001	24/26	N/A	5.7E-07	N/A	N/A	N/A		NO	NUT
7782-49-2	Selenium	8.3E-10	K, L	1.7E-09		MG/M3	IS25SS1800012	11/25	N/A	1.7E-09	N/A	1.8E-03 N	1.9E+00	SSL	NO	BSL
7440-22-4	Silver	6.8E-10	J	1.5E-07		MG/M3	IS25SS1800012	11/25	N/A	1.5E-07	N/A	1.8E-03 N	3.1E+00	SSL	NO	BSL
7440-28-0	Thallium	1.4E-09	J	1.4E-09	J	MG/M3	IS25SS160001	1/25	N/A	1.4E-09	N/A	2.6E-05 N	3.6E-01	SSL	NO	BSL
7440-62-2	Vanadium	1.0E-08		5.5E-08		MG/M3	IS25SS010001P	26/26	N/A	5.5E-08	N/A	1.1E-04 N	2.2E+01	SSL	NO	BSL
7440-66-6	Zinc	1.8E-08	J	4.0E-07	J	MG/M3	IS25SS030001	16/26	N/A	4.0E-07	N/A	1.1E-01 N	1.4E+03	SSL	NO	BSL

* Surface soil & subsurface soil combined

** Unable to calculate VF due to lack of physico-chemical data.

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.8.A.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table for Ambient Air, October 15, 2003, U.S. EPA Region III, Jennifer Hubba
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for anthracene used as surrogate for acenaphthylene.

[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.8.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 25, NDWIH
Site 25, Indian Head NSWC

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	
Methyl Acetate	N/A						
Methylene Chloride	1.01E-01	8.98E-02	1.17E-05	1.17E+01	7.02E-02	1.30E+04	
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	2.00E+02	
Toluene	8.70E-02	2.72E-01	8.60E-06	1.82E+02	1.09E00	5.26E+02	
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	
Acetophenone	N/A						
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Dibenzofuran	6.19E-02	3.98E-03		5.48E+03	3.29E+01	5.65E+00	
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	MG/KG	0.289	0.402	1.30		MG/KG	0.448	95% UCL-T	W-Test (4)	0.209	Mean-T	W-Test (4)
Benzo(a)pyrene	MG/KG	0.215	0.283	0.400	J	MG/KG	0.334	95% UCL-T	W-Test (4)	0.164	Mean-T	W-Test (4)
Benzo(b)fluoranthene	MG/KG	0.240	0.338	1.20		MG/KG	0.364	95% UCL-T	W-Test (1)	0.172	Mean-T	W-Test (1)
Dibenz(a,h)anthracene	MG/KG	0.263	0.322	0.220	J	MG/KG	0.220	Max	W-Test (4,2)	0.220	Max	W-Test (4,2)
Aluminum	MG/KG	6,670	7,720	13,600		MG/KG	7,770	95% UCL-T	W-Test (1)	6,248	Mean-T	W-Test (1)
Arsenic	MG/KG	7.73	9.83	23.8		MG/KG	9.58	95% UCL-T	W-Test (4)	6.62	Mean-T	W-Test (4)
Cadmium	MG/KG	3.45	7.47	47.2		MG/KG	5.83	95% UCL-T	W-Test (1)	0.86	Mean-T	W-Test (1)
Chromium	MG/KG	22.7	32.5	124		MG/KG	29.4	95% UCL-T	W-Test (4)	17.3	Mean-T	W-Test (4)
Iron	MG/KG	14,000	15,800	24,400		MG/KG	16,000	95% UCL-T	W-Test (1)	13,227	Mean-T	W-Test (1)
Manganese	MG/KG	395	478	971		MG/KG	498	95% UCL-T	W-Test (1)	351	Mean-T	W-Test (1)
Silver	MG/KG	13.9	32.0	201		MG/KG	42.3	95% UCL-T	W-Test (4)	1.55	Mean-T	W-Test (4)
Thallium	MG/KG	0.820	0.930	1.90	J	MG/KG	0.910	95% UCL-T	W-Test (4)	0.790	Mean-T	W-Test (4)
Vanadium	MG/KG	26.0	31.1	72.8		MG/KG	30.7	95% UCL-T	W-Test (1)	23.8	Mean-T	W-Test (1)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Barium	UG/L	225	N/A	352		UG/L	352	Max	W-Test (5)	225	Mean-N	W-Test (6)
Iron	UG/L	636	N/A	1,160		UG/L	1,160	Max	W-Test (5)	636	Mean-N	W-Test (6)
Manganese	UG/L	1,192	N/A	2,040		UG/L	2,040	Max	W-Test (5)	1,192	Mean-N	W-Test (6)

N/A - Not applicable because sample size is to small.

Full statistics for data included in Appendix. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Excavation Pit

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Barium	UG/L	225	N/A	352		UG/L	352	Max	W-Test (5)	225	Mean-N	W-Test (6)
Iron	UG/L	636	N/A	1,160		UG/L	1,160	Max	W-Test (5)	636	Mean-N	W-Test (6)
Manganese	UG/L	1,192	N/A	2,040		UG/L	2,040	Max	W-Test (5)	1,192	Mean-N	W-Test (6)

N/A - Not applicable because sample size is to small.

Full statistics for data included in Appendix. Unfiltered results for metals since construction worker expected to directly contact groundwater.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum concentration used for RME EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	MG/KG	0.268	0.354	1.30		MG/KG	0.359	95% UCL-T	W-Test (4)	0.206	Mean-T	W-Test (4)
Benzo(a)pyrene	MG/KG	0.211	0.263	0.400	J	MG/KG	0.289	95% UCL-T	W-Test (4)	0.171	Mean-T	W-Test (4)
Benzo(b)fluoranthene	MG/KG	0.230	0.304	1.20		MG/KG	0.307	95% UCL-T	W-Test (4)	0.178	Mean-T	W-Test (4)
Dibenz(a,h)anthracene	MG/KG	0.248	0.293	0.220	J	MG/KG	0.220	Max	W-Test (4,2)	0.220	Max	W-Test (4,2)
Aluminum	MG/KG	7,970	9,130	15,000		MG/KG	9,410	95% UCL-T	W-Test (1)	7,259	Mean-T	W-Test (1)
Arsenic	MG/KG	7.44	9.04	23.8		MG/KG	8.67	95% UCL-T	W-Test (4)	6.62	Mean-T	W-Test (4)
Cadmium	MG/KG	2.70	5.76	47.2		MG/KG	3.70	95% UCL-T	W-Test (4)	0.58	Mean-T	W-Test (4)
Chromium	MG/KG	21.5	28.9	124		MG/KG	25.6	95% UCL-T	W-Test (4)	17.3	Mean-T	W-Test (4)
Iron	MG/KG	16,200	18,300	30,100		MG/KG	18,800	95% UCL-T	W-Test (1)	15,210	Mean-T	W-Test (1)
Manganese	MG/KG	324	401	971		MG/KG	468	95% UCL-T	W-Test (1)	252	Mean-T	W-Test (1)
Silver	MG/KG	11.5	25.2	201		MG/KG	35.3	95% UCL-T	W-Test (4)	1.21	Mean-T	W-Test (4)
Thallium	MG/KG	0.820	0.900	1.90	J	MG/KG	0.880	95% UCL-T	W-Test (4)	0.790	Mean-T	W-Test (4)
Vanadium	MG/KG	28.2	32.3	72.8		MG/KG	32.5	95% UCL-T	W-Test (1)	26.0	Mean-T	W-Test (1)

* Surface soil & subsurface soil combined.

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997, (4)	3,700	EPA, 1997, (4)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (5)	0.11	EPA, 1997, (5)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) Surface area is 25% of total surface area for 12-15 year old male. 95th percentile for total surface area is 1.85 m^2, 50th percentile for total surface area is 1.49 m^2.

(5) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (2)	5,700	EPA, 1997, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area is based on trespasser wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.

(3) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997, (2)	0.32	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) SSAF based on maximum adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	1.0	EPA, 1997 (5)	1.0	EPA, 1997 (5)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	9	(3)	9	(3)	
	BW	Body Weight	kg	51	EPA, 1997,(4)	51	EPA, 1997,(4)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Professional Judgment assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 9 year old and 18 year old male body weight.

(5) Inhalation rate based on child, aged 10 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997 (3)	0.6	EPA, 1997 (3)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Inhalation rate based on average adult at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Site 25 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.1	EPA, 1997 (2)	2.1	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	2409	EPA, 1989	

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate based on average adult at a moderate activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	20,000	EPA, 1992, (1)	18,000	EPA, 1997b, (1)	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	x CF1 x CF2
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm2, with a mean of 20,000 cm2; the mean is used.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	1	EPA, 1997a	1	EPA, 1997a	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	x CF1 x CF2
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	CDI (mg/kg-day) =
	DAevent-A	Dermally Absorbed Dose per Event, Adult	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x EF x 1/AT
	DAevent-C	Dermally Absorbed Dose per Event, Child	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	
	DA-Adj	Dermally Absorbed Dose, Age-adjusted	mg-year/event-kg	calculated		calculated		DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics:
	ET-A	Exposure Time, Adult	hr/day	0.2	EPA, 1992	0.2	EPA, 1992	DAevent-A (mg/cm2-event) =
	ET-C	Exposure Time, Child	hr/day	0.33	EPA, 1992	0.33	EPA, 1992	PC x CW x ET-A x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	DAevent-C (mg/cm2-event) =
	SA-A	Skin Surface Area, Adult	cm^2	20,000	EPA, 1992	18,000	EPA, 1997b	PC x CW x ET-C x CF1 x CF2
	SA-C	Skin Surface Area, Child	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	Organics:
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	DAevent-A (mg/cm2-event) =
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	2 x PC x CW x (sqrt((6 x t x ET-A)/3.1415)) x CF1 x CF2
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	DAevent-C (mg/cm2-event) =
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	2 x PC x CW x (sqrt((6 x t x ET-C)/3.1415)) x CF1 x CF2
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table …	see Table …	see Table …	see Table …	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W-A	Ingestion Rate of Water, Adult	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
	IR-W-C	Ingestion Rate of Water, Child	liters/day	1	EPA, 1997a	1	EPA, 1997a	
	IR-W-Adj	Ingestion Rate of Water, Age-adjusted	liter-year/kg-day	1.09	calculated	0.58	calculated	IR-W-Adj (liter-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-W-C / BW-C) + (ED-A x IR-W-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Water
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table ----		see Table ----	chem. specific	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-day	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Inorganics: DAevent (mg/cm2-day) =
	t	Lag Time	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	PC x CW x ET x CF1 x CF2
	t*	Time to Reach Steady-state	hours	chem. specific	EPA, 1992	chem. specific	EPA, 1992	
	B	Ratio of Permeability of Stratum Corneum to Epidermis	dimensionless	chem. specific	EPA, 1992	chem. specific	EPA, 1992	Organics :
	ET	Exposure Time	hr/day	8	(1)	4	(1)	ET<t*: DAevent (mg/cm2-day) =
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (2)	2,000	EPA, 1992, (2)	x CF1 x CF2
	EF	Exposure Frequency	days/year	42	(3)	42	(3)	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	ET>t*: DAevent (mg/cm2-day) =
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	x CF1 x CF2
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgment based on construction activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(3) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Air

Exposure Point: Shallow Aquifer - Water Vapors at Showerhead

Receptor Population: Resident

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	InhExp	Inhalation Exposure per Shower	mg/kg-shower	see Table …	see Table …	see Table …	see Table …	Foster & Chrostowski Shower Inhalation Model for InhExp
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	InhExp x EF x ED x 1/AT
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA. 1989	3,285	EPA. 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Shallow Aquifer - Volatilization
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3	see Table --		see Table --		Two-Film Volatilization Model for CA
	IN	Inhalation Rate	m^3/hour	1.7	EPA, 1997	1.7	EPA, 1997	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	
	EF	Exposure Frequency	days/year	42	(2)	42	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1993	CA x IN x ET x EF x ED x 1/BW x 1/AT
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA. 1989	365	EPA. 1989	

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Professional Judgment based on assumption that construction would result in exposure to groundwater for a maximum of two months (not including weekends).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (1)	5,700	EPA, 1997, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997, (2)	0.2	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil
(1) Surface area based on resident wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is based on maximum adherence factor for gardeners.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,400	EPA, 1997, (1)	2,900	EPA, 1997, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (2)	0.11	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

* Surface and subsurface soil
(1) Surface area based on resident wearing shorts and short sleeve shirt. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.15

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S-Adj x EF x CF3 x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	EPA, 1993	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	114.29	calculated	46.43	calculated	IR-S-Adj (mg-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, Adult	cm^2	6,600	EPA, 1997a	5,700	EPA, 1997a	CS x DA-Adj x DABS x CF3 x EF x 1/AT
	SA-C	Skin Surface Area Available for Contact, Child	cm^2	3,400	EPA, 1997b	2,900	EPA, 1997b	
	SSAF-A	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997a	0.2	EPA, 1992	DA-Adj (mg-year/kg-day) =
	SSAF-C	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997a	0.11	EPA, 1997a	[(ED-C x SA-C x SSAF-C / BW-C) +
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	602	calculated	274	calculated	(ED-A x SA-A x SSAF-A / BW-A)]
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

TABLE 4.15

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

* Surface and subsurface soil

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.16

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	480	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.24	EPA, 1997, (2)	0.24	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

* Surface and subsurface soil
(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.
(2) Soil to skin adherence factor is based on maximum adherence factor for construction workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.17

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997, (2)	0.32	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	

* Surface and subsurface soil

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) SSAF based on maximum adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.18

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997, (4)	3,700	EPA, 1997, (4)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (5)	0.11	EPA, 1997, (5)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	(2)	9	(2)	
	BW	Body Weight	kg	51	EPA, 1997,(3)	51	EPA, 1997,(3)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average value for the 9 year old and 18 year old male body weight.

(4) Surface area is 25% of total surface area for 12-15 year old male. 95th percentile for total surface area is 1.85 m^2, 50th percentile for total surface area is 1.49 m^2.

(5) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.19

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----		see Table ----		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (2)	5,700	EPA, 1997, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 1995	chem. specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Surface area is based on trespasser wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.

(3) Soil to skin adherence factor is based on maximum adherence factor for soccer players.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.20

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997 (2)	0.6	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	219	EPA,1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface Soil

(1) Professional Judgment conservatively assumed all day.

(2) Inhalation rate based on average adult at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.21

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.8	EPA, 1997 (2)	0.8	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment conservatively assumed all day.

(2) Inhalation rate based on child, aged 6 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.22

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN-Adj x EF x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	CA (mg/m^3) = CS (1/PEF + 1/VF)
	IN-A	Inhalation Rate, Adult	m^3/hour	0.6	EPA, 1997 (2)	0.6	EPA, 1997 (2)	
	IN-C	Inhalation Rate, Child	m^3/hour	0.8	EPA, 1997 (3)	0.8	EPA, 1997 (3)	IN-Adj (m^3-year/kd-day) =
	IN-Adj	Inhalation Rate, Age-adjusted	m^3-year/kg-day	12.62	calculated	9.53	calculated	(ED-C x IN-C x ET / BW-C) + (ED-A x IN-A x ET / BW-A)
	ET	Exposure Time	hours/day	24	(1)	24	(1)	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment conservatively assumed all day.

(2) Inhalation rate based on average adult at a light activity level.

(3) Inhalation rate based on child, aged 6 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.23

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	3.9	EPA, 1997 (2)	3.9	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate based on average adult at a heavy activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Calc. (1): Calculated in Appendix--- Section Generation of Fugitive Dust During Construction Activities.

TABLE 4.24

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.1	EPA, 1997 (2)	2.1	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	2409	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate based on average adult at a moderate activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.25

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	1.0	EPA, 1997 (5)	1.0	EPA, 1997 (5)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	9	(3)	9	(3)	
	BW	Body Weight	kg	51	EPA, 1997,(4)	51	EPA, 1997,(4)	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Professional Judgment assuming adolescents from 9 to 18 years of age.

(4) Body weight is average value for the 9 year old and 18 year old male body weight.

(5) Inhalation rate based on child, aged 10 years at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.26

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997 (3)	0.6	EPA, 1997 (3)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

* Surface and subsurface soil

(1) Professional Judgment assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgment assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Inhalation rate based on average adult at a light activity level.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 25, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	NA	1.0E+00	mg/kg-day	CNS	100	NCEA	08/26/1996
	Subchronic	N/A								
Arsenic	Chronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin/vascular	3/1	IRIS	03/15/2001
	Subchronic	3.0E-04	mg/kg-day	0.95	3.0E-04	mg/kg-day	Skin/vascular	3/1	HEAST	07/08/1998
Barium	Chronic	7.0E-02	mg/kg-day	0.07	4.9E-03	mg/kg-day	Cardiovascular	3	IRIS	03/12/2001
	Subchronic	7.0E-02	mg/kg-day	0.07	4.9E-03	mg/kg-day	Cardiovascular	3	HEAST	07/08/1998
Benzo(a)anthracene	Chronic	N/A	mg/kg-day							
Benzo(a)pyrene	Chronic	N/A	mg/kg-day							
Benzo(b)fluoranthene	Chronic	N/A	mg/kg-day							
Cadmium (water)	Chronic	5.0E-04	mg/kg-day	0.05	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	03/08/2001
(for water)	Subchronic	N/A								
Cadmium (food)	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	03/08/2001
(for soil)	Subchronic	N/A								
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	NOAEL	300/3	IRIS	03/15/2001
	Subchronic	2.0E-02	mg/kg-day	0.025	5.0E-04	mg/kg-day	NOAEL	100	HEAST	07/08/1998
Dibenzo(a,h)anthracene	Chronic	N/A								
Iron	Chronic	3.0E-01	mg/kg-day	1.0	3.0E-01	mg/kg-day	Gastrointestinal	1	NCEA	07/23/1996
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								
Manganese (food)	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1	IRIS	03/12/2001
	Subchronic	N/A								
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3	IRIS	03/12/2001
	Subchronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3	HEAST	07/08/1998
Thallium	Chronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin/vascular	3	EPA Region III	10/05/2000
	Subchronic	7.0E-05	mg/kg-day	1	7.0E-05	mg/kg-day	Skin	3	HEAST	07/01/1997
Vanadium	Chronic	1.0E-03	mg/kg-day	0.026	2.6E-05	mg/kg-day	Kidney	100	NCEA	05/01/2000
	Subchronic	N/A								

N/A = Not Applicable or Not Available.

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

RESP = Respiratory System

CNS = Central Nervous System

TABLE 5.2

Site 25, NDWIH

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
Aluminum	Chronic Subchronic	3.5E-03 N/A	mg/m^3	1.0E-03	mg/kg-day	CNS	300	RBC	10/05/2000
Arsenic	Chronic	N/A							
Barium	Chronic Subchronic	4.9E-04 N/A	mg/m^3	1.4E-04	mg/kg-day	Cardiovascular		ATSDR	
Benzo(a)anthracene	Chronic	N/A							
Benzo(a)pyrene	Chronic	N/A							
Benzo(b)fluoranthene	Chronic	N/A							
Cadmium	Chronic	2.0E-04	mg/m^3	5.7E-05	mg/kg-day	Kidney	10	NCEA	06/17/1998
Chromium (VI)	Chronic Subchronic	1.1E-04 1.1E-03	mg/m^3 mg/m^3	3.0E-05 3.0E-04	mg/kg-day mg/kg-day	Respiratory NOAEL	300 100	IRIS NCEA	03/12/2001 11/18/1997
Dibenzo(a,h)anthracene	Chronic	N/A							
Iron	Chronic	N/A							
Manganese	Chronic Subchronic	5.0E-05 N/A	mg/m^3	1.4E-05	mg/kg-day	CNS	1000	IRIS	03/15/2001
Silver	Chronic	N/A							
Thallium	Chronic	N/A							
Vanadium	Chronic	N/A							

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 25, NDWIH

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Aluminum	N/A						
Arsenic	1.5E+00	0.95	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/2001
Barium	N/A				D	IRIS	03/08/2001
Cadmium	N/A				B1	IRIS	03/08/2001
Chromium (hexavalent)	N/A				D	IRIS	03/08/2001
Iron	N/A					NCEA	07/23/1996
Manganese (nonfood)	N/A				D	IRIS	03/08/2001
Silver	N/A				D	IRIS	03/08/2001
Thallium	N/A						
Vanadium	N/A						
Benzo(a)anthracene	7.3E-01	0.89	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Benzo(a)pyrene	7.3E+00	0.89	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/08/2001
Benzo(b)fluoranthene	7.3E-01	0.89	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993
Dibenz(a,h)anthracene	7.3E+00	0.89	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/1993

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

(2) See Risk Assessment text for derivation of the "Absorbed Cancer Slope Factor for Dermal".

* USEPA recommends that the adjustment for dermal toxicity is not performed for this constituent (USEPA 2001).

De NA = Not Available

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

USEPA R3 = Region 3 Risk-Based Concentration Table

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 25, NDWIH

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Aluminum	N/A							
Arsenic	4.3E-03	$(ug/m3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/2001
Barium	N/A							
Cadmium	1.8E-03	$(ug/m3)^{-1}$	3500	6.3E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	03/08/2001
Chromium (hexavalent)	1.2E-02	$(ug/m3)^{-1}$	3500	4.1E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/2001
Iron	N/A							
Manganese	N/A					D	IRIS	03/08/2001
Silver	N/A					D	IRIS	03/08/2001
Thallium	N/A							
Vanadium	N/A							
Benzo(a)anthracene	N/A					B2	IRIS	03/08/2001
Benzo(a)pyrene	8.9E-04	$(ug/m3)^{-1}$	3500	3.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	11/18/1994
Benzo(b)fluoranthene	N/A					B2	IRIS	03/08/2001
Dibenz(a,h)anthracene	N/A					B2	IRIS	03/08/2001

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

N/A = Not Available

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

D - Not classifiable as a human carcinogen

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	9.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	6.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	2.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-03
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	2.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.9E-03
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	1.6E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.6E-03
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	8.2E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.7E-03
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	4.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E-02
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	1.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.0E-03
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	1.2E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.4E-03
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	2.5E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.6E-03
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	8.6E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	8.6E-03
	(Total)												5.2E-02
Dermal	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	8.2E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	6.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	6.7E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.0E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	1.1E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-04
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	4.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.4E-03
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	8.2E-09	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	3.3E-04
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	4.2E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	5.5E-03
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	2.3E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.5E-04
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	7.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	8.8E-03
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	6.0E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.0E-03
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	1.3E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.8E-04
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	4.3E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.7E-02
	(Total)												3.7E-02
												Total Hazard Index Across All Exposure Routes/Pathways	8.9E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	9.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	6.8E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	7.4E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.5E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	1.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.6E-03
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.5E-03
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	1.2E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.2E-03
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	6.0E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.0E-03
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	3.3E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.1E-02
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	1.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.1E-03
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	8.6E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.7E-03
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	1.9E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.6E-03
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	6.2E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.2E-03
	(Total)												3.8E-02
Dermal	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	8.6E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	6.4E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	7.0E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.2E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	1.1E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-04
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	4.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.4E-03
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	8.6E-09	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	3.4E-04
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	4.3E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	5.8E-03
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	2.4E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.9E-04
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	7.4E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	9.2E-03
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	6.3E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.1E-03
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	1.3E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.9E-04
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	4.5E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.7E-02
	(Total)												3.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	7.6E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	4.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	3.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	3.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	7.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	7.6E-03
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	9.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.1E-02
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	5.7E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.7E-03
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	2.9E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	9.6E-03
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	1.6E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.2E-02
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	4.9E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.4E-02
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	4.1E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	8.3E-03
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	8.9E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.3E-02
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	3.0E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.0E-02
	(Total)												1.8E-01
Dermal	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	9.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	7.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	7.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	1.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-03
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	4.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.6E-02
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	9.7E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	3.9E-03
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	4.9E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	6.5E-02
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	2.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.9E-03
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	8.3E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.0E-01
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	7.0E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.5E-02
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	1.5E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.2E-03
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	5.1E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.0E-01
	(Total)												4.3E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.1E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A - not applicable.

TABLE 7.4.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	9.6E-03	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.4E-01
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	3.2E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.1E-01
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	5.6E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.8E+00
	(Total)												3.0E+00
Dermal	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	1.9E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	3.9E-03
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	6.4E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.1E-04
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	1.1E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.4E-01
	(Total)												1.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	3.2E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
N/A - not available or not applicable.
Dermal absorption per event calculated in Table 7.4.RME. Supplement

Table 7.4.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Barium	3.52E+02	µg/l	1.00E-03	N/A	0.2	7.04E-08
Iron	1.16E+03	µg/l	1.00E-03	N/A	0.2	2.32E-07
Manganese	2.04E+03	µg/l	1.00E-03	N/A	0.2	4.08E-07

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
1. Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

TABLE 7.5.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	2.3E-02	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	3.2E-01
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	7.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.5E-01
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	1.3E-01	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.5E+00
	(Total)												7.1E+00
Dermal	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	5.6E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	1.1E-02
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	1.8E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.1E-04
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	3.2E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.0E-01
	(Total)												4.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	7.5E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
N/A - not available or not applicable.
Dermal absorption per event calculated in Table 7.5.RME. Supplement

Table 7.5.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Barium	3.52E+02	µg/l	1.00E-03	N/A	0.33	1.16E-07
Iron	1.16E+03	µg/l	1.00E-03	N/A	0.33	3.83E-07
Manganese	2.04E+03	µg/l	1.00E-03	N/A	0.33	6.73E-07

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:

1. Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

TABLE 7.6.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Excavation Pit
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	2.5E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	5.0E-03
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	8.1E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.7E-04
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	1.4E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.8E-01
	(Total)												1.8E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.8E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
N/A - not available or not applicable.
Dermal absorption per event calculated in Table 7.6.RME. Supplement

Table 7.6.RME Supplement
Calculation of Daevent (Construction Worker)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent
Barium	3.52E+02	µg/l	1.00E-03	N/A	8	2.82E-06
Iron	1.16E+03	µg/l	1.00E-03	N/A	8	9.28E-06
Manganese	2.04E+03	µg/l	1.00E-03	N/A	8	1.63E-05

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Notes:
1. Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	4.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	4.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	4.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	3.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-02
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.0E-02
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	5.1E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.1E-03
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	3.5E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.2E-02
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.6E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.6E-02
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	6.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.2E-02
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	4.8E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	9.7E-03
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.2E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.7E-02
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	4.5E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.5E-02
	(Total)												2.6E-01
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	8.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	6.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	7.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	5.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.7E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E-03
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	4.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.6E-02
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	6.7E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.7E-03
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	4.6E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	6.2E-02
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	3.4E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.1E-02
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	8.5E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.1E-01
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	6.4E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.2E-02
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.6E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.3E-03
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	5.9E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.3E-01
	(Total)												4.6E-01
												Total Hazard Index Across All Exposure Routes/Pathways	7.2E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.8.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	4.6E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	3.7E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	3.9E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	2.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.2E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.2E-01
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	1.1E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.7E-01
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	4.7E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.7E-02
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	3.3E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.1E-01
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.4E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.0E-01
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	6.0E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.0E-01
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	4.5E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	9.0E-02
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.1E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.6E-01
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	4.2E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.2E-01
	(Total)												2.4E+00
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	1.1E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	9.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	9.5E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	6.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	2.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-03
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	6.2E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-02
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	8.8E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	3.5E-03
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	6.1E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	8.2E-02
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	4.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E-02
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	1.1E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.4E-01
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	8.4E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	4.2E-02
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	2.1E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.0E-03
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	7.8E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	3.0E-01
	(Total)												6.1E-01

Total Hazard Index Across All Exposure Routes/Pathways 3.0E+00

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.9.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	1.7E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	4.4E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.4E-02
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	4.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.4E-01
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.7E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.7E-02
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.0E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	8.8E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.9E-01
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	2.2E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.1E-01
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	1.7E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	3.3E-02
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	4.1E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.9E-02
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	1.5E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.5E-01
	(Total)												8.5E-01
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	5.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	4.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	5.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	3.6E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.2E-03
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	3.2E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	4.6E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.8E-03
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	3.2E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	6.4E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.3E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.8E-03
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	5.8E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.3E-02
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	4.4E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.2E-02
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.1E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.6E-03
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	4.0E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.6E-01
	(Total)												2.8E-01

*Soil is combined surface and subsurface soil.

Total Hazard Index Across All Exposure Routes/Pathways 1.1E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Subchronic value used if available. Chronic value used if no subchronic value available.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.10.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	3.5E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	2.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	3.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	2.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	9.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	9.2E-03
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	8.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.8E-02
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	3.6E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.6E-03
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	2.5E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	8.3E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.8E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.1E-02
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	4.6E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.3E-02
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	3.5E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	6.9E-03
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	8.6E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.2E-02
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	3.2E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.2E-02
	(Total)												1.8E-01
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	7.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	6.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	6.6E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.6E-03
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	4.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.4E-02
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	6.1E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.5E-03
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	4.2E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	5.7E-02
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	3.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.0E-02
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	7.8E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	9.7E-02
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	5.9E-06	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.9E-02
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.5E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.1E-03
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	5.4E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.1E-01
	(Total)												4.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.1E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	8.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	8.6E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	6.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	2.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.6E-03
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	2.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.1E-03
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.0E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.0E-03
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	7.2E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.4E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	5.3E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.8E-02
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	1.3E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.5E-03
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	9.9E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	2.0E-03
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	2.5E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.5E-03
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	9.1E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.1E-03
	(Total)												5.3E-02
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	6.6E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	5.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	5.6E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.0E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.3E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-04
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	3.7E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-03
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	5.2E-09	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.1E-04
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	3.6E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	4.8E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.7E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.9E-04
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	6.6E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	8.3E-03
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	5.0E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.5E-03
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.2E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.8E-04
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	4.6E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.8E-02
	(Total)												3.6E-02
												Total Hazard Index Across All Exposure Routes/Pathways	8.9E-02

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	7.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	5.9E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	6.2E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.5E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.9E-03
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.9E-03
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	7.5E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	7.5E-04
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	5.2E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.7E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	3.8E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-02
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	9.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.8E-03
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	7.2E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.4E-03
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.6E-03
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	6.6E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.6E-03
	(Total)												3.8E-02
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	6.9E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	5.6E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	5.9E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	4.2E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.4E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.4E-04
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	3.8E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.3E-03
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	5.5E-09	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.2E-04
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	3.8E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	5.0E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.8E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.3E-04
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	6.9E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	8.6E-03
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	5.2E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.6E-03
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.3E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.9E-04
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	4.8E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.8E-02
	(Total)												3.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	7.6E-02

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A - not applicable.

TABLE 7.13.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Barium	2.25E+02	µg/l	2.25E+02	µg/l	M	2.9E-03	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	4.1E-02
	Iron	6.36E+02	µg/l	6.36E+02	µg/l	M	8.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.7E-02
	Manganese	1.19E+03	µg/l	1.19E+03	µg/l	M	1.5E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.6E-01
	(Total)												8.3E-01
Dermal	Barium	2.25E+02	µg/l	0.00E+00	µg/l	M	7.4E-06	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	1.5E-03
	Iron	6.36E+02	µg/l	6.36E+02	µg/l	M	2.1E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.0E-05
	Manganese	1.19E+03	µg/l	1.19E+03	µg/l	M	3.9E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.9E-02
	(Total)												5.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	8.8E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
N/A - not available or not applicable.
Dermal absorption per event calculated in Table 7.13.CT Supplement

Table 7.13.CT Supplement
Calculation of DAevent (Adult)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Barium	2.25E+02	µg/l	1.00E-03	N/A	0.2	4.51E-08
Iron	6.36E+02	µg/l	1.00E-03	N/A	0.2	1.27E-07
Manganese	1.19E+03	µg/l	1.00E-03	N/A	0.2	2.38E-07

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
1. Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

TABLE 7.14.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Barium	2.25E+02	µg/l	2.25E+02	µg/l	M	9.6E-03	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.4E-01
	Iron	6.36E+02	µg/l	6.36E+02	µg/l	M	2.7E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.1E-02
	Manganese	1.19E+03	µg/l	1.19E+03	µg/l	M	5.1E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.5E+00
	(Total)												2.8E+00
Dermal	Barium	2.25E+02	µg/l	2.25E+02	µg/l	M	2.1E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	4.2E-03
	Iron	6.36E+02	µg/l	6.36E+02	µg/l	M	5.8E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.9E-04
	Manganese	1.19E+03	µg/l	1.19E+03	µg/l	M	1.1E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.4E-01
	(Total)												1.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.9E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
N/A - not available or not applicable.
Dermal absorption per event calculated in Table 7.14.CT Supplement

Table 7.14.CT Supplement
Calculation of DAevent (Child)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Barium	2.25E+02	µg/l	1.00E-03	N/A	0.33	7.44E-08
Iron	6.36E+02	µg/l	1.00E-03	N/A	0.33	2.10E-07
Manganese	1.19E+03	µg/l	1.00E-03	N/A	0.33	3.93E-07

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
1. Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

TABLE 7.15.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.06E-01	mg/kg	2.06E-01	mg/kg	M	8.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	1.71E-01	mg/kg	1.71E-01	mg/kg	M	7.3E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.78E-01	mg/kg	1.78E-01	mg/kg	M	7.6E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	9.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.26E+03	mg/kg	7.26E+03	mg/kg	M	3.1E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.1E-02
	Arsenic	6.62E+00	mg/kg	6.62E+00	mg/kg	M	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.4E-02
	Cadmium	5.80E-01	mg/kg	5.80E-01	mg/kg	M	2.5E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.5E-03
	Chromium	1.73E+01	mg/kg	1.73E+01	mg/kg	M	7.4E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.5E-02
	Iron	1.52E+04	mg/kg	1.52E+04	mg/kg	M	6.5E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.2E-01
	Manganese	2.52E+02	mg/kg	2.52E+02	mg/kg	M	1.1E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.4E-02
	Silver	1.21E+00	mg/kg	1.21E+00	mg/kg	M	5.2E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.0E-03
	Thallium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	3.4E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.8E-02
	Vanadium	2.60E+01	mg/kg	2.60E+01	mg/kg	M	1.1E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.1E-01
	(Total)												5.8E-01
Dermal	Benzo(a)anthracene	2.06E-01	mg/kg	2.06E-01	mg/kg	M	3.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	1.71E-01	mg/kg	1.71E-01	mg/kg	M	3.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.78E-01	mg/kg	1.78E-01	mg/kg	M	3.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	3.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.26E+03	mg/kg	7.26E+03	mg/kg	M	9.9E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	9.9E-04
	Arsenic	6.62E+00	mg/kg	6.62E+00	mg/kg	M	2.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.0E-03
	Cadmium	5.80E-01	mg/kg	5.80E-01	mg/kg	M	7.9E-09	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	3.2E-04
	Chromium	1.73E+01	mg/kg	1.73E+01	mg/kg	M	2.4E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.1E-02
	Iron	1.52E+04	mg/kg	1.52E+04	mg/kg	M	2.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.9E-03
	Manganese	2.52E+02	mg/kg	2.52E+02	mg/kg	M	3.4E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.3E-02
	Silver	1.21E+00	mg/kg	1.21E+00	mg/kg	M	1.6E-07	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	8.2E-04
	Thallium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	1.1E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.5E-03
	Vanadium	2.60E+01	mg/kg	2.60E+01	mg/kg	M	3.5E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.4E-01
	(Total)												2.3E-01
												Total Hazard Index Across All Exposure Routes/Pathways	8.1E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 7.16.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.06E-01	mg/kg	2.06E-01	mg/kg	M	8.5E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	1.71E-01	mg/kg	1.71E-01	mg/kg	M	7.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.78E-01	mg/kg	1.78E-01	mg/kg	M	7.3E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	9.1E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.26E+03	mg/kg	7.26E+03	mg/kg	M	3.0E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.0E-02
	Arsenic	6.62E+00	mg/kg	6.62E+00	mg/kg	M	2.7E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.1E-02
	Cadmium	5.80E-01	mg/kg	5.80E-01	mg/kg	M	2.4E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.4E-03
	Chromium	1.73E+01	mg/kg	1.73E+01	mg/kg	M	7.1E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.6E-03
	Iron	1.52E+04	mg/kg	1.52E+04	mg/kg	M	6.3E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.1E-01
	Manganese	2.52E+02	mg/kg	2.52E+02	mg/kg	M	1.0E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.2E-02
	Silver	1.21E+00	mg/kg	1.21E+00	mg/kg	M	5.0E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.0E-03
	Thallium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	3.3E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.6E-02
	Vanadium	2.60E+01	mg/kg	2.60E+01	mg/kg	M	1.1E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.1E-01
	(Total)												5.4E-01
Dermal	Benzo(a)anthracene	2.06E-01	mg/kg	2.06E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	1.71E-01	mg/kg	1.71E-01	mg/kg	M	9.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.78E-01	mg/kg	1.78E-01	mg/kg	M	9.5E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aluminum	7.26E+03	mg/kg	7.26E+03	mg/kg	M	3.0E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.0E-04
	Arsenic	6.62E+00	mg/kg	6.62E+00	mg/kg	M	8.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.7E-03
	Cadmium	5.80E-01	mg/kg	5.80E-01	mg/kg	M	2.4E-09	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	9.5E-05
	Chromium	1.73E+01	mg/kg	1.73E+01	mg/kg	M	7.1E-07	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.4E-03
	Iron	1.52E+04	mg/kg	1.52E+04	mg/kg	M	6.3E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.1E-03
	Manganese	2.52E+02	mg/kg	2.52E+02	mg/kg	M	1.0E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.3E-02
	Silver	1.21E+00	mg/kg	1.21E+00	mg/kg	M	5.0E-08	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.5E-04
	Thallium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	3.3E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.6E-04
	Vanadium	2.60E+01	mg/kg	2.60E+01	mg/kg	M	1.1E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	4.1E-02
	(Total)												6.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	6.0E-01

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Subchronic value used if available. Chronic value used if no subchronic value available.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	1.6E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.2E-08
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	1.2E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	8.8E-08
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	1.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	9.5E-09
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	7.9E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	5.8E-08
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	2.8E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	3.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	5.2E-07
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	2.1E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	5.7E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	1.8E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	3.3E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										6.8E-07
Dermal	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	1.1E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	7.7E-09
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	7.9E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	5.8E-08
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	8.6E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	6.3E-09
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	5.2E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.8E-08
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	1.4E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	5.2E-08	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	7.8E-08
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	1.1E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	5.3E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	2.9E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	9.1E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	7.7E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	1.7E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	5.6E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										1.9E-07
										Total Cancer Risk Across All Exposure Routes/Pathways	8.7E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A = not available or not applicable
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	3.1E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.28E-08
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	2.3E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.70E-07
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	2.5E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.85E-08
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.12E-07
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	5.4E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	6.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	1.00E-06
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	4.1E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	2.1E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	1.1E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	3.5E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	3.0E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	6.3E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	2.1E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										1.3E-06
Dermal	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	3.0E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.15E-08
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	2.2E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.61E-07
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	2.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.75E-08
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.06E-07
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	3.9E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	1.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	2.18E-07
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	3.0E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	1.5E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	8.1E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	2.5E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	2.1E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	4.6E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	1.6E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										5.2E-07
										Total Cancer Risk Across All Exposure Routes/Pathways	1.9E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A = not available or not applicable
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site 25 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	1.6E-07	mg/kg-day	7.3E-01	(mg/kg-day)$^{-1}$	1.14E-07
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	1.2E-07	mg/kg-day	7.3E+00	(mg/kg-day)$^{-1}$	8.52E-07
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	1.3E-07	mg/kg-day	7.3E-01	(mg/kg-day)$^{-1}$	9.29E-08
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	7.7E-08	mg/kg-day	7.3E+00	(mg/kg-day)$^{-1}$	5.61E-07
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	2.7E-03	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	3.3E-06	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	5.02E-06
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	2.0E-06	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	1.0E-05	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	5.6E-03	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	1.7E-04	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	1.5E-05	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	3.2E-07	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	1.1E-05	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	(Total)										6.6E-06
Dermal	Benzo(a)anthracene	4.48E-01	mg/kg	4.48E-01	mg/kg	M	3.5E-07	mg/kg-day	7.3E-01	(mg/kg-day)$^{-1}$	2.52E-07
	Benzo(a)pyrene	3.34E-01	mg/kg	3.34E-01	mg/kg	M	2.6E-07	mg/kg-day	7.3E+00	(mg/kg-day)$^{-1}$	1.88E-06
	Benzo(b)fluoranthene	3.64E-01	mg/kg	3.64E-01	mg/kg	M	2.8E-07	mg/kg-day	7.3E-01	(mg/kg-day)$^{-1}$	2.05E-07
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.7E-07	mg/kg-day	7.3E+00	(mg/kg-day)$^{-1}$	1.24E-06
	Aluminum	7.77E+03	mg/kg	7.77E+03	mg/kg	M	4.6E-04	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Arsenic	9.58E+00	mg/kg	9.58E+00	mg/kg	M	1.7E-06	mg/kg-day	1.5E+00	(mg/kg-day)$^{-1}$	2.56E-06
	Cadmium	5.83E+00	mg/kg	5.83E+00	mg/kg	M	3.5E-08	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Chromium	2.94E+01	mg/kg	2.94E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Iron	1.60E+04	mg/kg	1.60E+04	mg/kg	M	9.5E-04	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Manganese	4.98E+02	mg/kg	4.98E+02	mg/kg	M	3.0E-05	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Silver	4.23E+01	mg/kg	4.23E+01	mg/kg	M	2.5E-06	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Thallium	9.10E-01	mg/kg	9.10E-01	mg/kg	M	5.4E-08	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	Vanadium	3.07E+01	mg/kg	3.07E+01	mg/kg	M	1.8E-06	mg/kg-day	N/A	(mg/kg-day)$^{-1}$	N/A
	(Total)										6.1E-06
										Total Cancer Risk Across All Exposure Routes/Pathways	1.3E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A = not available or not applicable
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	5.3E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	1.7E-02	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	3.0E-02	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										0.0E+00
Dermal	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	1.1E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	3.8E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	6.6E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										0.0E+00
										Total Cancer Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - not available or not applicable.
Dermal absorption per event calculated in Table 8.4a.RME Supplement and Table 8.4b.RME Supplement

Table 8.4b.RME Supplement
Calculation of DAevent (Child)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Barium	3.52E+02	µg/l	1.00E-03	N/A	0.33	1.16E-07
Iron	1.16E+03	µg/l	1.00E-03	N/A	0.33	3.83E-07
Manganese	2.04E+03	µg/l	1.00E-03	N/A	0.33	6.73E-07

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
1. Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

Table 8.4a.RME Supplement
Calculation of DAevent (Adult)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Barium	3.52E+02	µg/l	1.00E-03	N/A	0.2	7.04E-08
Iron	1.16E+03	µg/l	1.00E-03	N/A	0.2	2.32E-07
Manganese	2.04E+03	µg/l	1.00E-03	N/A	0.2	4.08E-07

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
1. Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Aquifer - Excavation Pit
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Barium	3.52E+02	µg/l	3.52E+02	µg/l	M	3.5E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.16E+03	µg/l	1.16E+03	µg/l	M	1.2E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	2.04E+03	µg/l	2.04E+03	µg/l	M	2.0E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										0.0E+00
										Total Cancer Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - not available or not applicable.
Dermal absorption calculated in Table 8.5 RME Supplement

Table 8.5.RME Supplement
Calculation of Daevent (Construction Worker)
Shallow Aquifer
Site 25, NDWIH

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)	Lag Time (t)	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
Barium	3.52E+02	µg/l	1.00E-03	N/A	8	2.82E-06	N/A	N/A	1
Iron	1.16E+03	µg/l	1.00E-03	N/A	8	9.28E-06	N/A	N/A	1
Manganese	2.04E+03	µg/l	1.00E-03	N/A	8	1.63E-05	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Notes:
1. Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.

N/A - not available or not applicable.

TABLE 8.6.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	5.6E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	4.1E-07
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	4.5E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.3E-06
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	4.8E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	3.5E-07
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	3.4E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	2.5E-06
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.5E-02	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	1.4E-05	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	2.0E-05
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	5.8E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	4.0E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.9E-02	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	7.3E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	5.5E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	5.1E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										2.7E-05
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	3.8E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.8E-07
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	3.1E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	2.3E-06
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	3.3E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.4E-07
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	2.4E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.7E-06
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	7.8E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	2.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	3.2E-06
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	3.1E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	2.1E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.6E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	3.9E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	2.9E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	7.3E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	2.7E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										7.7E-06
										Total Cancer Risk Across All Exposure Routes/Pathways	3.5E-05

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

N/A = not available or not applicable

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	2.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.8E-08
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	1.9E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.4E-07
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	2.1E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.5E-08
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.1E-07
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	6.3E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	5.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	8.7E-07
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	2.5E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.3E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	3.1E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	2.4E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	5.9E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	2.2E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										1.2E-06
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	8.3E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	6.1E-09
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	6.7E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	4.9E-08
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	7.1E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	5.2E-09
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	5.1E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.7E-08
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.7E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	4.6E-08	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	6.9E-08
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	6.6E-10	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	4.6E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	3.3E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	8.3E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	6.3E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.6E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	5.8E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										1.7E-07

Total Cancer Risk Across All Exposure Routes/Pathways 1.3E-06

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

N/A = not available or not applicable

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 8.8.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	1.3E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	9.2E-08
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	1.0E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	7.4E-07
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	1.1E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	7.8E-08
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	7.7E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	5.6E-07
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	3.3E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	3.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	4.5E-06
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.3E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	8.9E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	6.6E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	1.6E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	1.2E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	3.1E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	1.1E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										6.0E-06
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	2.8E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.0E-07
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	2.2E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.6E-06
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	2.4E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.7E-07
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.7E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.2E-06
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	5.6E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	2.3E-06
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	2.2E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.1E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	2.8E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	2.1E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	5.2E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	1.9E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										5.5E-06
										Total Cancer Risk Across All Exposure Routes/Pathways	1.2E-05

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

N/A = not available or not applicable

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 8.9.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	1.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	9.4E-09
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	1.0E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	7.6E-08
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	1.1E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	8.0E-09
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	7.9E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	5.8E-08
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	3.4E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	3.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	4.7E-07
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.3E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	9.2E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	6.8E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	1.7E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	1.3E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	3.2E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	1.2E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										6.2E-07
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	8.5E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	6.2E-09
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	6.8E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	5.0E-08
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	7.3E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	5.3E-09
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	5.2E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.8E-08
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	1.7E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	4.7E-08	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	7.1E-08
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	6.7E-10	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	4.7E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	3.4E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	8.5E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	6.4E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	1.6E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	5.9E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										1.7E-07
										Total Cancer Risk Across All Exposure Routes/Pathways	7.9E-07

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

N/A = not available or not applicable

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil
Exposure Point: Site 25 Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	2.5E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.8E-08
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	2.0E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.5E-07
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	2.1E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.6E-08
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.1E-07
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	6.6E-04	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	6.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	9.1E-07
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	2.6E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	1.8E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.3E-03	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	3.3E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	2.5E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	6.1E-08	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	2.3E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										1.2E-06
Dermal	Benzo(a)anthracene	3.59E-01	mg/kg	3.59E-01	mg/kg	M	2.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.7E-08
	Benzo(a)pyrene	2.89E-01	mg/kg	2.89E-01	mg/kg	M	1.9E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.4E-07
	Benzo(b)fluoranthene	3.07E-01	mg/kg	3.07E-01	mg/kg	M	2.0E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.5E-08
	Dibenz(a,h)anthracene	2.20E-01	mg/kg	2.20E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.1E-07
	Aluminum	9.41E+03	mg/kg	9.41E+03	mg/kg	M	4.8E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Arsenic	8.67E+00	mg/kg	8.67E+00	mg/kg	M	1.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) $^{-1}$	2.0E-07
	Cadmium	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.9E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Chromium	2.56E+01	mg/kg	2.56E+01	mg/kg	M	1.3E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	9.5E-05	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Manganese	4.68E+02	mg/kg	4.68E+02	mg/kg	M	2.4E-06	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Silver	3.53E+01	mg/kg	3.53E+01	mg/kg	M	1.8E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Thallium	8.80E-01	mg/kg	8.80E-01	mg/kg	M	4.5E-09	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	Vanadium	3.25E+01	mg/kg	3.25E+01	mg/kg	M	1.6E-07	mg/kg-day	N/A	(mg/kg-day) $^{-1}$	N/A
	(Total)										4.7E-07
										Total Cancer Risk Across All Exposure Routes/Pathways	1.7E-06

*Soil is combined surface and subsurface soil.

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

N/A = not available or not applicable

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Current
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 25 Surface Soil											
			Benzo(a)anthracene	1.2E-08	--	7.73E-09	1.9E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	8.8E-08	--	5.76E-08	1.5E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	9.5E-09	--	6.28E-09	1.6E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	5.8E-08	--	3.79E-08	9.6E-08	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	2.2E-03	--	1.1E-04	2.3E-03
			Arsenic	5.2E-07	--	7.83E-08	5.9E-07	Arsenic	Skin/Vascular	8.9E-03	--	1.4E-03	1.0E-02
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	1.6E-03	--	3.3E-04	2.0E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	2.7E-03	--	5.5E-03	8.3E-03
			Iron	N/A	--	N/A	N/A	Iron	GI	1.5E-02	--	7.5E-04	1.6E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	7.0E-03	--	8.8E-03	1.6E-02
			Silver	N/A	--	N/A	N/A	Silver	Skin	2.4E-03	--	3.0E-03	5.4E-03
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	3.6E-03	--	1.8E-04	3.8E-03
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	8.6E-03	--	1.7E-02	2.5E-02
			(Total)	6.8E-07	0.0E+00	1.9E-07	8.7E-07	(Total)		5.2E-02	0.0E+00	3.7E-02	8.9E-02
			Total Risk Across Surface Soil				8.7E-07	Total Risk Across Surface Soil					8.9E-02
Total Risk Across All Media and All Exposure Routes							8.7E-07	Total Hazard Index Across All Media and All Exposure Routes					8.9E-02

Total CNS HI =	1.8E-02
Total GI HI =	1.6E-02
Total Kidney HI =	2.7E-02
Total NOAEL HI =	8.3E-03
Total Skin HI =	1.9E-02
Total Vascular HI =	1.4E-02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Current
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 25 Surface Soil											
			Benzo(a)anthracene	2.3E-08	--	2.2E-08	4.4E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	1.7E-07	--	1.6E-07	3.3E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	1.9E-08	--	1.7E-08	3.6E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	1.1E-07	--	1.1E-07	2.2E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	1.6E-03	--	1.1E-04	1.7E-03
			Arsenic	1.0E-06	--	2.2E-07	1.2E-06	Arsenic	Skin/Vascular	6.5E-03	--	1.4E-03	7.9E-03
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	1.2E-03	--	3.4E-04	1.5E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	2.0E-03	--	5.8E-03	7.8E-03
			Iron	N/A	--	N/A	N/A	Iron	GI	1.1E-02	--	7.9E-04	1.2E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	5.1E-03	--	9.2E-03	1.4E-02
			Silver	N/A	--	N/A	N/A	Silver	Skin	1.7E-03	--	3.1E-03	4.8E-03
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	2.6E-03	--	1.9E-04	2.8E-03
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	6.2E-03	--	1.7E-02	2.4E-02
			(Total)	1.3E-06	0.0E+00	5.2E-07	1.9E-06	(Total)		3.8E-02	0.0E+00	3.8E-02	7.6E-02
			Total Risk Across Surface Soil				1.9E-06	Total Risk Across Surface Soil					7.6E-02
			Total Risk Across All Media and All Exposure Routes				1.9E-06	Total Hazard Index Across All Media and All Exposure Routes					7.6E-02

Total CNS HI =	1.6E-02
Total GI HI =	1.2E-02
Total Kidney HI =	2.5E-02
Total NOAEL HI =	7.8E-03
Total Skin HI =	1.6E-02
Total Vascular HI =	1.1E-02

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Current
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Site 25 Surface Soil											
			Benzo(a)anthracene	1.1E-07	--	2.5E-07	3.7E-07	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	8.5E-07	--	1.9E-06	2.7E-06	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	9.3E-08	--	2.0E-07	3.0E-07	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	5.6E-07	--	1.2E-06	1.8E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	7.6E-03	--	1.3E-03	8.9E-03
			Arsenic	5.0E-06	--	2.6E-06	7.6E-06	Arsenic	Skin/Vascular	3.1E-02	--	1.6E-02	4.7E-02
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	5.7E-03	--	3.9E-03	9.6E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	9.6E-03	--	6.5E-02	7.5E-02
			Iron	N/A	--	N/A	N/A	Iron	GI	5.2E-02	--	8.9E-03	6.1E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	2.4E-02	--	1.0E-01	1.3E-01
			Silver	N/A	--	N/A	N/A	Silver	Skin	8.3E-03	--	3.5E-02	4.3E-02
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	1.3E-02	--	2.2E-03	1.5E-02
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	3.0E-02	--	2.0E-01	2.3E-01
			(Total)	6.6E-06	0.0E+00	6.1E-06	1.3E-05	(Total)		1.8E-01	0.0E+00	4.3E-01	6.1E-01
			Total Risk Across Surface Soil				1.3E-05	Total Risk Across Surface Soil					6.1E-01
Total Risk Across All Media and All Exposure Routes							1.3E-05	Total Hazard Index Across All Media and All Exposure Routes					6.1E-01

Total CNS HI =	1.4E-01
Total GI HI =	6.1E-02
Total Kidney HI =	2.4E-01
Total NOAEL HI =	7.5E-02
Total Skin HI =	1.1E-01
Total Vascular HI =	6.2E-02

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	1.4E-01	--	3.9E-03	1.4E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	1.1E-01	--	2.1E-04	1.1E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	2.8E+00	--	1.4E-01	2.9E+00
			(Total)	N/A	N/A	N/A	N/A	(Total)		3.0E+00	0.0E+00	1.4E-01	3.2E+00
			Total Risk Across Tap water				N/A	Total Hazard Index Across Tap water					3.2E+00
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	N/A	--	N/A	N/A	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	N/A	--	N/A	N/A	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	N/A	--	N/A	N/A	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	N/A	--	N/A	N/A	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	1.3E-02	--	1.7E-03	1.5E-02
			Arsenic	N/A	--	N/A	N/A	Arsenic	Skin/Vascular	4.0E-02	--	1.6E-02	5.5E-02
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	5.1E-03	--	2.7E-03	7.7E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	1.2E-02	--	6.2E-02	7.3E-02
			Iron	N/A	--	N/A	N/A	Iron	GI	8.6E-02	--	1.1E-02	9.7E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	3.2E-02	--	1.1E-01	1.4E-01
			Silver	N/A	--	N/A	N/A	Silver	Skin	9.7E-03	--	3.2E-02	4.2E-02
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	1.7E-02	--	2.3E-03	1.9E-02
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	4.5E-02	--	2.3E-01	2.7E-01
			(Total)	N/A	N/A	N/A	N/A	(Total)		2.6E-01	0.0E+00	4.6E-01	7.2E-01
			Total Risk Across Soil				N/A	Total Hazard Index Across Soil					7.2E-01
			Total Risk Across All Media and All Exposure Routes				N/A	Total Hazard Index Across All Media and All Exposure Routes					3.9E+00

Total Cardiovascular HI =	1.4E-01
Total CNS HI =	3.1E+00
Total Gastrointestinal HI =	2.0E-01
Total Kidney HI =	2.8E-01
Total NOAEL HI =	7.3E-02
Total Skin HI =	1.2E-01
Total Vascular HI =	7.5E-02

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	3.2E-01	--	1.1E-02	3.3E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	2.5E-01	--	6.1E-04	2.5E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	6.5E+00	--	4.0E-01	6.9E+00
			(Total)	N/A	N/A	N/A	N/A	(Total)		7.1E+00	0.0E+00	4.2E-01	7.5E+00
			Total Risk Across Tap water				N/A	Total Hazard Index Across Tap water					7.5E+00
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	N/A	--	N/A	N/A	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	N/A	--	N/A	N/A	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	N/A	--	N/A	N/A	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	N/A	--	N/A	N/A	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	1.2E-01	--	2.2E-03	1.2E-01
			Arsenic	N/A	--	N/A	N/A	Arsenic	Skin/Vascular	3.7E-01	--	2.1E-02	3.9E-01
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	4.7E-02	--	3.5E-03	5.1E-02
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	1.1E-01	--	8.2E-02	1.9E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	8.0E-01	--	1.5E-02	8.2E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	3.0E-01	--	1.4E-01	4.4E-01
			Silver	N/A	--	N/A	N/A	Silver	Skin	9.0E-02	--	4.2E-02	1.3E-01
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	1.6E-01	--	3.0E-03	1.6E-01
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	4.2E-01	--	3.0E-01	7.1E-01
			(Total)	N/A	N/A	N/A	N/A	(Total)		2.4E+00	0.0E+00	6.1E-01	3.0E+00
			Total Risk Across Soil				N/A	Total Hazard Index Across Soil					3.0E+00
			Total Risk Across All Media and All Exposure Routes				N/A	Total Hazard Index Across All Media and All Exposure Routes					1.1E+01

Total Cardiovascular HI =	3.3E-01
Total CNS HI =	7.5E+00
Total Gastrointestinal HI =	1.1E+00
Total Kidney HI =	7.7E-01
Total NOAEL HI =	1.9E-01
Total Skin HI =	6.9E-01
Total Vascular HI =	5.5E-01

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	N/A	--	N/A	N/A
			Iron	N/A	--	N/A	N/A	Iron	Gastrointestinal	N/A	--	N/A	N/A
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	N/A	--	N/A	N/A
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		N/A	N/A	N/A	N/A
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Tap water					N/A
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	4.1E-07	--	2.8E-07	6.9E-07	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	3.3E-06	--	2.3E-06	5.6E-06	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	3.5E-07	--	2.4E-07	5.9E-07	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	2.5E-06	--	1.7E-06	4.2E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	N/A	--	N/A	N/A
			Arsenic	2.0E-05	--	3.2E-06	2.4E-05	Arsenic	Skin	N/A	--	N/A	N/A
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	N/A	--	N/A	N/A
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	N/A	--	N/A	N/A
			Iron	N/A	--	N/A	N/A	Iron	GI	N/A	--	N/A	N/A
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	N/A	--	N/A	N/A
			Silver	N/A	--	N/A	N/A	Silver	Skin	N/A	--	N/A	N/A
			Thallium	N/A	--	N/A	N/A	Thallium	Skin	N/A	--	N/A	N/A
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	N/A	--	N/A	N/A
			(Total)	2.7E-05	0.0E+00	7.7E-06	3.5E-05	(Total)		N/A	N/A	N/A	N/A
			Total Risk Across Soil				3.5E-05	Total Hazard Index Across Soil					N/A
Total Risk Across All Media and All Exposure Routes							3.5E-05	Total Hazard Index Across All Media and All Exposure Routes					N/A

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer-Excavation Pit											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	N/A	--	5.0E-03	5.0E-03
			Iron	N/A	--	N/A	N/A	Iron	GI	N/A	--	2.7E-04	2.7E-04
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	N/A	--	1.8E-01	1.8E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		0.0E+00	0.0E+00	1.8E-01	1.8E-01
			Total Risk Across Tap water				0.0E+00	Total Hazard Index Across Excavation Pit Water					1.8E-01
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	1.8E-08	--	6.1E-09	2.4E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	1.4E-07	--	4.9E-08	1.9E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	1.5E-08	--	5.2E-09	2.0E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	1.1E-07	--	3.7E-08	1.4E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	4.4E-02	--	1.2E-03	4.5E-02
			Arsenic	8.7E-07	--	6.9E-08	9.4E-07	Arsenic	Skin/Vascular	1.4E-01	--	1.1E-02	1.5E-01
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	1.7E-02	--	1.8E-03	1.9E-02
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	6.0E-03	--	6.4E-03	1.2E-02
			Iron	N/A	--	N/A	N/A	Iron	GI	2.9E-01	--	7.8E-03	3.0E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	1.1E-01	--	7.3E-02	1.8E-01
			Silver	N/A	--	N/A	N/A	Silver	Skin	3.3E-02	--	2.2E-02	5.5E-02
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	5.9E-02	--	1.6E-03	6.1E-02
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	1.5E-01	--	1.6E-01	3.1E-01
			(Total)	1.2E-06	0.0E+00	1.7E-07	1.3E-06	(Total)		8.5E-01	0.0E+00	2.8E-01	1.1E+00
			Total Risk Across Soil				1.3E-06	Total Hazard Index Across Soil					1.1E+00
			Total Risk Across All Media and All Exposure Routes				1.3E-06	Total Hazard Index Across All Media and All Exposure Routes					1.3E+00

Total Cardiovascular HI =	5.0E-03
Total CNS HI =	4.1E-01
Total Gastrointestinal HI =	3.0E-01
Total Kidney HI =	3.3E-01
Total NOAEL HI =	1.2E-02
Total Skin HI =	2.6E-01
Total Vascular HI =	2.1E-01

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	9.2E-08	--	2.02E-07	2.9E-07	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	7.4E-07	--	1.63E-06	2.4E-06	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	7.8E-08	--	1.73E-07	2.5E-07	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	5.6E-07	--	1.24E-06	1.8E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	9.2E-03	--	1.6E-03	1.1E-02
			Arsenic	4.5E-06	--	2.31E-06	6.9E-06	Arsenic	Skin/Vascular	2.8E-02	--	1.4E-02	4.3E-02
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	3.6E-03	--	2.5E-03	6.1E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	8.3E-03	--	5.7E-02	6.5E-02
			Iron	N/A	--	N/A	N/A	Iron	GI	6.1E-02	--	1.0E-02	7.2E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	2.3E-02	--	9.7E-02	1.2E-01
			Silver	N/A	--	N/A	N/A	Silver	Skin	6.9E-03	--	2.9E-02	3.6E-02
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	1.2E-02	--	2.1E-03	1.4E-02
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	3.2E-02	--	2.1E-01	2.4E-01
			(Total)	6.0E-06	0.0E+00	5.5E-06	1.2E-05	(Total)		1.8E-01	0.0E+00	4.2E-01	6.1E-01
			Total Risk Across Surface Soil				1.2E-05	Total Risk Across Surface Soil					6.1E-01
			Total Risk Across All Media and All Exposure Routes				1.2E-05	Total Hazard Index Across All Media and All Exposure Routes					6.1E-01

Total CNS HI =	1.3E-01
Total GI HI =	7.2E-02
Total Kidney HI =	2.5E-01
Total NOAEL HI =	6.5E-02
Total Skin HI =	9.3E-02
Total Vascular HI =	5.7E-02

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	9.4E-09	--	6.19E-09	1.6E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	7.6E-08	--	4.98E-08	1.3E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	8.0E-09	--	5.29E-09	1.3E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	5.8E-08	--	3.79E-08	9.6E-08	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	2.6E-03	--	1.3E-04	2.8E-03
			Arsenic	4.7E-07	--	7.09E-08	5.4E-07	Arsenic	Skin/Vascular	8.1E-03	--	1.2E-03	9.3E-03
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	1.0E-03	--	2.1E-04	1.2E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	2.4E-03	--	4.8E-03	7.2E-03
			Iron	N/A	--	N/A	N/A	Iron	GI	1.8E-02	--	8.9E-04	1.8E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	6.5E-03	--	8.3E-03	1.5E-02
			Silver	N/A	--	N/A	N/A	Silver	Skin	2.0E-03	--	2.5E-03	4.5E-03
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	3.5E-03	--	1.8E-04	3.7E-03
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	9.1E-03	--	1.8E-02	2.7E-02
			(Total)	6.2E-07	0.0E+00	1.7E-07	7.9E-07	(Total)		5.3E-02	0.0E+00	3.6E-02	8.9E-02
			Total Risk Across Surface Soil				7.9E-07	Total Risk Across Surface Soil					8.9E-02
			Total Risk Across All Media and All Exposure Routes				7.9E-07	Total Hazard Index Across All Media and All Exposure Routes					8.9E-02

Total CNS HI =	1.8E-02
Total GI HI =	1.8E-02
Total Kidney HI =	2.8E-02
Total NOAEL HI =	7.2E-03
Total Skin HI =	1.7E-02
Total Vascular HI =	1.3E-02

TABLE 9.10.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	1.8E-08	--	1.73E-08	3.6E-08	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	1.5E-07	--	1.39E-07	2.9E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	1.6E-08	--	1.48E-08	3.0E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	1.1E-07	--	1.06E-07	2.2E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	1.9E-03	--	1.4E-04	2.1E-03
			Arsenic	9.1E-07	--	1.98E-07	1.1E-06	Arsenic	Skin/Vascular	5.9E-03	--	1.3E-03	7.2E-03
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	7.5E-04	--	2.2E-04	9.7E-04
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	1.7E-03	--	5.0E-03	6.8E-03
			Iron	N/A	--	N/A	N/A	Iron	GI	1.3E-02	--	9.3E-04	1.4E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	4.8E-03	--	8.6E-03	1.3E-02
			Silver	N/A	--	N/A	N/A	Silver	Skin	1.4E-03	--	2.6E-03	4.0E-03
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	2.6E-03	--	1.9E-04	2.7E-03
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	6.6E-03	--	1.8E-02	2.5E-02
			(Total)	1.2E-06	0.0E+00	4.7E-07	1.7E-06	(Total)		3.8E-02	0.0E+00	3.8E-02	7.6E-02
			Total Risk Across Surface Soil				1.7E-06	Total Risk Across Surface Soil					7.6E-02
			Total Risk Across All Media and All Exposure Routes				1.7E-06	Total Hazard Index Across All Media and All Exposure Routes					7.6E-02

Total CNS HI =	1.5E-02
Total GI HI =	1.4E-02
Total Kidney HI =	2.6E-02
Total NOAEL HI =	6.8E-03
Total Skin HI =	1.4E-02
Total Vascular HI =	9.9E-03

TABLE 9.11.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Residen
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	4.1E-02	--	1.5E-03	4.3E-02
			Iron	N/A	--	N/A	N/A	Iron	GI	2.7E-02	--	7.0E-05	2.7E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	7.6E-01	--	4.9E-02	8.1E-01
			(Total)	N/A	N/A	N/A	N/A	(Total)		8.3E-01	0.0E+00	5.1E-02	8.8E-01
			Total Risk Across Tap water				N/A	Total Hazard Index Across Tap water					8.8E-01
Total Risk Across All Media and All Exposure Routes							N/A	Total Hazard Index Across All Media and All Exposure Routes					8.8E-01

Total Cardiovascular HI =	4.3E-02
Total CNS HI =	8.1E-01
Total GI HI	2.7E-02

TABLE 9.12.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	1.4E-01	--	4.2E-03	1.4E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	9.1E-02	--	1.9E-04	9.1E-02
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	2.5E+00	--	1.4E-01	2.7E+00
			(Total)	N/A	N/A	N/A	N/A	(Total)		2.8E+00	0.0E+00	1.4E-01	2.9E+00
			Total Risk Across Tap water				N/A	Total Hazard Index Across Tap water					2.9E+00
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	N/A	--	N/A	N/A	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	N/A	--	N/A	N/A	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	N/A	--	N/A	N/A	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	N/A	--	N/A	N/A	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	3.1E-02	--	9.9E-04	3.2E-02
			Arsenic	N/A	--	N/A	N/A	Arsenic	Skin/Vascular	9.4E-02	--	9.0E-03	1.0E-01
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	2.5E-03	--	3.2E-04	2.8E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	2.5E-02	--	3.1E-02	5.6E-02
			Iron	N/A	--	N/A	N/A	Iron	GI	2.2E-01	--	6.9E-03	2.2E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	5.4E-02	--	4.3E-02	9.7E-02
			Silver	N/A	--	N/A	N/A	Silver	Skin	1.0E-03	--	8.2E-04	1.9E-03
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	4.8E-02	--	1.5E-03	5.0E-02
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	1.1E-01	--	1.4E-01	2.5E-01
			(Total)	N/A	N/A	N/A	N/A	(Total)		5.8E-01	0.0E+00	2.3E-01	8.1E-01
			Total Risk Across Soil				N/A	Total Hazard Index Across Soil					8.1E-01
			Total Risk Across All Media and All Exposure Routes				N/A	Total Hazard Index Across All Media and All Exposure Routes					3.7E+00

Total Cardiovascular HI =	1.4E-01
Total CNS HI =	2.8E+00
Total Gastrointestinal HI =	3.1E-01
Total Kidney HI =	2.5E-01
Total NOAEL HI =	5.6E-02
Total Skin HI =	1.5E-01
Total Vascular HI =	1.5E-01

TABLE 9.13.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 25 Soil											
			Benzo(a)anthracene	N/A	--	N/A	N/A	Benzo(a)anthracene	N/A	N/A	--	N/A	N/A
			Benzo(a)pyrene	N/A	--	N/A	N/A	Benzo(a)pyrene	N/A	N/A	--	N/A	N/A
			Benzo(b)fluoranthene	N/A	--	N/A	N/A	Benzo(b)fluoranthene	N/A	N/A	--	N/A	N/A
			Dibenz(a,h)anthracene	N/A	--	N/A	N/A	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	N/A
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	3.0E-02	--	3.0E-04	3.0E-02
			Arsenic	N/A	--	N/A	N/A	Arsenic	Skin/Vascular	9.1E-02	--	2.7E-03	9.4E-02
			Cadmium	N/A	--	N/A	N/A	Cadmium	Kidney	2.4E-03	--	9.5E-05	2.5E-03
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	3.6E-03	--	1.4E-03	5.0E-03
			Iron	N/A	--	N/A	N/A	Iron	GI	2.1E-01	--	2.1E-03	2.1E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	5.2E-02	--	1.3E-02	6.5E-02
			Silver	N/A	--	N/A	N/A	Silver	Skin	1.0E-03	--	2.5E-04	1.2E-03
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	4.6E-02	--	4.6E-04	4.7E-02
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	1.1E-01	--	4.1E-02	1.5E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		5.4E-01	0.0E+00	6.1E-02	6.0E-01
							Total Risk Across Soil						Total Hazard Index Across Soil
							0.0E+00						6.0E-01
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes
							N/A						6.0E-01

Total CNS HI =	9.5E-02
Total Gastrointestinal HI =	2.1E-01
Total Kidney HI =	1.5E-01
Total NOAEL HI =	5.0E-03
Total Skin HI =	1.4E-01
Total Vascular HI =	1.4E-01

TABLE 10.1.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	1.4E-01	--	3.9E-03	1.4E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	1.1E-01	--	2.1E-04	1.1E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	2.8E+00	--	1.4E-01	2.9E+00
			(Total)	N/A	N/A	N/A	N/A	(Total)		3.0E+00	0.0E+00	1.4E-01	3.2E+00
			Total Risk Across Tap water				N/A	Total Hazard Index Across Tap water					3.2E+00
Total Risk Across All Media and All Exposure Routes							N/A	Total Hazard Index Across All Media and All Exposure Routes					3.2E+00

Total Cardiovascular HI =	1.4E-01
Total CNS HI =	2.9E+00
Total Gastrointestinal HI =	1.1E-01

TABLE 10.2.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	3.2E-01	--	1.1E-02	3.3E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	2.5E-01	--	6.1E-04	2.5E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	6.5E+00	--	4.0E-01	6.9E+00
			(Total)	N/A	N/A	N/A	N/A	(Total)		7.1E+00	0.0E+00	4.2E-01	7.5E+00
			Total Risk Across Tap water				N/A	Total Hazard Index Across Tap water					7.5E+00
Soil*	Soil	Site 25 Soil											
			Aluminum	N/A	--	N/A	N/A	Aluminum	CNS	1.2E-01	--	2.2E-03	1.2E-01
			Arsenic	N/A	--	N/A	N/A	Arsenic	Skin/Vascular	3.7E-01	--	2.1E-02	3.9E-01
			Chromium	N/A	--	N/A	N/A	Chromium	NOAEL	1.1E-01	--	8.2E-02	1.9E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	8.0E-01	--	1.5E-02	8.2E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	3.0E-01	--	1.4E-01	4.4E-01
			Silver	N/A	--	N/A	N/A	Silver	Skin	9.0E-02	--	4.2E-02	1.3E-01
			Thallium	N/A	--	N/A	N/A	Thallium	Skin/Vascular	1.6E-01	--	3.0E-03	1.6E-01
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	4.2E-01	--	3.0E-01	7.1E-01
			(Total)	N/A	N/A	N/A	N/A	(Total)		2.4E+00	0.0E+00	6.0E-01	3.0E+00
			Total Risk Across Soil				N/A	Total Hazard Index Across Soil					3.0E+00
			Total Risk Across All Media and All Exposure Routes				N/A	Total Hazard Index Across All Media and All Exposure Routes					1.0E+01

Total Cardiovascular HI =	3.3E-01
Total CNS HI =	7.5E+00
Total Gastrointestinal HI =	1.1E+00
Total Kidney HI =	7.1E-01
Total NOAEL HI =	1.9E-01
Total Skin HI =	6.9E-01
Total Vascular HI =	5.5E-01

TABLE 10.3.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Constructior Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil	Site 25 Soil											
			Arsenic	n/A	--	n/A	0.0E+00	Arsenic	Skin/Vascular	1.4E-01	--	1.1E-02	1.5E-01
			Iron	N/A	--	N/A	N/A	Iron	GI	2.9E-01	--	7.8E-03	3.0E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	1.1E-01	--	7.3E-02	1.8E-01
			Vanadium	N/A	--	N/A	N/A	Vanadium	Kidney	1.5E-01	--	1.6E-01	3.1E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		6.9E-01	0.0E+00	2.5E-01	9.4E-01
			Total Risk Across Soil				0.0E+00	Total Hazard Index Across Soil					9.4E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					9.4E-01

Total CNS HI =	1.8E-01
Total Gastrointestinal HI =	3.0E-01
Total Kidney HI =	3.1E-01
Total Skin HI =	1.5E-01
Total Vascular HI =	1.5E-01

TABLE 10.4.CT

RISK ASSESSMENT SUMMARY

CENTRAL TENDENCY

Site 25, NDWIH

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer- Tap Water											
			Barium	N/A	--	N/A	N/A	Barium	Cardiovascular	1.4E-01	--	4.2E-03	1.4E-01
			Manganese	N/A	--	N/A	N/A	Manganese	CNS	2.5E+00	--	1.4E-01	2.7E+00
			(Total)	N/A	N/A	N/A	N/A	(Total)		2.7E+00	0.0E+00	1.4E-01	2.8E+00
			Total Risk Across Tap water				N/A	Total Hazard Index Across Tap water					2.8E+00

Screening Value Type	Chemical	Value	Units	Source	Reference	Comments	Hardness (mg/L)	pH	TOC (%)
EFACHES-sediment-freshwater	1,1,1-Trichloroethane	170	ug/kg	EcoTox Thresholds	USEPA 1996	BTAG value derived from AET approach for 1,2,4-Trichlorobenzene (apparent transcription error). Selected value is the Sediment Quality Benchmark for 1,1,1-Trichloroethane calculated using the Tier II water value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,1,2,2-Tetrachloroethane	1400	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,1,2-Trichloroethane	1200	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value derived from AET approach for 1,2,4-Trichlorobenzene (apparent transcription error). Selected value is based on SCV for 1,1,2-Trichloroethane and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,1-Dichloroethane	27	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC)			1
EFACHES-sediment-freshwater	1,1-Dichloroethene	31	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,2,4-Trichlorobenzene	9600	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	Basis for BTAG value unknown. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,2-Dibromoethane	167	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	1,2-Dichlorobenzene	330	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,2-Dichloroethane	250	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,2-Dichloroethene (total)	400	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,2-Dichloropropane	4928	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	1,3-Dichlorobenzene	1700	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,3-Dichloropropene	0.051	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	1,3-Dinitrobenzene	47	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{toc} = K_{oc}$ (partion coefficient for organic carbon) X NOAEL (substituted for the Final Chronic Value), K_{oc} of 29.5 L/kg estimated from log K_{ow} of 1.50 (USEPA 1995). TOC of 1%			1
EFACHES-sediment-freshwater	1,3,5-Trinitrobenzene	12	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{toc} = K_{oc}$ (partion coefficient for organic carbon) X NOAEL (substituted for the Final Chronic Value), K_{oc} of 14.5 L/kg estimated from log K_{ow} of 1.18 (USEPA, 1995). TOC of 1%.			1
EFACHES-sediment-freshwater	1,4-Dichlorobenzene	340	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	2,4,5-Trichlorophenol	4299	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2,4,6-Trichlorophenol	42087	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2,4,6-Trinitrotoluene	90	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Selected value is a Sediment Quality Benchmark based on the calculated chron water quality criteria and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	2,4-Dichlorophenol	3892	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2,4-Dimethylphenol	1108	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2,4-Dinitrophenol	50.1	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2,4-Dinitrotoluene	218	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2,6-Dinitrotoluene	41.4	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2,3,7,8-TCDD (dioxin)	0.0036	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. AET (Neanthes bioassay)			
EFACHES-sediment-freshwater	2-Butanone	270	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-freshwater	2-Chloronaphthalene	66523	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2-Chlorophenol	126	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2-Hexanone	22	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-freshwater	2-Methylnaphthalene	969	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2-Methylphenol	12	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-freshwater	2-Nitroaniline	1697	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	2-Nitrophenol	88.3	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	4,4'-DDD	110	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	4,4'-DDE	110	ug/kg	Value for 4,4'-DDD used as a surrogate	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	4,4'-DDT	340	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	3,3'-Dichlorobenzidine	296	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	3-Nitroaniline	238	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	4-Bromophenyl-phenylether	1200	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected values based on SCV and equilibrium partitioning (1 TOC).			1
EFACHES-sediment-freshwater	4-Chloroaniline	32.9	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	4-Methyl-2-pentanone	33	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-freshwater	4-Methylphenol	670	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox and oyster larvae)			
EFACHES-sediment-freshwater	4-Nitrophenol	111	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Acenaphthene	620	ug/kg	EcoTox Thresholds	USEPA 1996	BTAG value does not account for site-specific bioavailability. Selected value is the Sediment Quality Criterion calculated using the final chronic value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Acenaphthylene	44	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Acetone	8.7	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-freshwater	Aldrin	7360	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	alpha-BHC	120	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	alpha-Chlordane	2800	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Aluminum	25500	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is the lowest ARCs Threshold Effects Level (TEL) for Hyallela azteca.			
EFACHES-sediment-freshwater	Ammonia	100000	ug/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is based on Ontario open water disposal guidelines.			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-freshwater	Anthracene	220	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Antimony	150	mg/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (benthic community impacts); not in 1998 version.			
EFACHES-sediment-freshwater	Aroclor-1016	44.8	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Aroclor-1221	120	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Aroclor-1232	600	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Aroclor-1242	170	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Aroclor-1248	1000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Aroclor-1254	810	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Aroclor-1260	44.8	ug/kg	Value for Aroclor-1016 used as a surrogate	see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Arsenic	12.1	mg/kg	NBS-ARCS Project (EPA, 1996)	Jones et al. 1997	Threshold Effects Concentration for freshwater sediments			
EFACHES-sediment-freshwater	Barium	500	mg/kg		Beyer 1990	No BTAG value. Selected value is the Wisconsin Interim Sediment Quality Criterion for Great Lakes disposal (1985).			
EFACHES-sediment-freshwater	Benzene	160	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Based on SCV and equilibrium partitioning (1% TOC)			1
EFACHES-sediment-freshwater	Benzidine	1.7	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Based on SCV and equilibrium partitioning (1% TOC). *Polar*			1
EFACHES-sediment-freshwater	Benzo(a)anthracene	110	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Benzo(a)pyrene	140	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Benzo(b)fluoranthene	127403	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Benzo(g,h,i)perylene	670	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-freshwater	Benzo(k)fluoranthene	240	ug/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is the Lowest Effect Level (LEL) based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms.			
EFACHES-sediment-freshwater	Benzoic acid	650	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (oyster larvae; benthic community impacts; Microtox)			
EFACHES-sediment-freshwater	Benzyl alcohol	1.1	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning. *Polar*			1
EFACHES-sediment-freshwater	beta-BHC	120	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	bis(2-Chloroethoxy)methane	60.1	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	bis(2-Chloroethyl)ether	368	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	bis(2-Ethylhexyl)phthalate	890000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Bromochloromethane	268	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Bromodichloromethane	1276	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Butylbenzylphthalate	11000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected values based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Cadmium	1.2	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Carbazole	33826	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Carbon disulfide	0.85	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Carbon tetrachloride	47	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Chlordane	2800	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Chlorobenzene	410	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Chloroform	22	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Chloromethane	432	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Chromium	81	mg/kg		Long et al. 1995	BTAG value derived from soil-based toxicity studies on tobacco. Selected value the ER-L for marine and estuarine sediments.			
EFACHES-sediment-freshwater	Chrysene	384	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	cis-1,2-Dichloroethene	782	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	cis-1,3-Dichloropropene	226	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Cobalt	50	mg/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is the Ontario open water disposal guideline.			
EFACHES-sediment-freshwater	Copper	34	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Cyanide	0.1	mg/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is the Ontario open water disposal guideline.			
EFACHES-sediment-freshwater	delta-BHC	120	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Dibenz(a,h)anthracene	63.4	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Dibenzofuran	420	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Based on SCV an equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Dibromochloromethane	1495	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Dieldrin	52	ug/kg	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is the Sediment Quality Criterion calculated using the final chronic value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Diethylphthalate	600	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected values based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Dimethylphthalate	115	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Di-n-butylphthalate	11000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Di-n-octylphthalate	2514093	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Endosulfan I	5.5	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Endosulfan II	5.5	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Endosulfan sulfate	5.5	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Endrin	20	ug/kg	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is the Sediment Quality Criterion calculated using the final chronic value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Endrin aldehyde	3.08	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Endrin ketone	3.08	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Ethylbenzene	89	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Screening value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Fluoranthene	6200	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Based on NAWQ and equilibrium partitioning.			1
EFACHES-sediment-freshwater	Fluorene	540	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected values based on SCV and equilibrium partitioning (1% TOC).			1

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-freshwater	gamma-BHC (Lindane)	3.7	ug/kg	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is the Sediment Quality Benchmark calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	gamma-Chlordane	2800	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Heptachlor	68	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Heptachlor epoxide	5.68	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Hexachlorobenzene	22699	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Hexachlorobutadiene	4977	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Hexachlorocyclopentadiene	10343	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Hexachloroethane	1000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	213	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{oc} = K_{oc}$ (partion coefficient for organic carbon) X NOAEL (substituted for the Final Chronic Value), K_{oc} of 6.46 L/kg estimated from log K_{ow} of 0.82 (SRC 2001). TOC of 1%.			1
EFACHES-sediment-freshwater	Indeno(1,2,3-cd)pyrene	600	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-freshwater	Iron	188400	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is the lowest ARCs Threshold Effects Level (TEL) for Hyallela azteca.			
EFACHES-sediment-freshwater	Isophorone	5490	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Lead	46.7	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Malathion	0.67	ug/kg	EcoTox Thresholds	USEPA 1996	Sediment Quality Benchmark calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Manganese	460	mg/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is the Lowest Effect Level (LEL) based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms			
EFACHES-sediment-freshwater	Mercury	0.15	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Methoxychlor	19	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Methyl bromide	16.3	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Methylene chloride	370	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Mirex	7	ug/kg		Ontario Ministry of the Environment 1993	LEL value is based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms			
EFACHES-sediment-freshwater	Naphthalene	240	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Nickel	20.9	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Nitrobenzene	1739	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	N-Nitrosodiphenylamine	7477	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	PAH (total)	4022	ug/kg		Long et al. 1995	No BTAG value. Selected value is the ER-L for marine and estuarine sediments.			
EFACHES-sediment-freshwater	Parathion	31	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-freshwater	Pentachlorobenzene	700	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Pentachlorophenol	6758	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Phenanthrene	1800	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Based on NAWQ and equilibrium partitioning.			1
EFACHES-sediment-freshwater	Phenol	31	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Polychlorinated biphenyls (PCBs	22.7	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Pyrene	665	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	RDX (hexahydro-1,3,5-trinitro-1,	10	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated by Talmage et al. (1999) using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{oc} = K_{oc}$ (partion coefficient for organic carbon) X calculated Secondary Chronic Value, TOC of 1%.			1
EFACHES-sediment-freshwater	Selenium	1	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine amphipods.			
EFACHES-sediment-freshwater	Silver	1	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-freshwater	Styrene	1872	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Tetrachloroethene	410	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Toluene	50	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Toxaphene	28	ug/kg	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is the Sediment Quality Benchmark calculated using the Tier II water value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	trans-1,2-Dichloroethene	1258	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	trans-1,3-Dichloropropene	226	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Tribromomethane	650	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Trichlorobenzene	40	ug/kg		USEPA 1995	Basis for value unknown.			
EFACHES-sediment-freshwater	Trichloroethene	220	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Vanadium	57	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-freshwater	Vinyl chloride	346	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-freshwater	Xylene, total	160	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-freshwater	Zinc	150	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	1,1,1-Trichloroethane	8556	ug/kg		see screening values for salt water	BTAG value derived from AET approach for 1,2,4-Trichlorobenzene (apparent transcription error). Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,1,2,2-Tetrachloroethane	1394	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,1,2-Trichloroethane	3233	ug/kg		see screening values for salt water	BTAG value derived from AET approach for 1,2,4-Trichlorobenzene (apparent transcription error). Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,1-Dichloroethane	1841	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,1-Dichloroethene	27817	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,2,4-Trichlorobenzene	11290	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-marine	1,2-Dichlorobenzene	3038	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,2-Dichloroethane	315	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,2-Dichloropropane	2628	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,3-Dichlorobenzene	786	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	1,4-Dichlorobenzene	2970	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,4,5-Trichlorophenol	751	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,4,6-Trichlorophenol	525	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,4-Dichlorophenol	53.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,4-Dimethylphenol	230	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,4-Dinitrophenol	162	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,4-Dinitrotoluene	350	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,6-Dinitrotoluene	6894	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2,3,7,8-TCDD (dioxin)	0.0036	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. AET (Neanthes bioassay)			
EFACHES-sediment-marine	2-Chloronaphthalene	80.5	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2-Chlorophenol	68.9	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2-Methylnaphthalene	2047	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	2-Methylphenol	63	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Amphipod and oyster larvae)			
EFACHES-sediment-marine	2-Nitrophenol	285	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	3,3'-Dichlorobenzidine	206	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	4,4'-DDD	248	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	4,4'-DDE	61871	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	4,4'-DDT	26.3	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	4-Bromophenyl-phenylether	1200	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-marine	4-Chloroaniline	85	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	4-Nitrophenol	358	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	4-Methylphenol	670	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox and oyster larvae)			
EFACHES-sediment-marine	Acenaphthene	1100	ug/kg	EcoTox Thresholds	USEPA 1996	BTAG value does not account for site-specific bioavailability. Selected value is the Sediment Quality Criterion calculated using the final chronic value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-marine	Acenaphthylene	44	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Aldrin	3190	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	alpha-BHC	1.85	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	alpha-Chlordane	65.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Aluminum	18000	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-marine	Ammonia	100000	ug/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is based on Ontario open water disposal guidelines.			
EFACHES-sediment-marine	Anthracene	8914	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Antimony	150	mg/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (benthic community impacts); not in 1998 version.			
EFACHES-sediment-marine	Aroclor-1016	96	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Aroclor-1221	12.5	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Aroclor-1232	31	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Aroclor-1242	96	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Aroclor-1248	373	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Aroclor-1254	736	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Aroclor-1260	1451	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Arsenic	8.2	mg/kg	Long et al. 1995	USEPA 1995	ER-L (total As)			
EFACHES-sediment-marine	Barium	48	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is the Apparent Effects Threshold (AET) for marine amphipods.			
EFACHES-sediment-marine	Benzene	869	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Benzo(a)anthracene	32619	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Benzo(a)pyrene	213	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Benzo(b)fluoranthene	373251	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Benzo(g,h,i)perylene	1157447	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Benzo(k)fluoranthene	373251	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Benzoic acid	650	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (oyster larvae; benthic community impacts; Microtox)			
EFACHES-sediment-marine	Benzyl alcohol	57	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-marine	beta-BHC	1.89	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	bis(2-Chloroethoxy)methane	350	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-marine	bis(2-Ethylhexyl)phthalate	54011035	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Bromochloromethane	1558	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Bromodichloromethane	7426	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Butylbenzylphthalate	16840	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Cadmium	1.2	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Carbazole	338	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Carbon disulfide	1.85	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Carbon tetrachloride	24146	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Chlordane	0.5	ug/kg		Long and Morgan 1990	No BTAG value. Selected value is the ER-L for marine and estuarine sediments.			
EFACHES-sediment-marine	Chlorobenzene	681	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Chloroform	629	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Chloromethane	212	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Chromium	81	mg/kg		Long et al. 1995	BTAG value derived from soil-based toxicity studies on tobacco. Selected value the ER-L for marine and estuarine sediments.			
EFACHES-sediment-marine	Chrysene	120365	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	cis-1,2-Dichloroethene	15098	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	cis-1,3-Dichloropropene	73.1	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Cobalt	10	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-marine	Copper	34	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Cyanide	0.1	mg/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is the Ontario open water disposal guideline.			
EFACHES-sediment-marine	delta-BHC	3.65	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Dibenz(a,h)anthracene	1131544	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Dibenzofuran	1345	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Dibromochloromethane	8701	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Dieldrin	3.61	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Diethylphthalate	218	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Dimethylphthalate	203	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Di-n-butylphthalate	1157	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Di-n-octylphthalate	2849305	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Endosulfan I	0.51	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Endosulfan II	2.42	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Endosulfan sulfate	0.38	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Endrin	0.02	ug/kg		Long and Morgan 1990	No BTAG value. Selected value is the ER-L for marine and estuarine sediments.			
EFACHES-sediment-marine	Endrin aldehyde	0.2	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Endrin ketone	0.2	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Ethylbenzene	525	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Fluoranthene	600	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Fluorene	4129	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	gamma-BHC (Lindane)	0.74	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	gamma-Chlordane	65.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Heptachlor	51.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Heptachlor epoxide	2.96	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Hexachlorobenzene	795682	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Hexachlorobutadiene	1713	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Hexachloroethane	8043	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Hexachlorocyclopentadiene	1392	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Indeno(1,2,3-cd)pyrene	1033597	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Iron	220000	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-marine	Isophorone	605	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Lead	46.7	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Manganese	260	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-marine	Mercury	0.15	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Methoxychlor	29.6	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Methyl bromide	17.8	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Methylene chloride	1084	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Mirex	7	ug/kg		Ontario Ministry of the Environment 1993	LEL value is based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms			
EFACHES-sediment-marine	Naphthalene	4623	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-marine	Nickel	20.9	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Nitrobenzene	430	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	N-Nitrosodiphenylamine	4217683	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	PAH (total)	4022	ug/kg		Long et al. 1995	No BTAG value. Selected value is the ER-L for marine and estuarine sediments.			
EFACHES-sediment-marine	Parathion	31	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-marine	Pentachlorophenol	7969	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Phenanthrene	240	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Phenol	420	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (oyster larvae)			
EFACHES-sediment-marine	Polychlorinated biphenyls (PCBs	22.7	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Pyrene	31661	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Selenium	1	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine amphipods.			
EFACHES-sediment-marine	Silver	1	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-marine	Styrene	3962	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Tetrachloroethene	1897	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Toluene	187	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Toxaphene	536	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	trans-1,2-Dichloroethene	24285	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	trans-1,3-Dichloropropene	73.1	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Tribromomethane	1308	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Trichlorobenzene	40	ug/kg		USEPA 1995	Basis for value unknown.			
EFACHES-sediment-marine	Trichloroethene	923	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Vanadium	57	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-marine	Vinyl chloride	6684	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Xylene, total	1889	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-marine	Zinc	150	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	1,1,1-Trichloroethane	170	ug/kg	EcoTox Thresholds	USEPA 1996	BTAG value derived from AET approach for 1,2,4-Trichlorobenzene (apparent transcription error). Selected value is the Sediment Quality Benchmark for 1,1,1-Trichloroethane calculated using the Tier II water value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,1,2,2-Tetrachloroethane	1394	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	1,1,2-Trichloroethane	1200	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value derived from AET approach for 1,2,4-Trichlorobenzene (apparent transcription error). Selected value is based on SCV for 1,1,2-Trichloroethane and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,1-Dichloroethane	27	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC)			1
EFACHES-sediment-brackish	1,1-Dichloroethene	31	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,2,4-Trichlorobenzene	9600	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	Basis for BTAG value unknown. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,2-Dibromoethane	167	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	1,2-Dichlorobenzene	330	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,2-Dichloroethane	250	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,2-Dichloroethene (total)	400	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,2-Dichloropropane	2628	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	1,3-Dichlorobenzene	786	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	1,3-Dichloropropene	0.051	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	1,3-Dinitrobenzene	47	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{oc} = K_{oc}$ (partion coefficient for organic carbon) X NOAEL (substituted for the Final Chronic Value), K_{oc} of 29.5 L/kg estimated from log K_{ow} of 1.50 (USEPA 1995). TOC of 1%.			1
EFACHES-sediment-brackish	1,3,5-Trinitrobenzene	12	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{oc} = K_{oc}$ (partion coefficient for organic carbon) X NOAEL (substituted for the Final Chronic Value), K_{oc} of 14.5 L/kg estimated from log K_{ow} of 1.18 (USEPA 1995). TOC of 1%.			1
EFACHES-sediment-brackish	1,4-Dichlorobenzene	340	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	2,3,7,8-TCDD (dioxin)	0.0036	ug/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. AET (Neanthes bioassay)			
EFACHES-sediment-brackish	2,4,5-Trichlorophenol	751	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2,4,6-Trichlorophenol	525	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2,4,6-Trinitrotoluene	90	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value is a Sediment Quality Benchmark based on the calculated chronic l414water quality criteria and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	2,4-Dichlorophenol	53.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2,4-Dimethylphenol	230	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2,4-Dinitrophenol	50.1	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2,4-Dinitrotoluene	218	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2,6-Dinitrotoluene	41.4	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2-Butanone	270	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-brackish	2-Chloronaphthalene	80.5	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2-Chlorophenol	68.9	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2-Hexanone	22	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-brackish	2-Methylnaphthalene	969	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-brackish	2-Methylphenol	12	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-brackish	2-Nitroaniline	1697	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	2-Nitrophenol	88.3	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	3,3'-Dichlorobenzidine	206	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	3-Nitroaniline	238	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	4,4'-DDD	110	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	4,4'-DDE	61871	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	4,4'-DDT	26.3	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	4-Bromophenyl-phenylether	1200	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	4-Chloroaniline	32.9	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	4-Methyl-2-pentanone	33	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-brackish	4-Methylphenol	670	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox and oyster larvae)			
EFACHES-sediment-brackish	4-Nitrophenol	111	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Acenaphthene	620	ug/kg	EcoTox Thresholds	USEPA 1996	BTAG value does not account for site-specific bioavailability. Selected value is the Sediment Quality Criterion calculated using the final chronic value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Acenaphthylene	44	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Acetone	8.7	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC). This chemical is a polar organic so the value is likely to be conservative.			1
EFACHES-sediment-brackish	Aldrin	3190	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	alpha-BHC	1.85	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	alpha-Chlordane	65.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Aluminum	18000	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-brackish	Ammonia	100000	ug/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is based on Ontario open water disposal guidelines.			
EFACHES-sediment-brackish	Anthracene	220	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Antimony	150	mg/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (benthic community impacts); not in 1998 version.			
EFACHES-sediment-brackish	Aroclor-1016	44.8	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Aroclor-1221	12.5	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Aroclor-1232	31	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Aroclor-1242	96	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Aroclor-1248	373	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Aroclor-1254	736	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Aroclor-1260	1451	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Arsenic	8.2	mg/kg	Long et al. 1995	USEPA 1995	ER-L (total As)			
EFACHES-sediment-brackish	Barium	48	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is the Apparent Effects Threshold (AET) for marine amphipods.			
EFACHES-sediment-brackish	Benzene	160	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Based on SCV and equilibrium partitioning (1% TOC)			1
EFACHES-sediment-brackish	Benzidine	1.7	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Based on SCV and equilibrium partitioning (1% TOC). *Polar*			1
EFACHES-sediment-brackish	Benzo(a)anthracene	110	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Benzo(a)pyrene	140	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Benzo(b)fluoranthene	127403	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Benzo(g,h,i)perylene	670	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-brackish	Benzo(k)fluoranthene	240	ug/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is the Lowest Effect Level (LEL) based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms.			
EFACHES-sediment-brackish	Benzoic acid	650	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (oyster larvae; benthic community impacts; Microtox)			
EFACHES-sediment-brackish	Benzyl alcohol	1.1	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning. *Polar*			1
EFACHES-sediment-brackish	beta-BHC	1.89	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	bis(2-Chloroethoxy)methane	60.1	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	bis(2-Chloroethyl)ether	368	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	bis(2-Ethylhexyl)phthalate	890000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Bromochloromethane	268	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Bromodichloromethane	1276	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Butylbenzylphthalate	11000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected values based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Cadmium	1.2	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Carbazole	338	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Carbon disulfide	0.85	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Carbon tetrachloride	47	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Chlordane	0.5	ug/kg		Long and Morgan 1990	No BTAG value. Selected value is the ER-L for marine and estuarine sediments.			
EFACHES-sediment-brackish	Chlorobenzene	410	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Chloroform	22	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Chloromethane	212	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-brackish	Chromium	81	mg/kg		Long et al. 1995	BTAG value derived from soil-based toxicity studies on tobacco. Selected value the ER-L for marine and estuarine sediments.			
EFACHES-sediment-brackish	Chrysene	384	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	cis-1,2-Dichloroethene	782	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	cis-1,3-Dichloropropene	73.1	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Cobalt	10	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-brackish	Copper	34	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Cyanide	0.1	mg/kg		Ontario Ministry of the Environment 1993	No BTAG value. Selected value is the Ontario open water disposal guideline.			
EFACHES-sediment-brackish	delta-BHC	3.65	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Dibenz(a,h)anthracene	63.4	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Dibenzofuran	420	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Based on SCV ar equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Dibromochloromethane	1495	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Dieldrin	3.61	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Diethylphthalate	218	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Dimethylphthalate	115	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Di-n-butylphthalate	1157	ug/kg		see screening values for salt water	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Di-n-octylphthalate	2514093	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Endosulfan I	0.51	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Endosulfan II	2.42	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Endosulfan sulfate	0.38	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Endrin	0.02	ug/kg		Long and Morgan 1990	No BTAG value. Selected value is the ER-L for marine and estuarine sediments.			
EFACHES-sediment-brackish	Endrin aldehyde	0.2	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Endrin ketone	0.2	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Ethylbenzene	89	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Screening value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Fluoranthene	600	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Fluorene	540	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected values based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	gamma-BHC (Lindane)	0.74	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	gamma-Chlordane	65.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Heptachlor	51.3	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Heptachlor epoxide	2.96	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Hexachlorobenzene	22699	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Hexachlorobutadiene	1713	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Hexachlorocyclopentadiene	1392	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Hexachloroethane	1000	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	213	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{oc} = K_{oc}$ (partion coefficient for organic carbon) X NOAEL (substituted for the Final Chronic Value), K_{oc} of 6.46 L/kg estimated from log K_{ow} of 0.82 (SRC 2001). TOC of 1%.			1
EFACHES-sediment-brackish	Indeno(1,2,3-cd)pyrene	600	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-brackish	Iron	188400	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is the lowest ARCs Threshold Effects Level (TEL) for Hyallela azteca.			
EFACHES-sediment-brackish	Isophorone	605	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Lead	46.7	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Malathion	0.67	ug/kg	EcoTox Thresholds	USEPA 1996	Sediment Quality Benchmark calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Manganese	260	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-brackish	Mercury	0.15	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Methoxychlor	19	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Methyl bromide	16.3	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Methylene chloride	370	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Mirex	7	ug/kg		Ontario Ministry of the Environment 1993	LEL value is based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms			
EFACHES-sediment-brackish	Naphthalene	240	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Nickel	20.9	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Nitrobenzene	430	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	N-Nitrosodiphenylamine	7477	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	PAH (total)	4022	ug/kg		Long et al. 1995	No BTAG value. Selected value is the ER-L for marine and estuarine sediments.			
EFACHES-sediment-brackish	Parathion	31	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	AET (Microtox)			
EFACHES-sediment-brackish	Pentachlorobenzene	700	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Pentachlorophenol	6758	ug/kg		see screening values for freshwater	BTAG value does not account for site-specific bioavailability. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Phenanthrene	240	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Phenol	31	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is calculated using the chronic AWQC and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Polychlorinated biphenyls (PCBs	22.7	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Pyrene	665	ug/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	10	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value calculated by Talmage et al. (1999) using the EqP method of Di Toro et al. (1991) and USEPA (1993): $SQB_{oc} = K_{oc}$ (partion coefficient for organic carbon) X calculated Secondary Chronic Value, TOC of 1%.			1

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-sediment-brackish	Selenium	1	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine amphipods.			
EFACHES-sediment-brackish	Silver	1	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-sediment-brackish	Styrene	1872	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Tetrachloroethene	410	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Toluene	50	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Toxaphene	28	ug/kg	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is the Sediment Quality Benchmark calculated using the Tier II water value and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	trans-1,2-Dichloroethene	1258	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	trans-1,3-Dichloropropene	73.1	ug/kg		see screening values for salt water	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Tribromomethane	650	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Trichlorobenzene	40	ug/kg		USEPA 1995	Basis for value unknown.			
EFACHES-sediment-brackish	Trichloroethene	220	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	No BTAG value. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Vanadium	57	mg/kg	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
EFACHES-sediment-brackish	Vinyl chloride	346	ug/kg		see screening values for freshwater	No BTAG value. Selected value is based on equilibrium partitioning (see screening values for water). Value shown is based on 1% TOC.			1
EFACHES-sediment-brackish	Xylene, total	160	ug/kg	ORNL (1997) sediment benchmark	Jones et al. 1997	BTAG value does not account for site-specific bioavailability. Selected value is based on SCV and equilibrium partitioning (1% TOC).			1
EFACHES-sediment-brackish	Zinc	150	mg/kg	Long et al. 1995	USEPA 1995	ER-L			
EFACHES-soil	1,1,1,2-Tetrachloroethane	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,1,1-Trichloroethane	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,1,2,2-Tetrachloroethane	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,1,2-Trichloroethane	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,1-Dichloroethane	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,2,4,5-Tetrachlorobenzene	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,2,4-Trichlorobenzene	1270	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Selected value is based on a LC50 for earthworms (from an artificial soil toxicity test) of 127 ppm (the lowest toxic concentration of 4 reported) and an adjustment factor of 100.			
EFACHES-soil	1,2-Dibromoethane	5000	ug/kg	OHM/TADS	USEPA 1995				
EFACHES-soil	1,2-Dichlorobenzene	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,2-Dichloroethane	401	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value is based on acute oral ingestion endpoint. Selected value is the mean of the detection limit and the intervention value (Dutch soil standards) based on the minimum TOC of 2%.			2
EFACHES-soil	1,2-Dichloroethene (total)	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,2-Dichloropropane	38800	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Selected value based on a LC50 for earthworms (soil toxicity test) of 3880 ppm (lowest toxic concentration of 5 reported) and an adjustment factor of 100.			
EFACHES-soil	1,3-Dichlorobenzene	100	ug/kg	Value for 1,2-Dichlorobenzene used as a surrogate		No BTAG value			
EFACHES-soil	1,3-Dichloropropene	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	1,4-Dichlorobenzene	1280	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Selected value is based on a LC50 for earthworms (soil toxicity test) of 128 ppm (lowest toxic concentration of 4 reported) and an adjustment factor of 100.			
EFACHES-soil	2,3,4,6-Tetrachlorophenol	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	2,3,7,8-TCDD (dioxin)	10	ug/kg		USEPA 1995	LD50 (oral) - rabbit			
EFACHES-soil	2,4,5-Trichlorophenol	430	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Selected value is based on an EC50 from a 14-day toxicity test (growth endpoint) with lettuce (4.3 ppm) and an adjustment factor of 10.			
EFACHES-soil	2,4,6-Trichlorophenol	580	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Selected value is based on a LC50 for earthworms (soil toxicity test) of 58 ppm (lowest toxic concentration of 5 reported) and an adjustment factor of 100.			
EFACHES-soil	2,4,6-Trinitrotoluene	10000	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	NOAEL for wheat and grass growth			
EFACHES-soil	2,4-Dichlorophenol	13400	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Selected value is based on LC50 data for earthworms (soil toxicity tests; 12 values). Value is approximate ER-L (134 ppm) with an adjustment factor of 10.			
EFACHES-soil	2,4-Dimethylphenol	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	2,4-Dinitrophenol	20000	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Selected value is a LOEC for 21-day toxicity tests (growth) with several crop species (20 ppm).			
EFACHES-soil	2,6-Dichlorophenol	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	2-Amino-4,6'Dinitrotoluene	80000	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	NOAEL for yellow nutsedge; weight (yield)			
EFACHES-soil	2-Chloronaphthalene	1033	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. selected value is the mean of the detection limit and the intervention value (Dutch soil standards) based on the minimum TOC of 2% for organic chemicals.			2
EFACHES-soil	2-Chlorophenol	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	2-Methylphenol	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	4,4'-DDD	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	4,4'-DDE	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	4,4'-DDT	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	4-Chloro-3-methylphenol	100	ug/kg	Value for 2-chlorophenol used as a surrogate		No BTAG value			
EFACHES-soil	4-Methyl-2-pentanone	10000	ug/kg			BTAG value is based on acute endpoint; adjustment factor of 10 applied to BTAG value.			
EFACHES-soil	2-Methylnaphthalene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	4-Methylphenol	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	4-Nitrophenol	380	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. selected is based on a LC50 for earthworms (soil toxicity test) of 38 ppm (lowest toxic concentration of 5 reported) and an adjustment factor of 100.			
EFACHES-soil	Acenaphthene	2500	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Selected value based on an EC50 (25 ppm) from a 14-day toxicity test (growth endpoint) with lettuce and an adjustment factor of 10.			
EFACHES-soil	Acenaphthylene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Acrylonitrile	1000000	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	No BTAG value. Selected value is based on LOEC for soil microorganism (microflora) respiration (1,000 ppm).			
EFACHES-soil	Aldrin	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	alpha-BHC	100000	ug/kg		USEPA 1995	LOEC - bacteria			
EFACHES-soil	alpha-Chlordane	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Aluminum	50	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Basis for BTAG value is unknown. Selected value derived from toxicity study on white clover in soil (LOEC).			
EFACHES-soil	Anthracene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Antimony	5	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value apparently based on background. selected value derived from toxicity studies with various plants in soil.			
EFACHES-soil	Aroclor-1016	100	ug/kg		USEPA 1995	Plants? Also matches Canadian background value			
EFACHES-soil	Aroclor-1221	100	ug/kg		USEPA 1995	Plants? Also matches Canadian background value			
EFACHES-soil	Aroclor-1232	100	ug/kg		USEPA 1995	Plants? Also matches Canadian background value			
EFACHES-soil	Aroclor-1242	100	ug/kg		USEPA 1995	Plants? Also matches Canadian background value			
EFACHES-soil	Aroclor-1248	100	ug/kg		USEPA 1995	Plants? Also matches Canadian background value			
EFACHES-soil	Aroclor-1254	100	ug/kg		USEPA 1995	Plants? Also matches Canadian background value			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-soil	Aroclor-1260	100	ug/kg		USEPA 1995	Plants? Also matches Canadian background value			
EFACHES-soil	Arsenic	10	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Approximate LOEC from four studies; LOEC based on As+3 and cotton			
EFACHES-soil	Barium	500	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on USGS background data. Selected value is a LOEC derived from 14-day studies using barley and bush beans.			
EFACHES-soil	Benzene	105	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value based on Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TC of 2%.			2
EFACHES-soil	Benzo(a)anthracene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Benzo(a)pyrene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Benzo(b)fluoranthene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Benzo(g,h,i)perylene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Benzo(k)fluoranthene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Beryllium	10	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Source and basis of BTAG value unknown. Selected value derived from soil toxicity studies with various plant species.			
EFACHES-soil	beta-BHC	100000	ug/kg		USEPA 1995	LOEC - bacteria			
EFACHES-soil	bis(2-Ethylhexyl)phthalate	6010	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. For selected value, see total phthalates.			2
EFACHES-soil	Boron	0.5	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Source and basis for BTAG value unknown. Selected value is LOEC derived from 7-week study on corn seedlings.			
EFACHES-soil	Bromochloromethane	300000	ug/kg			BTAG value is based on acute endpoint; adjustment factor of 10 applied to BTAG value			
EFACHES-soil	Bromodichloromethane	45000	ug/kg			BTAG value is based on acute endpoint; adjustment factor of 10 applied to BTAG value			
EFACHES-soil	Cadmium	4	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Basis for BTAG value unknown. Selected value derived from results of 74 studies (wide range of species); value estimated to be equivalent to an ER-L.			
EFACHES-soil	Carbon tetrachloride	1000000	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration data. Selected value is the approximate LOEC for effects to native soil microorganisms.			
EFACHES-soil	Chlordane	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Chlorobenzene	2400	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. selected value is based on a LC50 for earthworms (soil toxicity test) of 240 ppm (lowest toxic concentration of 4 reported) and an adjustment factor of 100.			
EFACHES-soil	Chlorobenzenes, total	3001	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. Selected value is the mean of target and intervention values for total chlorobenzenes (Dutch soil standards) based on a default TOC of 2% (adjustment range is 2 - 30%).			2
EFACHES-soil	Chlorophenols, total	1001	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. Selected value is the mean of the detection limit and the intervention value for total chlorophenols (Dutch soil standards) based on a default TOC of 2%.			2
EFACHES-soil	Chloroform	1000	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value is based on Canadian background concentration. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%.			2
EFACHES-soil	Chromium	0.4	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background data. Selected value based upon survival in earthworms (most sensitive endpoint) exposed to Cr(VI) in soil/manure; 2 ppm LOEC with adjustment factor of 5.			
EFACHES-soil	Chrysene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	cis-1,2-Dichloroethene	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	cis-1,3-Dichloropropene	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Cobalt	20	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Value derived from soil toxicity studies with various plant species.			
EFACHES-soil	Copper	50	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	No BTAG value for soil fauna. selected value derived from the results of 24 earthworm studies using a variety of chemical forms and endpoints; value is approximately equivalent to an ER-L.			
EFACHES-soil	Cyanide	27.5	mg/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value for flora. Selected value is the mean of target and intervention values (Dutch soil standards) for total cyanide (pH >5).			
EFACHES-soil	DDT, total	400	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. Selected value is the mean of target and intervention values (Dutch soil standards) for total DDT (DDT, DDE, and DDD) based on a default TOC of 2%.			2
EFACHES-soil	delta-BHC	100000	ug/kg		USEPA 1995	LOEC - bacteria			
EFACHES-soil	Dibenz(a,h)anthracene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Dichlorobenzenes, total	10	ug/kg	Friday 1998	USEPA Region IV 1999	Dutch soil standards (1994): target value for total dichlorobenzenes			
EFACHES-soil	Dichlorophenols, total	3	ug/kg	Friday 1998	USEPA Region IV 1999	Dutch soil standards (1994): target value for total dichlorophenols			
EFACHES-soil	Dieldrin	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			2
EFACHES-soil	Diethylphthalate	13400	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	No BTAG value available. Selected value based on EC50 for lettuce (growth endpoint) in loam soil (134 ppm) and an adjustment factor of 10.			
EFACHES-soil	Dimethyl phthalate	10640	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	No BTAG value available. Selected value based on a LC50 for earthworms (artificial soil toxicity test) of 1064 ppm (lowest toxic concentration of 3 reported and adjustment factor of 100.			
EFACHES-soil	Di-n-butylphthalate	200000	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	No BTAG value available. Selected value is based on a LOEC derived from studies on corn and soybeans (21-day toxicity test).			
EFACHES-soil	Dinitrophenol	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Drins	400	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. Selected value is the mean of target and intervention values (Dutch soil standards) for aldrin, dieldrin, and endrin based on a default TOC of 2%.			2
EFACHES-soil	Endrin	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Endrin aldehyde	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Endrin ketone	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Ethylbenzene	5005	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value is based on Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%.			2
EFACHES-soil	Fluoranthene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Fluorene	1730	ug/kg	The Toxicity of Selected Organic Chemicals to the Earthworm *Eisenia foetida*	Neuhauser et al., 1985	Value selected is based on LC50 for earthworms (soil toxicity test) of 173 ppm and an adjustment factor of 100.			
EFACHES-soil	HCH-technical	200	ug/kg		MHSPE 1994	Mean of target (0.05) and intervention (2,000) values for total HCH based on a default TOC of 2%.			2
EFACHES-soil	gamma-Chlordane	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	HCH-technical	100000	ug/kg		USEPA 1995	LOEC - bacteria			
EFACHES-soil	Heptachlor epoxide	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Hexachlorobenzene	100000	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	Approximate LOEC for effects to native soil microorganisms. Safety factor of 10 applied.			
EFACHES-soil	Hexachlorocyclopentadiene	1000	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	No BTAG value. Selected value based on a EC50 (toxicity test; growth endpoint) for lettuce in loam soil (10 ppm) and adjustment factor of 10.			
EFACHES-soil	HMX (octahydro-1,3,5,7-tetranit	50000	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage *et al.* 1999	Value based on 14-day test with earthworm (Eisenia foetida), minor weight loss (1.4% organic matter).			
EFACHES-soil	Indeno(1,2,3-cd)pyrene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Iron	200	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value is based on unadjusted oral ingestion exposure to rabbits. Selected value is based on the lowest effective concentration (280 ppm) from 9 studies with soil microorganisms.			
EFACHES-soil	Lead	50	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Basis for BTAG values unknown. Selected value is a LOEC derived from 17 values (several studies and plant species) and is approximately equivalent to an ER-L.			
EFACHES-soil	Magnesium	4400	mg/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Based on mean USGS background value			
EFACHES-soil	Manganese	500	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on USGS background data. Selected value is a LOEC from 17-day study with bush beans in soil.			
EFACHES-soil	Mercury	0.1	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on USGS background data. Selected value based upon survival and reproduction in earthworms exposed to HgCl in soil; 0.5 ppm LOEC with adjustment factor of 5.			
EFACHES-soil	Methoxychlor	100	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Methylene chloride	1001	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value is based on Canadian background concentration. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%.			2
EFACHES-soil	Molybdenum	2	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a				
EFACHES-soil	Naphthalene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Nickel	30	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on single species. Selected value is an approximate ER-L derived using 14 values from several studies.			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-soil	Nitrobenzene	2260	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	No BTAG value. Selected value is based on a LC50 for earthworms (14-day toxicity test) of 226 ppm (lowest toxic concentration of 4 reported) and an adjustment factor of 100.			
EFACHES-soil	n-Nitrosodiphenylamine	1090	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	No BTAG value. Selected value based on a LC50 for earthworms (14-day toxicity test) of 109 ppm (lowest toxic concentration of 5 reported) and an adjustment factor of 100.			
EFACHES-soil	PAH (total)	4100	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. Selected value is the mean of target and intervention values for 10 PAHs (Dutch soil standards) based on the minimum TOC of 2% for organic chemicals.			2
EFACHES-soil	Pentachlorobenzene	1150	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Selected value is based on a LC50 for earthworms (soil toxicity tests) of 115 ppm (lowest toxic concentration of 4 reported) and an adjustment factor of 100.			
EFACHES-soil	Pentachlorophenol	3000	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Selected value is a LOEC from two soil toxicity studies with three species.			
EFACHES-soil	Phenanthrene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	Phenol	1880	ug/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Selected value based on a LC50 for earthworms (soil toxicity tests) of 188 ppm (lowest toxic concentration of 5 reported) and an adjustment factor of 100.			
EFACHES-soil	Phthalates, total	6010	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	No BTAG value. Selected value is the mean of target and intervention values (Dutch soil standards) for total phthalates based on a default TOC of 2%.			2
EFACHES-soil	Polychlorinated biphenyls (PCBs	102	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value appears to be based upon Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) for 7 Aroclors based on a default TOC of 2%.			2
EFACHES-soil	Pyrene	1730	ug/kg	Fluorene used as surrogate		BTAG value based on Canadian background concentration.			
EFACHES-soil	RDX (hexahydro-1,3,5-trinitro-1,	50000	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage *et al.* 1999	Value based on 14-day test with earthworm (Eisenia foetida), minor weight loss (1.4% organic matter).			
EFACHES-soil	Selenium	1	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Approximate ER-L value is based on 14 values.			
EFACHES-soil	Silver	2	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Basis for BTAG value unknown. Selected value derived from soil toxicity studies with various plant species.			
EFACHES-soil	Strontium	120	mg/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Based on mean USGS background value.			
EFACHES-soil	Styrene	10010	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value based on Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TC of 2%.			2
EFACHES-soil	Tetrachloroethene	401	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value is based on Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%.			2
EFACHES-soil	Tetryl (N-methyl-N-2,4,6-tetranit	25000	ug/kg	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage *et al.* 1999	Recommended soil screening value developed by Talmage et al. (1999); based on toxicity tests with various plant speces.			
EFACHES-soil	Thallium	1	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Basis for BTAG value unknown. Selected value derived from soil toxicity studies with various plant species.			
EFACHES-soil	Tin	50	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value based on USGS background data. Selected value derived from soil toxicity studies with various plant species.			
EFACHES-soil	Toluene	13005	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value based on Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TC of 2%.			2
EFACHES-soil	trans-1,2-Dichloroethene	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	trans-1,3-Dichloropropene	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Tribromomethane	114700	ug/kg			BTAG value is based on acute endpoint; adjustment factor of 10 applied to BTAG value			
EFACHES-soil	Trichlorobenzene	3001	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value based on Canadian background concentration. For selected value, see total chlorobenzenes.			2
EFACHES-soil	Trichloroethene	6000	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value is based on Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%.			2
EFACHES-soil	Uranium	5	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	BTAG value is a background concentration.			
EFACHES-soil	Vanadium	2	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Basis for BTAG value unknown. Selected value based on toxicity study with unspecified species of plants.			
EFACHES-soil	Vinyl chloride	300	ug/kg	NOAA Screening Guidelines (94-8)	USEPA 1995	Canadian background concentration			
EFACHES-soil	Xylene, total	2505	ug/kg	Dutch Soil Quality Standards (1994)	MHSPE 1994	BTAG value is based on Canadian background data. Selected value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%.			2
EFACHES-soil	Zinc	50	mg/kg	ORNL (1997) soil benchmark	Efroymson et al. 1997a	Basis for BTAG value unknown. Selected value derived from results of 6 studies (several species); value estimated to be equivalent to an ER-L.			
EFACHES-water-fresh	1,1,1,2-Tetrachloroethane	2400	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	1,1,1-Trichloroethane	9400	ug/L	IRIS	USEPA 1995	Chronic LOEL (for 1,1,2-)			
EFACHES-water-fresh	1,1,2,2-Tetrachloroethane	2400	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	1,1,2-Trichloroethane	9400	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	1,1-Dichloroethane	1600	ug/L			BTAG value is based on 24-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	1,1-Dichloroethene	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	1,2,4,5-Tetrachlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	1,2,4-Trichlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	1,2-Dibromoethane	180	ug/L			BTAG value is based on 48-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	1,2-Dichlorobenzene	763	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	1,2-Dichloroethane	20000	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	1,2-Dichloroethene (total)	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	1,2-Dichloropropane	5700	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	1,2-Diphenylhydrazine	27	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	1,3-Dichlorobenzene	763	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	1,3-Dichloropropene	244	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	1,3-Dinitrobenzene	160	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	BTAG value is based on acute endpoint; value selected is based on a NOAEL f rainbow trout (*Oncorhyncus mykiss*), 71-d (hatching success and fry survival).			
EFACHES-water-fresh	1,3,5-Trinitrobenzene	80	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value is based on NOAEL for fathead minnow (*Pimephales promelas*); 32-d, time to hatch, hatching success, fry survival, overall survival, fry deformities, fry length, and fry weight.			
EFACHES-water-fresh	1,4-Dichlorobenzene	763	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	2,3,5,6-Tetrachlorophenol	44	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is acute LOEL with an acute to chronic adjustment factor of 10 applied.			
EFACHES-water-fresh	2,3,7,8-TCDD (dioxin)	0.00001	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic			
EFACHES-water-fresh	2,4,5-Trichlorophenol	63	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-fresh	2,4,6-Trichloroaniline	100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	2,4,6-Trichlorophenol	970	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	2,4,6-Trinitrotoluene	90	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Chronic water quality criteria calculated using the guidelines for deriving national water quality criteria (USEPA, PB85-227049).			
EFACHES-water-fresh	2,4-Dichlorophenol	365	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	2,4-Dimethylphenol	530	ug/L	59FR3762	Federal Register 59:3762 (1994)	BTAG value is based on acute endpoint. Selected value is the 1994 proposed chronic Ambient Water Quality Criteria.			
EFACHES-water-fresh	2,4-Dinitrophenol	150	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	2,4-Dinitrotoluene	230	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	2,6-Dinitrotoluene	60	ug/L		AQUIRE 2000 (Ref 847)	No BTAG value.			
EFACHES-water-fresh	2-Butanone	14000	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	2-Chloronaphthalene	620	ug/L	IRIS	USEPA 1995	Chronic			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-fresh	2-Chlorophenol	97	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	2-Hexanone	4280	ug/L			BTAG value is based on 96-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	2-Methylnaphthalene	14.2	ug/L		AQUIRE 2000 (Ref 16475)	No BTAG value.			
EFACHES-water-fresh	2-Methylphenol	13	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	No BTAG value. Selected value is based on the secondary chronic value deriv using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	2-Nitroaniline	2300	ug/L		AQUIRE 2000 (Ref 17554)	No BTAG value.			
EFACHES-water-fresh	2-Nitrophenol	150	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is the chronic AWQC (LOEL) for nitrophenols.			
EFACHES-water-fresh	3,3'-Dichlorobenzidine	10.5	ug/L		AQUIRE 2000 (Ref 17138)	No BTAG value.			
EFACHES-water-fresh	3-Nitroaniline	1000	ug/L		AQUIRE 2000 (Refs 16405 & 18163)	No BTAG value.			
EFACHES-water-fresh	3,5-Dinitroaniline	60	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	4,4'-DDD	0.06	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	4,4'-DDE	105	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	4,4'-DDT	0.001	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	4,6-Dinitro-2-methylphenol	2.3	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to lowest acute toxicity value for 4 species).			
EFACHES-water-fresh	4-Bromophenyl-phenylether	1.5	ug/L	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is based on the secondary chronic value deriv using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	4-Chloro-3-methylphenol	0.3	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to lowest acute toxicity value for 1 species).			
EFACHES-water-fresh	4-Chloroaniline	50	ug/L	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on a chronic LOEL reported by NOAA			
EFACHES-water-fresh	4-Methyl-2-pentanone	4600	ug/L			BTAG value is based on 24-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	4-Nitrophenol	150	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Acenaphthene	520	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Acetone	90000	ug/L			BTAG value is based on LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	Acrolein	21	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Acrylonitrile	2600	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Aldrin	0.3	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	alpha-BHC	2.2	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint for technical BHC. Selected value is based on the secondary chronic value for this specific chemical derived using th USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	alpha-Chlordane	0.17	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value (for chlordane), which reflects current USEPA policy.			
EFACHES-water-fresh	Aluminum	87	ug/L		USEPA 1999	Basis for BTAG value unknown. Selected value is the current chronic AWQC (pH range = 6.5 to 9.0) based on total aluminum.			
EFACHES-water-fresh	Ammonia	17	ug/L		USEPA 1995	Chronic			
EFACHES-water-fresh	Aniline	14	ug/L		Federal Register 59:3762 (1994)	No BTAG value. Selected value is the 1994 proposed chronic Ambient Water Quality Criterion.			
EFACHES-water-fresh	Anthracene	0.73	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value not referenced. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Antimony	30	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-fresh	Aroclor-1016	0.014	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-fresh	Aroclor-1221	0.28	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value for PCBs. Selected value is based on the secondary chronic value (which reflects current USEPA policy) for this specific Aroclor.			
EFACHES-water-fresh	Aroclor-1232	0.58	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value for PCBs. Selected value is based on the secondary chronic value (which reflects current USEPA policy) for this specific Aroclor.			
EFACHES-water-fresh	Aroclor-1242	0.053	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value for PCBs. Selected value is based on the secondary chronic value (which reflects current USEPA policy) for this specific Aroclor.			
EFACHES-water-fresh	Aroclor-1248	0.081	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value for PCBs. Selected value is based on the secondary chronic value (which reflects current USEPA policy) for this specific Aroclor.			
EFACHES-water-fresh	Aroclor-1254	0.033	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value for PCBs. Selected value is based on the secondary chronic value (which reflects current USEPA policy) for this specific Aroclor.			
EFACHES-water-fresh	Aroclor-1260	94	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value for PCBs. Selected value is based on the secondary chronic value (which reflects current USEPA policy) for this specific Aroclor.			
EFACHES-water-fresh	Arsenic	150	ug/L		USEPA 1999	Basis for BTAG value unclear. Selected value is the current chronic AWQC (based on As+3 but applied to total dissolved arsenic).			
EFACHES-water-fresh	Barium	1000	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Benzene	530	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Benzidine	250	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Benzo(a)anthracene	6.3	ug/L		USEPA 1995	Chronic			
EFACHES-water-fresh	Benzo(a)pyrene	0.014	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	No BTAG value. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Benzo(b)fluoranthene	10.24	ug/L		AQUIRE 2000 (Ref 17714)	No BTAG value.			
EFACHES-water-fresh	Benzoic acid	42	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	No BTAG value. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Benzyl alcohol	4600	ug/L			BTAG value is based on an LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	Beryllium	5.3	ug/L	IRIS	USEPA 1995	Chronic; hardness			
EFACHES-water-fresh	beta-BHC	2.2	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint for technical BHC. Selected value is based on the secondary chronic value for this specific chemical derived using th USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	bis(2-Chloroethoxy)methane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	bis(2-Chloroethyl)ether	2380	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to lowest acute toxicity value for 1 species).			
EFACHES-water-fresh	bis(2-Ethylhexyl)phthalate	30	ug/L		USEPA 1995	Chronic			
EFACHES-water-fresh	Boron	53000	ug/L		USEPA 1995	Chronic			
EFACHES-water-fresh	Bromochloromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Bromodichloromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Butylbenzylphthalate	22	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest chronic LOEL value [2 species] and an adjustment factor of 10).			
EFACHES-water-fresh	Cadmium	2.24	ug/L		USEPA 1999	BTAG value is based on old AWQC. Selected value is the current, hardness-adjusted AWQC based on dissolved cadmium. Value shown is based on a hardness of 100 mg/L.	100		
EFACHES-water-fresh	Carbazole	1000.00	ug/L		AQUIRE 2000 (Ref 4344)				
EFACHES-water-fresh	Carbon disulfide	2	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Carbon tetrachloride	3520	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Chlordane	0.17	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value, which reflects current USEPA policy.			
EFACHES-water-fresh	Chloride	230000	ug/L		USEPA 1999				
EFACHES-water-fresh	Chlorine	11	ug/L		USEPA 1999				

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-fresh	Chlorobenzene	130	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on chemical class. Selected value is based on the secondary chronic value for this specific chemical derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Chloroform	1240	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Chloromethane	5500	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-fresh	Chlorpyrifos	0.041	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Chromium	11	ug/L		USEPA 1999	BTAG value is based on unadjusted AWQC. Selected value is the current AWQC based on dissolved chromium (hexavalent).			
EFACHES-water-fresh	cis-1,2-Dichloroethene	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	cis-1,3-Dichloropropene	244	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Cobalt	23	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Copper	9.0	ug/L		USEPA 1999	BTAG value not adjusted for hardness. Selected value is the current AWQC based on dissolved copper adjusted for hardness. Value shown is based on a hardness of 100 mg/L.	100		
EFACHES-water-fresh	Creosote	35.1	ug/L			BTAG value is based on 24-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	Cyanide	5.2	ug/L	Smith et al. 1979	USEPA 1995	Chronic; HCN			
EFACHES-water-fresh	delta-BHC	2.2	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint for technical BHC. Selected value is based on the secondary chronic value for this specific chemical derived using th USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Dibenzofuran	20	ug/L	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Dibromochloromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Dibromomethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Dichlorodifluoromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Dieldrin	0.056	ug/L		USEPA 1999	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value, which reflects current USEPA policy.			
EFACHES-water-fresh	Diethylphthalate	220	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on chemical class. Selected value is based on the secondary chronic value for this specific phthalate derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Dimethyl phthalate	330	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-fresh	Di-n-butylphthalate	33	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on chemical class. Selected value is based on the secondary chronic value for this specific phthalate derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Dinitrophenol	150	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Di-n-octyl phthalate	3	ug/L	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	BTAG value with possible decimal error. Selected value is the chronic LOEL fo phthalates from NOAA summary.			
EFACHES-water-fresh	Endosulfan	0.056	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Endosulfan I	0.056	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Endosulfan II	0.056	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Endosulfan sulfate	0.056	ug/L	IRIS	USEPA 1995	Chronic (value for endosulfan)			
EFACHES-water-fresh	Endrin	0.036	ug/L		USEPA 1999	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value, which reflects current USEPA policy.			
EFACHES-water-fresh	Endrin aldehyde	0.036	ug/L		USEPA 1996	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value (for endrin), which reflects current USEPA policy.			
EFACHES-water-fresh	Endrin ketone	0.036	ug/L		USEPA 1996	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value (for endrin), which reflects current USEPA policy.			
EFACHES-water-fresh	Ethylbenzene	3200	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Fluoranthene	398	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Fluorene	430	ug/L		USEPA 1995	Chronic			
EFACHES-water-fresh	Fluoride	2000	ug/L		USEPA 1995	Acute (48-hr - 35% growth reduction)			
EFACHES-water-fresh	gamma-BHC (Lindane)	0.08	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	gamma-Chlordane	0.17	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value (for chlordane), which reflects current USEPA policy.			
EFACHES-water-fresh	HCH-technical	10	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Heptachlor	0.0069	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on Final Residue Value. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology; use of the chronic value over the residue value reflects current USEPA policy.			
EFACHES-water-fresh	Heptachlor epoxide	0.0069	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology; use of the chronic value over the residue value reflects current USEPA policy.			
EFACHES-water-fresh	Hexachlorobenzene	3.68	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-fresh	Hexachlorobutadiene	9.3	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Hexachlorocyclopentadiene	5.2	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Hexachloroethane	540	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Hydrogen sulfide	2	ug/L		USEPA 1999				
EFACHES-water-fresh	Iron	1000	ug/L		USEPA 1999	AWQC Freshwater Chronic - Total			
EFACHES-water-fresh	Isophorone	11700	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Kepone	0.7	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Lead	2.5	ug/L		USEPA 1999	BTAG value not adjusted for hardness. Selected value is the current AWQC based on dissolved lead adjusted for hardness. Value shown is based on a hardness of 100 mg/L.	100		
EFACHES-water-fresh	Malathion	0.1	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Manganese	120	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	Basis for BTAG value unclear but appears to be based upon an acute endpoint Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Mercury	0.77	ug/L		USEPA 1999	BTAG value is based on Final Residue Value. Selected value is the current AWQC based on the Final Chronic Value, which reflects current USEPA policy.			
EFACHES-water-fresh	Methoxychlor	0.03	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Methyl bromide	110	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-fresh	Methylene chloride	2200	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Mirex	0.001	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Naphthalene	100	ug/L		USEPA 1995	Chronic			
EFACHES-water-fresh	Nickel	52.0	ug/L		USEPA 1999	BTAG value not adjusted for hardness. Selected value is the current AWQC based on dissolved nickel adjusted for hardness. Value shown is based on a hardness of 100 mg/L.	100		
EFACHES-water-fresh	Nitrobenzene	2700	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	n-Nitrosodiphenylamine	585	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Parathion	0.013	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Pentachlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Pentachloroethane	1100	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-fresh	Pentachlorophenol	6.7	ug/L		USEPA 1999	BTAG value not adjusted for pH. Selected value is the current AWQC adjusted for pH. The value shown is for neutral pH (7.0) but will be adjusted based on si specific pH values.		7.0	
EFACHES-water-fresh	Phenanthrene	6.3	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-fresh	Phenol	256	ug/L		USEPA Region IV 1999	BTAG value is based on acute endpoint. Selected value is the Region IV chron screening value (chronic LOEL value and adjustment factor of 10).			
EFACHES-water-fresh	Phosphorus (white)	0.1	ug/L	IRIS	USEPA 1995	Chronic? (96-hr LC50 - bluegill)			
EFACHES-water-fresh	Polychlorinated biphenyls (PCBs	0.14	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on Final Residue Value. Selected value is based on the secondary chronic value (derived using the USEPA Tier II Great Lakes methodology), which reflects current USEPA policy.			
EFACHES-water-fresh	Selenium	4.6	ug/L		USEPA 1999	BTAG value is based on total selenium. Selected value is the current chronic AWQC based on dissolved selenium, which better reflects the bioavailable fraction.			
EFACHES-water-fresh	Silver	0.36	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value long suspected of recording error. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-fresh	Styrene	241	ug/L		AQUIRE 2000	No BTAG value.			
EFACHES-water-fresh	Tetrachloroethene	840	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Thallium	40	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Thiodiglycol (Thiodiethylene glyc	6843	ug/L			BTAG value is based on a LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-fresh	Toluene	1700	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Toxaphene	0.011	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on Final Residue Value. Selected value is based on the secondary chronic value (derived using the USEPA Tier II Great Lakes methodology) from USEPA (1996).			
EFACHES-water-fresh	trans-1,2-Dichloroethene	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	trans-1,3-Dichloropropene	244	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Tribromomethane	320	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value (derived using the USEPA Tier II Great Lakes methodology) from USEPA (1996).			
EFACHES-water-fresh	Tributyltin	0.063	ug/L		USEPA 1999	No BTAG value. Selected value is the currently proposed chronic Ambient Water Quality Criterion.			
EFACHES-water-fresh	Trichlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-fresh	Trichloroethene	21900	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-fresh	Trichlorofluoromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Vanadium	10000	ug/L		USEPA 1995				
EFACHES-water-fresh	Vinyl chloride	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-fresh	Xylene, total	130	ug/L	USEPA Region III 1995	USEPA 1995	BTAG value is based on human health effects. Selected value is based on acu data cited in BTAG document with an acute to chronic adjustment factor of 100 applied.			
EFACHES-water-fresh	Zinc	118.1	ug/L		USEPA 1999	BTAG value is not referenced (no toxicological study is referenced nor is the value listed as an AWQC). Selected value is the current freshwater chronic AWQC based on dissolved zinc and adjusted for hardness. Value shown is based on a hardness of 100 mg/L.	100		
EFACHES-water-marine	1,1,1,2-Tetrachloroethane	623	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	1,1,1-Trichloroethane	3120	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	1,1,2,2-Tetrachloroethane	623	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	1,1,2-Trichloroethane	3120	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	1,1-Dichloroethane	3200	ug/L			BTAG value is based on 24-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-marine	1,1-Dichloroethene	22400	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	1,2,4,5-Tetrachlorobenzene	129	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	1,2,4-Trichlorobenzene	129	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	1,2-Dichlorobenzene	129	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	1,2-Dichloroethane	1130	ug/L			BTAG value is based on 96-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-marine	1,2-Dichloroethene (total)	22400	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	1,2-Dichloropropane	3040	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	1,3-Dichlorobenzene	28.5	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-marine	1,3-Dichloropropene	79	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	1,4-Dichlorobenzene	129	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	2,3,5,6-Tetrachlorophenol	44	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is acute LOEL with an acute to chronic adjustment factor of 10 applied.			
EFACHES-water-marine	2,3,7,8-TCDD (dioxin)	0.00001	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (same as the freshwater AWQC based on chronic LOEL).			
EFACHES-water-marine	2,4,5-Trichlorophenol	11	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-marine	2,4,6-Trichlorophenol	12.1	ug/L		AQUIRE 2000 (Ref 4894)	No BTAG value.			
EFACHES-water-marine	2,4,6-Trichloroaniline	100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	2,4,6-Trinitrotoluene	250	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	72-hr toxicity test with marine copepod *Tigriopus californicus*);18% mortality at 2,500 ug/L, converted to chronic value using uncertainty factor of 10.			
EFACHES-water-marine	2,4-Dichlorophenol	5	ug/L		AQUIRE 2000 (Ref 14985)	No BTAG value.			
EFACHES-water-marine	2,4-Dimethylphenol	110	ug/L	59FR3762	Federal Register 59:3762 (1994)	No BTAG value. Selected value is the 1994 proposed chronic Ambient Water Quality Criteria.			
EFACHES-water-marine	2,4-Dinitrophenol	485	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	2,4-Dinitrotoluene	370	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	2,6-Dinitrotoluene	10000	ug/L		AQUIRE 2000 (Ref 2476)	No BTAG value.			
EFACHES-water-marine	2-Amino-4,6-Dinitrotoluene	5000	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	NOAEL (survival) for tidepool copepod *Tigriopus californicus*) and oyster larvase (*Crassostrea gigas*) (72 and 96 hr tests, respectively). Value is adjusted with an uncertainty factor of 10 because chronic endpoint was not used.			
EFACHES-water-marine	2-Chloronaphthalene	0.75	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	2-Chlorophenol	53	ug/L		AQUIRE 2000 (Ref 5810)	No BTAG value.			
EFACHES-water-marine	2-Methylnaphthalene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	2-Nitrophenol	485	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is the acute AWQC (LOEL) for nitrophenols with an acute to chronic adjustment factor of 10 applied.			
EFACHES-water-marine	3,3'-Dichlorobenzidine	7.3	ug/L		AQUIRE 2000 (Ref 3163)	No BTAG value			
EFACHES-water-marine	4,4'-DDD	0.025	ug/L		USEPA Region IV 1999	BTAG value is based on acute endpoint. Selected value is the Region IV chronic screening value (lowest acute toxicity value [3 species] and an adjustment factor of 100).			
EFACHES-water-marine	4,4'-DDE	1.4	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	4,4'-DDT	0.001	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	4-Chloroaniline	129	ug/L	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	Selected value is a chronic LOEL from the updated (1999) reference for BTAG value (1994).			
EFACHES-water-marine	4-Nitrophenol	485	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Acenaphthene	710	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Acenaphthylene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-marine	Acrolein	5.5	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Aldrin	0.13	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	alpha-BHC	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	alpha-Chlordane	0.004	ug/L	IRIS	USEPA 1995	Chronic (value for chlordane)			
EFACHES-water-marine	Ammonia	17	ug/L		USEPA 1995	Chronic			
EFACHES-water-marine	Aniline	37	ug/L		Federal Register 59:3762 (1994)	No BTAG value. Selected value is the 1994 proposed chronic Ambient Water Quality Criteria.			
EFACHES-water-marine	Anthracene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Antimony	500	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-marine	Aroclor-1016	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-marine	Aroclor-1221	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-marine	Aroclor-1232	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-marine	Aroclor-1242	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-marine	Aroclor-1248	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-marine	Aroclor-1254	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-marine	Aroclor-1260	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-marine	Arsenic	36	ug/L		USEPA 1999	Basis for BTAG value unclear. Selected value is the current chronic AWQC (based on As+3 but applied to total dissolved arsenic).			
EFACHES-water-marine	Barium	1000	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Benzene	700	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Benzo(a)anthracene	8.13	ug/L		USEPA 1995	Chronic			
EFACHES-water-marine	Benzo(a)pyrene	0.021	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Benzo(b)fluoranthene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Benzo(g,h,i)perylene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Benzo(k)fluoranthene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Beryllium	1500	ug/L	OHM/TADs	USEPA 1995				
EFACHES-water-marine	beta-BHC	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	bis(2-Chloroethoxy)methane	6400	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	bis(2-Ethylhexyl)phthalate	360	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-marine	Boron	1200	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Bromochloromethane	6400	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Bromodichloromethane	6400	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Butylbenzylphthalate	29.4	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-marine	Cadmium	9.3	ug/L		USEPA 1999	BTAG value is based on old AWQC. Selected value is the current AWQC base on dissolved cadmium.			
EFACHES-water-marine	Carabazole	10.0	ug/L		AQUIRE 2000 (Ref 4941)	No BTAG value.			
EFACHES-water-marine	Carbon disulfide	2	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Carbon tetrachloride	5000	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Chlordane	0.004	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Chlorine	7.5	ug/L		USEPA 1999				
EFACHES-water-marine	Chlorobenzene	105	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific chemical (based on the lowest acute value [2 species] and an adjustment factor of 100).			
EFACHES-water-marine	Chloroform	815	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-marine	Chloromethane	2700	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-marine	Chlorpyrifos	0.0056	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Chromium	50	ug/L		USEPA 1999	BTAG value is based on unadjusted AWQC. Selected value is the current AWQC based on dissolved chromium (hexavalent).			
EFACHES-water-marine	Chrysene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	cis-1,2-Dichloroethene	22400	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	cis-1,3-Dichloropropene	79	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Copper	3.1	ug/L		USEPA 1999	BTAG value is based on Pacific oyster embryo. Selected value is the current AWQC for dissolved copper.			
EFACHES-water-marine	Cyanide	1	ug/L	IRIS	USEPA 1995	Acute/chronic			
EFACHES-water-marine	delta-BHC	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Dibenz(a,h)anthracene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Dibenzofuran	10	ug/L		AQUIRE 2000 (Ref 10366)	No BTAG value			
EFACHES-water-marine	Dibromochloromethane	6400	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Dibromomethane	6400	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Dichlorodifluoromethane	6400	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Dieldrin	0.0019	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Diethylphthalate	75.9	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-marine	Dimethyl phthalate	580	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-marine	Di-n-butylphthalate	3.4	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Dinitrophenol	485	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Di-n-octyl phthalate	3.4	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL (for chemical class)			
EFACHES-water-marine	Endosulfan	0.0087	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Endosulfan I	0.0087	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Endosulfan II	0.0087	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Endosulfan sulfate	0.0087	ug/L	IRIS	USEPA 1995	Chronic (value for endosulfan)			
EFACHES-water-marine	Endrin	0.0023	ug/L	IRIS	USEPA 1995	Chronic; FRV			
EFACHES-water-marine	Endrin aldehyde	0.0023	ug/L	IRIS	USEPA 1995	Chronic (value for endrin)			
EFACHES-water-marine	Endrin ketone	0.0023	ug/L	IRIS	USEPA 1995	Chronic (value for endrin)			
EFACHES-water-marine	Ethylbenzene	43	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Fluoranthene	16	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Fluorene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	gamma-BHC (Lindane)	0.016	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	gamma-Chlordane	0.004	ug/L	IRIS	USEPA 1995	Chronic (based on Final Residue Value)			
EFACHES-water-marine	HCH-technical	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Heptachlor	0.0036	ug/L	IRIS	USEPA 1995	Chronic (based on Final Residue Value)			
EFACHES-water-marine	Heptachlor epoxide	0.0036	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Hexachlorobenzene	129	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-marine	Hexachlorobutadiene	3.2	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Hexachlorocyclopentadiene	0.7	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Hexachloroethane	94	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Hydrogen sulfide	2	ug/L		USEPA 1999				
EFACHES-water-marine	Indeno(1,2,3-cd)pyrene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Isophorone	1290	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Kepone	0.07	ug/L			BTAG value is based on a LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-marine	Lead	8.1	ug/L		USEPA 1999	Basis for BTAG value unknown. Selected value is the current saltwater chronic AWQC based on dissolved lead.			
EFACHES-water-marine	Malathion	0.1	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Manganese	10	ug/L		USEPA 1995	Chronic; pH(?); hardness(?)			
EFACHES-water-marine	Mercury	0.94	ug/L		USEPA 1999	BTAG value is based on Final Residue Value. Selected value is the current AWQC based on the Final Chronic Value, which reflects current USEPA policy.			
EFACHES-water-marine	Methoxychlor	0.03	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Methyl bromide	120	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-marine	Methylene chloride	6400	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Mirex	0.001	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Naphthalene	230	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Nickel	8.2	ug/L		USEPA 1999	BTAG value is based on total nickel. Selected value is the current chronic AWQC based on dissolved nickel, which better reflects the bioavailable fraction			
EFACHES-water-marine	Nitrobenzene	668	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	n-Nitrosodiphenylamine	330000	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	PAH (total)	30	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is based on an acute LOEL with an adjustment factor of 10 applied.			
EFACHES-water-marine	Parathion	0.178	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-marine	Pentachlorobenzene	129	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Pentachloroethane	281	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Pentachlorophenol	7.9	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Phenanthrene	4.6	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-marine	Phenol	580	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Phosphorus (white)	0.1	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Polychlorinated biphenyls (PCBs	0.03	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Pyrene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Selenium	71	ug/L		USEPA 1999	BTAG value not referenced. Selected value is the current AWQC based on dissolved selenium and the Final Chronic Value.			
EFACHES-water-marine	Silver	0.23	ug/L		USEPA Region IV 1999	BTAG value long suspected of recording error. Selected value is the Region IV chronic screening value (chronic LOEL for 1 species and an adjustment factor of 10).			
EFACHES-water-marine	Styrene	510	ug/L		AQUIRE 2000 (Ref 10366)	No BTAG value.			
EFACHES-water-marine	Tetrachloroethene	450	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-marine	Thallium	213	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Toluene	37	ug/L		USEPA Region IV 1999	BTAG value is based on acute endpoint. Selected value is based on the USEPA Region IV chronic screening value (lowest acute toxicity value [3 species] and an adjustment factor of 100).			
EFACHES-water-marine	Toxaphene	0.21	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on Final Residue Value. Selected value is based on the Final Chronic Value from USEPA (1996), which reflects current USEPA policy.			
EFACHES-water-marine	trans-1,2-Dichloroethene	22400	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	trans-1,3-Dichloropropene	79	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Tribromomethane	640	ug/L		USEPA Region IV 1999	BTAG value is based on acute endpoint. Selected value is the Region IV chron screening value (chronic LOEL for 1 species and an adjustment factor of 10).			
EFACHES-water-marine	Tributyltin	0.01	ug/L		USEPA 1999	No BTAG value. Selected value is the currently proposed chronic AWQC.			
EFACHES-water-marine	Trichlorobenzene	129	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Trichloroethene	200	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Trichlorofluoromethane	6400	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-marine	Vanadium	10000	ug/L		USEPA 1995				
EFACHES-water-marine	Vinyl chloride	22400	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-marine	Xylene, total	135	ug/L	USEPA Region III 1995	USEPA 1995	BTAG value is based on human health effects. Selected value is based on acu data cited in BTAG document with an acute to chronic adjustment factor of 100 applied.			
EFACHES-water-marine	Zinc	81	ug/L		USEPA 1999	BTAG value is not referenced but is thought to be from the EPA Quality Criteria for Water (1986) based on effects to species of saltwater plants. No toxicological study is referenced nor is the value listed as an AWQC. Selected value is the current chronic saltwater AWQC based on dissolved zinc.			
EFACHES-water-brackish	1,1,1,2-Tetrachloroethane	623	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	1,1,1-Trichloroethane	3120	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	1,1,2,2-Tetrachloroethane	623	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	1,1,2-Trichloroethane	3120	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	1,1-Dichloroethane	1600	ug/L			BTAG value is based on 24-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	1,1-Dichloroethene	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	1,2,4,5-Tetrachlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	1,2,4-Trichlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	1,2-Dibromoethane	180	ug/L			BTAG value is based on 48-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	1,2-Dichlorobenzene	129	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	1,2-Dichloroethane	1130	ug/L			BTAG value is based on 96-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	1,2-Dichloroethene (total)	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	1,2-Dichloropropane	3040	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	1,2-Diphenylhydrazine	27	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	1,3-Dichlorobenzene	28.5	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-brackish	1,3-Dichloropropene	79	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			

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mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-brackish	1,3-Dinitrobenzene	160	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	BTAG value is based on acute endpoint; value selected is based on a NOAEL f rainbow trout (*Oncorhyncus mykiss*), 71-d (hatching success and fry survival).			
EFACHES-water-brackish	1,3,5-Trinitrobenzene	80	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	BTAG value is based on NOAEL for fathead minnow (*Pimephales promelas*); 32- d, time to hatch, hatching success, fry survival, overall survival, fry deformities, fry length, and fry weight.			
EFACHES-water-brackish	1,4-Dichlorobenzene	129	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	2,3,5,6-Tetrachlorophenol	44	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is acute LOEL with an acute to chronic adjustment factor of 10 applied.			
EFACHES-water-brackish	2,3,7,8-TCDD (dioxin)	0.00001	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (same as the freshwater AWQC based on chronic LOEL).			
EFACHES-water-brackish	2,4,5-Trichlorophenol	11	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-brackish	2,4,6-Trichloroaniline	100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	2,4,6-Trichlorophenol	12.1	ug/L		AQUIRE 2000 (Ref 4894)	No BTAG value.			
EFACHES-water-brackish	2,4,6-Trinitrotoluene	90	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Chronic water quality criteria calculated using the guidelines for deriving national water quality criteria (USEPA, PB85-227049).			
EFACHES-water-brackish	2,4-Dichlorophenol	5	ug/L		AQUIRE 2000 (Ref 14985)	No BTAG value.			
EFACHES-water-brackish	2,4-Dimethylphenol	110	ug/L	59FR3762	Federal Register 59:3762 (1994)	No BTAG value. Selected value is the 1994 proposed chronic Ambient Water Quality Criteria.			
EFACHES-water-brackish	2,4-Dinitrophenol	150	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	2,4-Dinitrotoluene	230	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	2,6-Dinitrotoluene	60	ug/L		AQUIRE 2000 (Ref 847)	No BTAG value.			
EFACHES-water-brackish	2-Amino-4,6-Dinitrotoluene	20	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	2-Butanone	14000	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	2-Chloronaphthalene	0.75	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	2-Chlorophenol	53	ug/L		AQUIRE 2000 (Ref 5810)	No BTAG value.			
EFACHES-water-brackish	2-Hexanone	4280	ug/L			BTAG value is based on 96-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	2-Methylnaphthalene	14.2	ug/L		AQUIRE 2000 (Ref 16475)	No BTAG value.			
EFACHES-water-brackish	2-Methylphenol	13	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	No BTAG value. Selected value is based on the secondary chronic value deriv using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	2-Nitroaniline	2300	ug/L		AQUIRE 2000 (Ref 17554)	No BTAG value.			
EFACHES-water-brackish	2-Nitrophenol	150	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is the chronic AWQC (LOEL) for nitrophenols.			
EFACHES-water-brackish	3,3'-Dichlorobenzidine	7.3	ug/L		AQUIRE 2000 (Ref 3163)	No BTAG value			
EFACHES-water-brackish	3-Nitroaniline	1000	ug/L		AQUIRE 2000 (Refs 16405 & 18163)	No BTAG value.			
EFACHES-water-brackish	3,5-Dinitroaniline	60	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	4,4'-DDD	0.025	ug/L		USEPA Region IV 1999	BTAG value is based on acute endpoint. Selected value is the Region IV chronic screening value (lowest acute toxicity value [3 species] and an adjustment factor of 100).			
EFACHES-water-brackish	4,4'-DDE	1.4	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	4,4'-DDT	0.001	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	4,6-Dinitro-2-methylphenol	2.3	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to lowest acute toxicity value for 4 species).			
EFACHES-water-brackish	4-Bromophenyl-phenylether	1.5	ug/L	EcoTox Thresholds	USEPA 1996	No BTAG value. Selected value is based on the secondary chronic value deriv using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	4-Chloro-3-methylphenol	0.3	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to lowest acute toxicity value for 1 species).			
EFACHES-water-brackish	4-Chloroaniline	50	ug/L	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	No BTAG value. Selected value is based on a chronic LOEL reported by NOAA			
EFACHES-water-brackish	4-Methyl-2-pentanone	4600	ug/L			BTAG value is based on 24-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	4-Nitrophenol	150	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Acenaphthene	520	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Acenaphthylene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Acetone	90000	ug/L			BTAG value is based on LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	Acrolein	5.5	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Acrylonitrile	2600	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Aldrin	0.13	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	alpha-BHC	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	alpha-Chlordane	0.004	ug/L	IRIS	USEPA 1995	Chronic (value for chlordane)			
EFACHES-water-brackish	Aluminum	87	ug/L		USEPA 1999	Basis for BTAG value unknown. Selected value is the current chronic AWQC (pH range = 6.5 to 9.0) based on total aluminum.			
EFACHES-water-brackish	Ammonia	17	ug/L		USEPA 1995	Chronic			
EFACHES-water-brackish	Aniline	14	ug/L		Federal Register 59:3762 (1994)	No BTAG value. Selected value is the 1994 proposed chronic Ambient Water Quality Criterion.			
EFACHES-water-brackish	Anthracene	0.73	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value not referenced. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	Antimony	30	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-brackish	Aroclor-1016	0.014	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-brackish	Aroclor-1221	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-brackish	Aroclor-1232	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-brackish	Aroclor-1242	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-brackish	Aroclor-1248	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-brackish	Aroclor-1254	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-brackish	Aroclor-1260	0.03	ug/L	IRIS	USEPA 1995	Chronic (value for PCBs)			
EFACHES-water-brackish	Arsenic	36	ug/L		USEPA 1999	Basis for BTAG value unclear. Selected value is the current chronic AWQC (based on As+3 but applied to total dissolved arsenic).			
EFACHES-water-brackish	Barium	1000	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Benzene	530	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Benzidine	250	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Benzo(a)anthracene	6.3	ug/L		USEPA 1995	Chronic			
EFACHES-water-brackish	Benzo(a)pyrene	0.014	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	No BTAG value. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	Benzo(b)fluoranthene	10.24	ug/L		AQUIRE 2000 (Ref 17714)	No BTAG value.			
EFACHES-water-brackish	Benzo(g,h,i)perylene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Benzo(k)fluoranthene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Benzoic acid	42	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	No BTAG value. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	Benzyl alcohol	4600	ug/L			BTAG value is based on an LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	Beryllium	5.3	ug/L	IRIS	USEPA 1995	Chronic; hardness			
EFACHES-water-brackish	beta-BHC	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	bis(2-Chloroethoxy)methane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-brackish	bis(2-Chloroethyl)ether	2380	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to lowest acute toxicity value for 1 species).			
EFACHES-water-brackish	bis(2-Ethylhexyl)phthalate	30	ug/L		USEPA 1995	Chronic			
EFACHES-water-brackish	Boron	1200	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Bromochloromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Bromodichloromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Butylbenzylphthalate	22	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest chronic LOEL value [2 species] and an adjustment factor of 10).			
EFACHES-water-brackish	Cadmium	2.24	ug/L		USEPA 1999	BTAG value is based on old AWQC. Selected value is the current, hardness-adjusted AWQC based on dissolved cadmium. Value shown is based on a hardness of 100 mg/L.	100		
EFACHES-water-brackish	Carabazole	10.0	ug/L		AQUIRE 2000 (Ref 4941)	No BTAG value.			
EFACHES-water-brackish	Carbon disulfide	2	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Carbon tetrachloride	3520	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Chlordane	0.004	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Chloride	230000	ug/L		USEPA 1999				
EFACHES-water-brackish	Chlorine	7.5	ug/L		USEPA 1999				
EFACHES-water-brackish	Chlorobenzene	105	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific chemical (based on the lowest acute value [2 species] and an adjustment factor of 100).			
EFACHES-water-brackish	Chloroform	815	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-brackish	Chloromethane	2700	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-brackish	Chlorpyrifos	0.041	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Chromium	11	ug/L		USEPA 1999	BTAG value is based on unadjusted AWQC. Selected value is the current AWQC based on dissolved chromium (hexavalent).			
EFACHES-water-brackish	Chrysene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	cis-1,2-Dichloroethene	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	cis-1,3-Dichloropropene	79	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Cobalt	23	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	Copper	3.1	ug/L		USEPA 1999	BTAG value is based on Pacific oyster embryo. Selected value is the current AWQC for dissolved copper.			
EFACHES-water-brackish	Creosote	35.1	ug/L			BTAG value is based on 24-hour LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	Cyanide	1	ug/L	IRIS	USEPA 1995	Acute/chronic			
EFACHES-water-brackish	delta-BHC	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Dibenz(a,h)anthracene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Dibenzofuran	10	ug/L		AQUIRE 2000 (Ref 10366)	No BTAG value			
EFACHES-water-brackish	Dibromochloromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Dibromomethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Dichlorodifluoromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Dieldrin	0.0019	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Diethylphthalate	75.9	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-brackish	Dimethyl phthalate	330	ug/L		USEPA Region IV 1999	BTAG value is based on chemical class. Selected value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest acute toxicity value [2 species] and an adjustment factor of 100).			
EFACHES-water-brackish	Di-n-butylphthalate	3.4	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Dinitrophenol	150	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Di-n-octyl phthalate	3	ug/L	NOAA SQUIRTs 99-1 (1999)	Buchman 1999	BTAG value with possible decimal error. Selected value is the chronic LOEL fo phthalates from NOAA summary.			
EFACHES-water-brackish	Endosulfan	0.0087	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Endosulfan I	0.0087	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Endosulfan II	0.056	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Endosulfan II	0.0087	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Endosulfan sulfate	0.0087	ug/L	IRIS	USEPA 1995	Chronic (value for endosulfan)			
EFACHES-water-brackish	Endrin	0.0023	ug/L	IRIS	USEPA 1995	Chronic; FRV			
EFACHES-water-brackish	Endrin aldehyde	0.0023	ug/L	IRIS	USEPA 1995	Chronic (value for endrin)			
EFACHES-water-brackish	Endrin ketone	0.0023	ug/L	IRIS	USEPA 1995	Chronic (value for endrin)			
EFACHES-water-brackish	Ethylbenzene	43	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Fluoranthene	16	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Fluorene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Fluoride	2000	ug/L		USEPA 1995	Acute (48-hr - 35% growth reduction)			
EFACHES-water-brackish	gamma-BHC (Lindane)	0.016	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	gamma-Chlordane	0.004	ug/L	IRIS	USEPA 1995	Chronic (based on Final Residue Value)			
EFACHES-water-brackish	HCH-technical	0.034	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Heptachlor	0.0036	ug/L	IRIS	USEPA 1995	Chronic (based on Final Residue Value)			
EFACHES-water-brackish	Heptachlor epoxide	0.0036	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Hexachlorobenzene	3.68	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-brackish	Hexachlorobutadiene	3.2	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Hexachlorocyclopentadiene	0.7	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Hexachloroethane	94	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Hydrogen sulfide	2	ug/L		USEPA 1999				
EFACHES-water-brackish	HMX (octahydro-1,3,5,7-tetranit	3300	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value is based on NOAEL for fathead minnow (*Pimephales promelas*);32-d test, growth and survival.			
EFACHES-water-brackish	Indeno(1,2,3-cd)pyrene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Iron	1000	ug/L		USEPA 1999	AWQC Freshwater Chronic - Total			
EFACHES-water-brackish	Isophorone	1290	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Kepone	0.07	ug/L			BTAG value is based on a LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	Lead	2.5	ug/L		USEPA 1999	BTAG value not adjusted for hardness. Selected value is the current AWQC based on dissolved lead adjusted for hardness. Value shown is based on a hardness of 100 mg/L.	100		
EFACHES-water-brackish	Malathion	0.1	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Manganese	10	ug/L		USEPA 1995	Chronic; pH(?); hardness(?)			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

EFACHES-water-brackish	Mercury	0.77	ug/L		USEPA 1999	BTAG value is based on Final Residue Value. Selected value is the current AWQC based on the Final Chronic Value, which reflects current USEPA policy.			
EFACHES-water-brackish	Methoxychlor	0.03	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Methyl bromide	110	ug/L		USEPA Region IV 1999	No BTAG value. Selected value is the Region IV chronic screening value (facto of 100 applied to the lowest acute toxicity value for 1 species).			
EFACHES-water-brackish	Methylene chloride	2200	ug/L	ORNL (1996) water benchmark	Suter and Tsao 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	Mirex	0.001	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Naphthalene	100	ug/L		USEPA 1995	Chronic			
EFACHES-water-brackish	Nickel	8.2	ug/L		USEPA 1999	BTAG value is based on total nickel. Selected value is the current chronic AWQC based on dissolved nickel, which better reflects the bioavailable fraction			
EFACHES-water-brackish	Nitrobenzene	668	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	n-Nitrosodiphenylamine	585	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	PAH (total)	30	ug/L	USEPA 1994 Summary	USEPA 1994	No BTAG value. Selected value is based on an acute LOEL with an adjustment factor of 10 applied.			
EFACHES-water-brackish	Parathion	0.013	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Pentachlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Pentachloroethane	281	ug/L	NOAA Screening Guidelines (94-8)	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Pentachlorophenol	6.7	ug/L		USEPA 1999	BTAG value not adjusted for pH. Selected value is the current AWQC adjusted for pH. The value shown is for neutral pH (7.0) but will be adjusted based on si specific pH values.		7.0	
EFACHES-water-brackish	Phenanthrene	4.6	ug/L	IRIS	USEPA 1995	Chronic; proposed			
EFACHES-water-brackish	Phenol	256	ug/L		USEPA Region IV 1999	BTAG value is based on acute endpoint. Selected value is the Region IV chron screening value (chronic LOEL value and adjustment factor of 10).			
EFACHES-water-brackish	Phosphorus (white)	0.1	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Polychlorinated biphenyls (PCBs	0.03	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Pyrene	30	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	RDX (hexahydro-1,3,5-trinitro-1,	190	ug/L	Nitroaromatic Munitions Compounds: Environmental Effects and Screening Values	Talmage et al. 1999	Value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
EFACHES-water-brackish	Selenium	4.6	ug/L		USEPA 1999	BTAG value is based on total selenium. Selected value is the current chronic AWQC based on dissolved selenium, which better reflects the bioavailable fraction.			
EFACHES-water-brackish	Silver	0.23	ug/L		USEPA Region IV 1999	BTAG value long suspected of recording error. Selected value is the Region IV chronic screening value (chronic LOEL for 1 species and an adjustment factor of 10).			
EFACHES-water-brackish	Styrene	241	ug/L		AQUIRE 2000	No BTAG value.			
EFACHES-water-brackish	Tetrachloroethene	450	ug/L	IRIS	USEPA 1995	Chronic LOEL			
EFACHES-water-brackish	Thallium	40	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Thiodiglycol (Thiodiethylene glyc	6843	ug/L			BTAG value is based on a LC50; adjustment factor of 100 applied to lowest BTAG value.			
EFACHES-water-brackish	Toluene	37	ug/L		USEPA Region IV 1999	BTAG value is based on acute endpoint. Selected value is based on the USEPA Region IV chronic screening value (lowest acute toxicity value [3 species] and an adjustment factor of 100).			
EFACHES-water-brackish	Toxaphene	0.011	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on Final Residue Value. Selected value is based on the secondary chronic value (derived using the USEPA Tier II Great Lakes methodology) from USEPA (1996).			
EFACHES-water-brackish	trans-1,2-Dichloroethene	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	trans-1,3-Dichloropropene	79	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Tribromomethane	320	ug/L	EcoTox Thresholds	USEPA 1996	BTAG value is based on acute endpoint. Selected value is based on the secondary chronic value (derived using the USEPA Tier II Great Lakes methodology) from USEPA (1996).			
EFACHES-water-brackish	Tributyltin	0.01	ug/L		USEPA 1999	No BTAG value. Selected value is the currently proposed chronic AWQC.			
EFACHES-water-brackish	Trichlorobenzene	50	ug/L	IRIS	USEPA 1995	Chronic			
EFACHES-water-brackish	Trichloroethene	200	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Trichlorofluoromethane	1100	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Vanadium	10000	ug/L		USEPA 1995				
EFACHES-water-brackish	Vinyl chloride	1160	ug/L			BTAG value is based on acute endpoint; adjustment factor of 10 applied to lowest BTAG value.			
EFACHES-water-brackish	Xylene, total	130	ug/L	USEPA Region III 1995	USEPA 1995	BTAG value is based on human health effects. Selected value is based on acu data cited in BTAG document with an acute to chronic adjustment factor of 100 applied.			
EFACHES-water-brackish	Zinc	81	ug/L		USEPA 1999	BTAG value is not referenced but is thought to be from the EPA Quality Criteria for Water (1986) based on effects to species of saltwater plants. No toxicological study is referenced nor is the value listed as an AWQC. Selected value is the current chronic saltwater AWQC based on dissolved zinc.			

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter

TECHNICAL MEMORANDUM CH2MHILL

Investigation of Groundwater Flow at Site 13, Indian Head Division-NSWC, Indian Head, Maryland

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DATE: April 15, 2003

Introduction

This technical memorandum presents the results of additional investigation activities conducted at Installation Restoration (IR) Site 13 at the Indian Head Division – Naval Surface Warfare Center (IHDIV-NSWC). The investigation was undertaken in an effort to reduce the level of uncertainty regarding potential volatile organic compound (VOC) contamination in groundwater at Site 13. The *Draft Final Remedial Investigation Report for Sites 11, 13, 17, 21, and 25* (CH2M HILL, 2002) concluded that the former painting activities at Site 13 likely had minimal impact on the underlying groundwater. The regulatory agencies, however, expressed concern about the level of uncertainty surrounding this determination. During the September 2002 Indian Head Installation Restoration Team (IHIRT) meeting, it was proposed that one monitoring well be installed at the site and sampled for VOCs. The scope was further clarified during an IHIRT conference call and subsequently presented in the final work plan dated November 11, 2002 (CH2M HILL, 2002).

Background

Site 13 encompasses the area adjacent to the Paint Shop (Building 870). In July of 2000, nine surface soil samples and five subsurface soil samples were collected from soil borings installed at Site 13. The subsurface soil samples were collected from either the depth with the highest photoionization detector (PID) reading or, if there were no PID readings above background levels, the maximum boring depth. Sample collection depths ranged from 17 feet below ground surface (bgs) to 30 feet bgs. Groundwater was not encountered in any of the soil borings.

The surface soil samples and subsurface soil samples were analyzed for Target Compound List (TCL) VOCs, TCL semi-volatile organic compounds (SVOCs), and Target Analyte List

(TAL) metals. The results were compared to the United States Environmental Protection Agency (EPA) Region III Soil Screening Levels (SSLs) with a dilution and attenuation factor of 20. In the surface soil samples, four compounds, 1,1,2-trichloroethane, acetophenone, 2,6-dinitrotoluene and arsenic, were detected at concentrations above their corresponding SSLs. One VOC, methylene chloride and two SVOCs, diethylphthalate and pyrene, were detected in the five subsurface soil samples (CH2M HILL, 2002). No organic compounds, however, were detected in subsurface samples above the SSLs. These results suggested that the former painting operations had minimal impact on the surface soil and that little transport of organic compounds from the surface soil to the subsurface soil had occurred.

The RI report further concluded that the potential for former operations at Site 13 to impact the underlying groundwater was minimal. This conclusion was based on the fact that depth to groundwater was greater than 30 feet bgs and 15 to 17 feet of fine-grained material (i.e., low conductivity) were observed in each borehole. It was noted, however, that there was some uncertainty associated with this conclusion.

The IHIRT team initially agreed that the level of uncertainty associated with the site was acceptable given the weight of evidence behind the site conclusions. However, subsequent concerns were raised by EPA and Maryland Department of the Environment (MDE) regarding impacts to groundwater, which led to the investigation presented below.

Field Activities

One monitoring well (IS13MW01) was installed and sampled at Site 13 (Figure 1). The borehole was advanced with a hollow-stem auger (HSA) rig to a depth of 46 feet bgs. Split-spoon samples were collected throughout the boring during drilling. The samples were logged lithologically and screened for VOCs using a PID (Figure 2). Groundwater was encountered during drilling at approximately 37 feet bgs. The monitoring well was installed to a depth of 44 feet bgs and constructed with Schedule 40 polyvinyl chloride (PVC) casing and a 10-foot PVC screen. Soil-boring and well-construction data are provided in Figure 2.

Following installation and development, the well was sampled using low-flow methodology. The sample was submitted to a fixed-based laboratory for analysis of Low-Concentration (LC) VOCs.

Results

The analytical data report was submitted for third-party validation. Table 1 presents the raw data and detected constituents (as shaded cells). One VOC, toluene, was detected in the primary and duplicate samples at a concentration of 0.32 J micrograms per liter (µg/l). EPA's Region III Risk-Based Concentration (RBC) for toluene in tap water (October 9, 2002) is 75 µg/l and the Federal Maximum Contaminant Level (MCL) for toluene (November 2000) is 1,000 µg/l. Neither of these screening criteria for toluene was exceeded in the groundwater sample (Table 2).

Conclusion and Recommendation

The applicable screening criteria were not exceeded during the 2003 sampling event. Based on constituent concentrations in the groundwater, operations at Building 870 have not impacted groundwater and have only minimally impacted soil. The analytical results confirm the recommendation proposed in the *Draft Final Remedial Investigation Report for Sites 11, 13, 17, 21, and 25*, for no further action (NFA) for Site 13. This technical memorandum will be included in the final RI report as an appendix and CH2M HILL will proceed with the generation of a NFA Proposed Remedial Action Plan (PRAP), as outlined in the following consensus agreement drafted during the February 2003 IHIRT meeting:

> **CONSENSUS: Site 13, 2/12/03** The team agrees to proceed with a NFA PRAP at Site 13 pending the receipt of validated data consistent with unvalidated data presented at the 2/12/03 IHIRT meeting. The technical memorandum with sampling results will be incorporated as an appendix in Final RI.

References

CH2M HILL. August 2002. *Draft Final Remedial Investigation Report, Sites 11, 13, 17, 21, and 25, Indian Head Division–NSWC*, Indian Head, Maryland.

CH2M HILL. November 2002. *Final Work Plan,, Site 13, Indian Head Division–NSWC*, Indian Head, Maryland.

Table 1
Raw Data and Detected Constituents for Monitoring Well Groundwater Sample
Investigation of Groundwater at Site 13
CTO 122, NSWC
Indian Head, Maryland

Station ID	IS13MW01			
Sample ID	IS13MW010103		IS13MW010103P	
Sample Date	01/22/03		01/22/03	
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	0.5	U	0.5	U
1,1,2,2-Tetrachloroethane	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5	U	0.5	U
1,1,2-Trichloroethane	0.5	U	0.5	U
1,1-Dichloroethane	0.5	U	0.5	U
1,1-Dichloroethene	0.5	U	0.5	U
1,2,3-Trichlorobenzene	0.5	U	0.5	U
1,2,4-Trichlorobenzene	0.5	U	0.5	U
1,2-Dibromo-3-chloropropane	1	R	1	R
1,2-Dibromoethane	0.5	U	0.5	U
1,2-Dichlorobenzene	0.5	U	0.5	U
1,2-Dichloroethane	0.5	U	0.5	U
1,2-Dichloropropane	0.5	U	0.5	U
1,3-Dichlorobenzene	0.5	U	0.5	U
1,4-Dichlorobenzene	0.5	U	0.5	U
2-Butanone	5	R	5	R
2-Hexanone	5	U	5	U
4-Methyl-2-pentanone	5	U	5	U
Acetone	2.8	B	2.9	B
Benzene	0.5	U	0.5	U
Bromochloromethane	0.5	U	0.5	U
Bromodichloromethane	0.5	U	0.5	U
Bromoform	0.5	U	0.5	U
Bromomethane	0.5	U	0.5	U
Carbon disulfide	0.5	U	0.5	B
Carbon tetrachloride	0.5	U	0.5	U
Chlorobenzene	0.5	U	0.5	U
Chloroethane	0.5	U	0.5	U
Chloroform	0.5	U	0.5	U
Chloromethane	0.5	U	0.5	U
Cumene	0.5	U	0.5	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result

Table 1
Raw Data and Detected Constituents for Monitoring Well Groundwater Sample
Investigation of Groundwater at Site 13
CTO 122, NSWC
Indian Head, Maryland

Station ID	IS13MW01			
Sample ID	IS13MW010103		IS13MW010103P	
Sample Date	01/22/03		01/22/03	
Chemical Name				
Cyclohexane	0.5	U	0.5	U
Dibromochloromethane	0.5	U	0.5	U
Dichlorodifluoromethane(Freon-12)	0.5	U	0.5	U
Ethylbenzene	0.5	U	0.5	U
Methyl acetate	0.5	U	0.5	U
Methyl-tert-butyl ether (MTBE)	0.5	U	0.5	U
Methylcyclohexane	0.5	U	0.5	U
Methylene chloride	1.2	B	1.4	B
Styrene	0.5	U	0.5	U
Tetrachloroethene	0.5	U	0.5	U
Toluene	0.32	J	0.32	J
Trichloroethene	0.5	U	0.5	U
Trichlorofluoromethane(Freon-11)	0.5	U	0.5	U
Vinyl chloride	0.5	U	0.5	U
Xylene, total	0.5	U	0.5	U
cis-1,2-Dichloroethene	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.5	U	0.5	U
trans-1,2-Dichloroethene	0.5	U	0.5	U
trans-1,3-Dichloropropene	0.5	U	0.5	U
Notes:				
Shaded cell indicatesconstituent is detected in the sample.				
Sample IS13MW010103 is the primary (or parent) sample.				
Sample IS13MW010103P is the duplicate sample.				

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result

Table 2
Comparison of Detected Constituent to Screening Criteria for Monitoring Well Groundwater Sample Data
Investigation of Groundwater at Site 13
CTO 122, NSWC
Indian Head, Maryland

Station ID	**MCL**	**Tap Water Adjusted RBC ***	IS13MW01	
Sample ID			IS13MW010103	IS13MW010103P
Sample Date			01/22/03	01/22/03
Chemical Name				
Volatile Organic Compounds (UG/L)				
Toluene	1,000	75	0.32 J	0.32 J

Note:
*Tapwater RBC for toluene, a non-caricogenic constituent, was adjusted by dividing the RBC by 10 resulting in a hazard quotient of 0.1 to account for multiple constituents.

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

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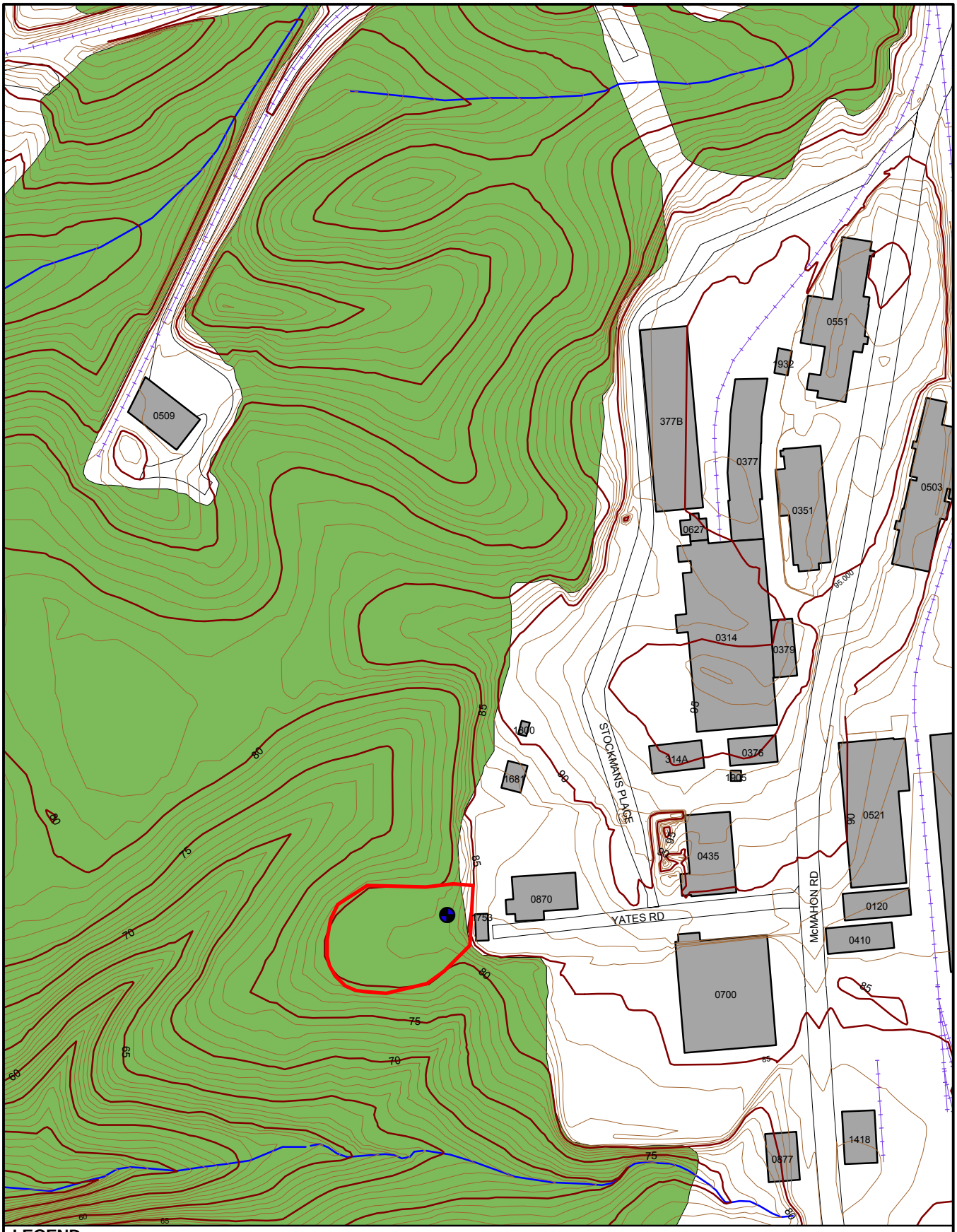

LEGEND

- Monitoring Well
- Wooded Area
- IR Site Boundary
- Buildings
- Topographic Contours (1 foot Intervals)
- Topographic Index Contours (5 foot Intervals)
- Waterbodies
- Railroads
- Road

N

0 75 150 Feet

Figure 1
Monitoring Well Location
Site 13
IHDIV-NSWC
Indian Head, Maryland

CH2MHILL

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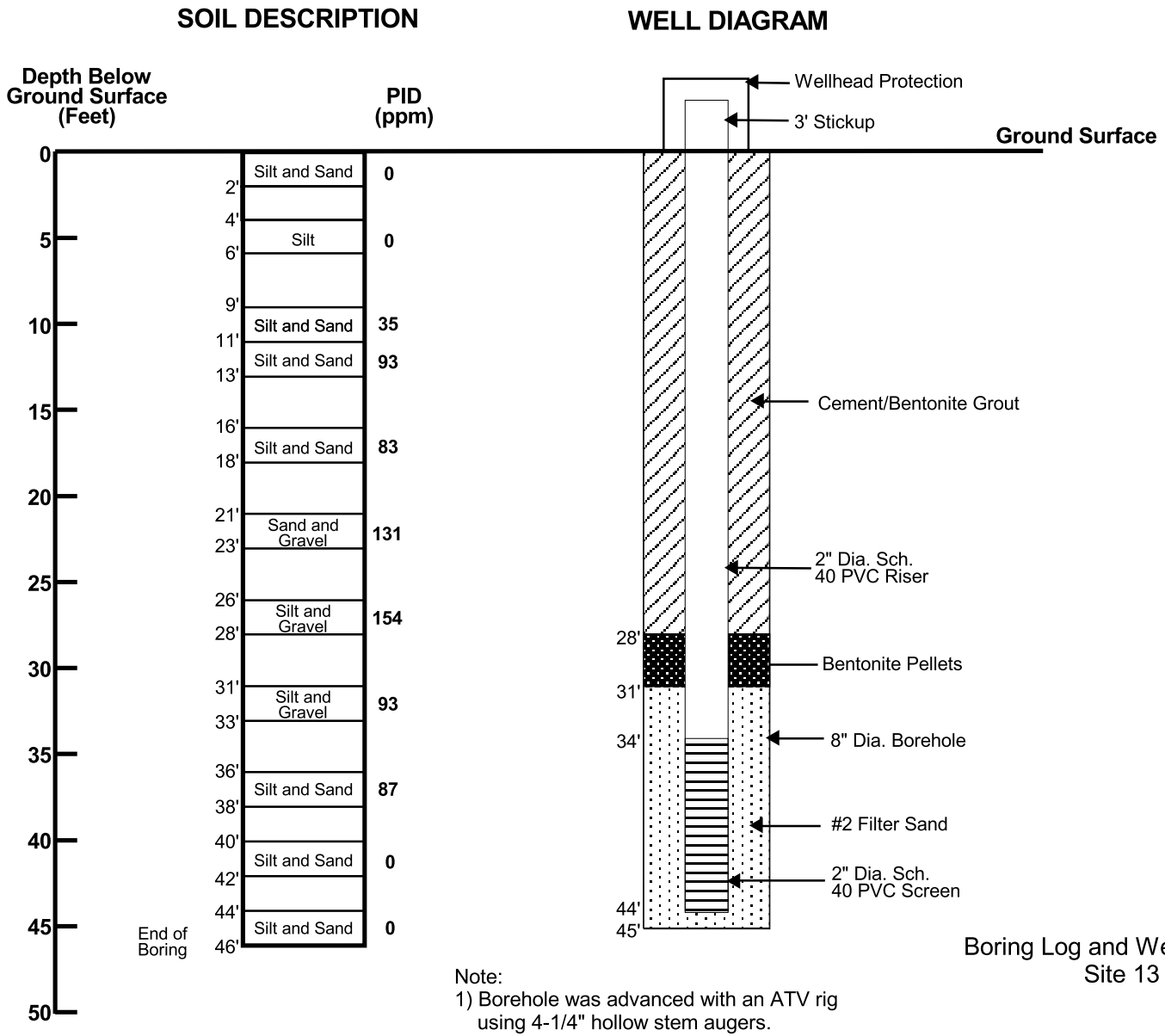

Note:
1) Borehole was advanced with an ATV rig using 4-1/4" hollow stem augers.
2) Water was encountered at 37.4 feet bgs.

Figure 2
Boring Log and Well Construction Diagram
Site 13 Technical Memorandum
IHDIV-NSWC
Indian Head, Maryland

CH2MHILL

Pre-Feasibility Study Groundwater Sampling Activities Site 21 (Bronson Road Landfill), Indian Head Division-NSWC Indian Head, Maryland

PREPARED FOR: Jeff Morris/EFA CHES
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DATE: October 8, 2002

The remedial investigation (RI) conducted at Site 21 at the Indian Head Division-Naval Surface Warfare Center (IHDIV-NSWC) identified contaminants of concern in groundwater (CH2M HILL, August 2002). Additional data needs were identified during the RI to be addressed before proceeding to the feasibility study (FS). Field activities were conducted to fill these data gaps in a pre-FS investigation, as described in a work plan prepared for the purpose (CH2M HILL, April 2002). This technical memorandum (memo) presents a summary of the groundwater sampling activities and results.

Background

Groundwater sampling conducted at Site 21 during the initial field effort in August 2000 detected constituents of concern in groundwater. In particular, the groundwater sample collected from monitoring well IS21MW02 contained manganese at a concentration of 23,100 micrograms per liter (µg/l) and the groundwater samples collected from IS21MW01 and IS21MW04 contained perchlorate at concentrations of 2 µg/l and 2,000 µg/l, respectively (CH2M HILL, August 2002). It is believed that naturally occurring manganese is being mobilized due to oxidation/reduction (redox) conditions in the subsurface present at Site 21. The source of the perchlorate is unknown.

To ensure that the concentrations of manganese and perchlorate observed in these wells were not anomalous and to aid in the understanding of the hydrogeochemistry of the site, a second round of groundwater sampling was proposed.

Site 21 Groundwater Sampling Activities

CH2MHILL conducted a second round of groundwater sampling at Site 21 in July 2002. Groundwater samples were collected from the four monitoring wells (IS21MW01, IS21MW02, IS21MW03, and IS21MW04) at the site. Samples were analyzed for perchlorate by United States Environmental Protection Agency (EPA) Method 314, Target Analyte List (TAL) inorganics (total and dissolved) by Contract Laboratory Program (CLP) Method ILM04.0, and sulfate by EPA Method 375. Sulfate was included in the analysis to assist in evaluating whether or not natural attenuation is occurring at the site. *In situ* parameters including pH, temperature, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity were measured in the field. Before groundwater sampling, the water level of each well was measured.

Note that, due to the current drought conditions affecting the East Coast, all four monitoring wells had low water levels and were, as a result, purged dry during sampling. *In situ* parameters could only be measured at IS21MW01 and IS21MW04 because the other two wells went dry too quickly. Further, sufficient sample volume for all samples could not be obtained from monitoring wells IS21MW02 and IS21MW03; thus, dissolved metals and sulfate samples could not be obtained from either well, and a total metals sample could not be obtained from IS21MW03.

Results

The analytical results are presented in Table 1. *In situ* parameters for monitoring wells IS21MW01 and IS21MW04 are presented in Table 2.

Perchlorate

Perchlorate was detected in monitoring well IS21MW04 at a concentration of 2,900 µg/l. Perchlorate was not detected in any other well at the site.

Metals

Total manganese was detected at a concentration of 10,900 µg/l in monitoring well IS21MW02, a concentration that is significantly lower than the concentration detected during the September 2000 sampling event (23,100µg/l) but is still more than an order of magnitude higher than the tap water risk-based concentration (RBC) of 730 µg/l (USEPA, 2002). The decrease in concentration may be due to the following:

- Changed hydrogeologic conditions: The water table was lower during the second sampling event, which probably resulted in changes to thegroundwater-flow regime between the two sampling events.
- Possible differences in groundwater geochemistry: Some of the physico-chemical properties such as ORP, pH, and DO were not measured in two of the four wells. Hence, nothing definitive can be said about this possibility.

Except for a few metals such as aluminum, iron, and lead, which show a general increase in total concentrations between the September 2000 and the July 2002 sampling events, no temporal or spatial concentration trends are evidenced by the 2000 and 2002 groundwater sample results. The general increase in total concentration observed for aluminum, iron,

and lead may be due to higher turbidity values measured during the second event (although data are available from only two of the wells). Additionally, in some cases, the concentrations of total metals detected during the July 2002 event exceeded RBCs whereas they did not exceed the RBCs in the September 2000 sampling round. However, only copper and vanadium exceeded their RBCs for the first time in the second round, and both did so in the sample from well IS21MW04, which was excessively turbid in the second sampling round.

Sulfate

Sulfate was detected in the samples collected from monitoring wells IS21MW01 and IS21MW04 at concentrations of 4.5 µg/l and 83 µg/l, respectively. Definite conclusions could not be reached regarding sulfate concentrations because only two wells could be sampled for the analyte. However, the highest concentration from the available data was in the background well (IS21MW04), tentatively suggesting that the concentrations of sulfate in groundwater are being lowered as groundwater moves under the site.

Conclusions

The goals of the investigation were met:

- Analytical results are not anomalous because they are relatively consistent with the results presented in the RI report.
- Further investigation will be needed to identify the source of perchlorate in groundwater at the site.

The data will be incorporated into the Site 21 FS to aid in the evaluation of remedial alternatives.

References

CH2M HILL. April 2002. *Work Plan for Pre-Feasibility Study Field Activities at Site 17 Indian Head Division-NSWC*, Indian Head, Maryland

CH2M HILL. August 2002. *Draft Final Remedial Investigation Report, Sites 11, 13, 17, 21, and 25, Indian Head Division–NSWC,* Indian Head, Maryland.

United States Environmental Protection Agency Region III, Superfund Technical Support Section. April 2002. *Risk-Based Concentration Table.*

Table 1
Detected Compounds in Site 21 Monitoring Well Samples
Site 21 Pre-FS Groundwater Sampling
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03		IS21MW04	
Sample ID	IS21MW01071602		IS21MW02071802		IS21MW03071802		IS21MW04071602	
Sample Date	07/16/02		07/18/02		07/18/02		07/16/02	
Chemical Name								
Explosives (UG/L)								
Perchlorate	4	U	4	U	4	U	2,900	
Total Metals (UG/L)								
Aluminum	5,920		4,700		NA		18,300	
Arsenic	3.5	U	2.5	U	NA		6.6	J
Barium	52.3	J	128	J	NA		71.4	J
Chromium	21.4		29.7		NA		167	
Cobalt	6	J	137		NA		32.4	J
Copper	33.3		36.2		NA		31.2	B
Iron	3,940		30,100		NA		35,600	
Lead	9.8	J	7		NA		20.2	
Magnesium	1,370	B	13,000		NA		2,490	B
Manganese	32.4	B	10,900		NA		384	
Mercury	0.1	U	0.1	U	NA		0.26	
Nickel	16.5	J	29.7	J	NA		92.5	
Potassium	2,390	B	10,800		NA		3,310	B
Selenium	3	UL	4.3	L	NA		3	UL
Sodium	12,700	B	108,000		NA		96,200	
Thallium	4.2	U	4.9	J	NA		4.2	U
Vanadium	13.7	J	16.6	J	NA		52.6	
Zinc	89.9	B	254		NA		86.2	B
Dissolved Metals (UG/L)								
Aluminum	62.7	B	NA		NA		895	
Barium	31.9	J	NA		NA		17.1	J
Chromium	0.8	J	NA		NA		4.7	B
Cobalt	5.1	J	NA		NA		14.9	J
Lead	2.3	J	NA		NA		1.5	U
Manganese	17.5	B	NA		NA		230	
Sodium	12,900	B	NA		NA		94,600	
Wet Chemistry (MG/L)								
Sulfate	4.5		NA		NA		83	

NA - Not analyzed
B - Blank contamination
J - Estimated
L - Biased low
U - Undetected

UL - Undetected, limit biased low

Table 2
***In Situ* Parameters**
Site 21 Pre-FS Groundwater Sampling
IHDIV-NSWC
Indian Head, Maryland

Well	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	ORP (mV)	Dissolved Oxygen (mg/L)	Temperature (^{o}C)
IS17MW01	4.13	0.105	66.3	304	2.4	24.15
IS17MW02	NC	NC	NC	NC	NC	NC
IS17MW03	NC	NC	NC	NC	NC	NC
IS17MW04	5.54	0.508	> 1000	14	0.89	23.9

mS/cm = microsiemens per centimeter
NTU = nephelometric turbidity units
mg/L = milligrams per liter
^{o}C = degrees celsius
mV = millivolts
NC = Not Collected (Dry Well)

Raw Title 1
Raw Title 2
Raw Title 3
Raw Title 4

Station ID	IS21MW01		IS21MW02		IS21MW03		IS21MW04	
Sample ID	IS21MW01071602		IS21MW02071802		IS21MW03071802		IS21MW04071602	
Sample Date	07/16/02		07/18/02		07/18/02		07/16/02	
Chemical Name								
Explosives (UG/L)								
Perchlorate	4	U	4	U	4	U	2,900	
Total Metals (UG/L)								
Aluminum	5,920		4,700		NA		18,300	
Antimony	2.3	UL	1.7	UL	NA		2.3	UL
Arsenic	3.5	U	2.5	U	NA		6.6	J
Barium	52.3	J	128	J	NA		71.4	J
Beryllium	0.54	B	0.48	B	NA		1.1	B
Cadmium	0.41	B	0.44	B	NA		0.39	B
Calcium	1,850	B	21,200	B	NA		4,130	B
Chromium	21.4		29.7		NA		167	
Cobalt	6	J	137		NA		32.4	J
Copper	33.3		36.2		NA		31.2	B
Iron	3,940		30,100		NA		35,600	
Lead	9.8	J	7		NA		20.2	
Magnesium	1,370	B	13,000		NA		2,490	B
Manganese	32.4	B	10,900		NA		384	
Mercury	0.1	U	0.1	U	NA		0.26	
Nickel	16.5	J	29.7	J	NA		92.5	
Potassium	2,390	B	10,800		NA		3,310	B
Selenium	3	UL	4.3	L	NA		3	UL
Silver	1.3	U	0.5	U	NA		1.3	U
Sodium	12,700	B	108,000		NA		96,200	
Thallium	4.2	U	4.9	J	NA		4.2	U
Vanadium	13.7	J	16.6	J	NA		52.6	
Zinc	89.9	B	254		NA		86.2	B
Dissolved Metals (UG/L)								
Aluminum	62.7	B	NA		NA		895	
Antimony	2.3	UL	NA		NA		2.3	UL
Arsenic	3.5	U	NA		NA		3.5	U
Barium	31.9	J	NA		NA		17.1	J
Beryllium	0.36	B	NA		NA		0.1	B

NA - Not analyzed
B - Blank contamination
J - Estimated
L - Biased low
U - Undetected

UL - Undetected, limit biased low

Raw Title 1
Raw Title 2
Raw Title 3
Raw Title 4

Station ID	IS21MW01		IS21MW02		IS21MW03		IS21MW04	
Sample ID	IS21MW01071602		IS21MW02071802		IS21MW03071802		IS21MW04071602	
Sample Date	07/16/02		07/18/02		07/18/02		07/16/02	
Chemical Name								
Cadmium	0.3	U	NA		NA		0.3	U
Calcium	1,730	B	NA		NA		3,290	B
Chromium	0.8	J	NA		NA		4.7	B
Cobalt	5.1	J	NA		NA		14.9	J
Copper	13.2	B	NA		NA		3.7	B
Iron	46.5	B	NA		NA		1,510	
Lead	2.3	J	NA		NA		1.5	U
Magnesium	1,060	B	NA		NA		1,340	B
Manganese	17.5	B	NA		NA		230	
Mercury	0.1	U	NA		NA		0.1	U
Nickel	6.5	B	NA		NA		11.5	B
Potassium	1,800	B	NA		NA		1,640	B
Selenium	3	UL	NA		NA		3	UL
Silver	1.3	U	NA		NA		1.3	U
Sodium	12,900	B	NA		NA		94,600	
Thallium	4.2	U	NA		NA		4.2	U
Vanadium	1.3	U	NA		NA		2.1	B
Zinc	41.1	B	NA		NA		22.5	B
Wet Chemistry (MG/L)								
Sulfate	4.5		NA		NA		83	

NA - Not analyzed
B - Blank contamination
J - Estimated
L - Biased low
U - Undetected

UL - Undetected, limit biased low

Investigation of Groundwater Flow and Perchlorate at Site 21, Indian Head Division-NSWC

Indian Head, Maryland

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DATE: March 14, 2003

Introduction

This technical memorandum presents a summary of the investigation activities and analytical results at Site 21, Indian Head Division—Naval Surface Warfare Center (IHDIV-NSWC). The Draft Final Remedial Investigation Report for Sites 11, 13, 17, 21 and 25 (CH2M HILL, August 2002) identified perchlorate in the groundwater sample collected from the upgradient monitoring well (IS21MW04) for Site 21. Pre-feasibility study (pre-FS) sampling performed after the draft final report was submitted confirmed the presence of perchlorate at Site 21. Because the perchlorate was identified in the upgradient monitoring well, the source was not readily identifiable. The report also noted that the groundwater flow regime at Site 21 was not well defined.

A draft work plan for additional investigation of perchlorate in the vicinity of IS21MW04 was submitted to the IHIRT on October 24, 2002 followed by further clarification of the scope during the October 2002 IHIRT meeting. During a November 7, 2002 conference call it was agreed that the objective of the field effort would be to determine if perchlorate in groundwater is associated with the landfill (Site 21). On November 13, 2002, a draft final work plan memorandum was submitted to the IHIRT. On November 21, 2002, a final work plan was submitted to the IHIRT (CH2M HILL, November 2002).

Background

Site 21, the Bronson Road Landfill, is located between Building 602 and Bronson Road. In August of 2000, four groundwater samples were collected from monitoring wells installed earlier in the month as part of the remedial investigation conducted at the site. The samples

were analyzed for perchlorate as well as for other parameters. Perchlorate was detected in the sample collected from IS21MW01 at an estimated (i.e., J qualified) concentration of 2 micrograms per liter (µg/L) and the sample collected from IS21MW04 at a concentration of 2,000 µg/L (Figure 1). Monitoring well IS21MW04 is located upgradient of the landfill, which suggests that material disposed of at the landfill is not the source of the perchlorate. Additionally, a literature search conducted at IHDIV-NSWC did not identify a potential source of perchlorate at Site 21. Pre-FS sampling conducted in July 2002 (CH2M HILL, October 2002) confirmed the presence of perchlorate in groundwater. It should be noted that for the July 2002 sampling event perchlorate was not detected in the sample collected from IS21MW01 and the concentration observed in the sample collected from IS21MW04 was 2,900 µg/L.

The draft final remedial investigation report also concluded that the groundwater flow regime was not well defined at Site 21. One monitoring well, IS21MW04, was installed upgradient of the landfill and three monitoring wells (IS21MW01, IS21MW02, and IS21MW03) were installed downgradient of the landfill. Water levels measured in the four wells during the initial (August 2000) and follow-up (July 2002) sampling events indicate that groundwater generally flows from the northeast to the southwest. However, at times, flow to the west and northwest is expected, most notably in the northern portion of the site. Additionally, there is some uncertainty whether groundwater encountered at IS21MW04 flows toward the landfill or flows more toward the east because well IS21MW04 is near the top of a topographic rise that may represent a groundwater divide.

Field Activities

CH2M HILL collected soil and groundwater samples at Site 21 in December 2002. Seven soil boring locations (IS2101 through IS2107) were proposed in the final work plan. During the field effort, however, it was determined that one proposed location (IS2106) could not be accessed due to snow creating hazardous slippery conditions. Soil borings were advanced using a hollow-stem auger (HSA) rig at the six locations shown on Figure 1. The borings were placed at distances ranging from approximately 50 feet to approximately 100 feet from monitoring well IS21MW04 (Figure 1). The north and south locations provided analytical results in these geographic directions from IS21MW04. The borings located in an arc from northwest to southwest provided spatial data between monitoring wells IS21MW04 and IS21MW01 (to the west) and between IS21MW04 and the landfill (Site 21). By this approach, the direction the perchlorate is migrating could be determined.

During advancement of each boring, split-spoon samples were collected every 5 feet from ground surface to the top of the water table for lithology. Split-spoon samples were not collected below the water table. Soil boring logs are provided in Appendix A.

Geoprobe groundwater samples were collected at two depths: the shallower sample was collected at a depth representative of the IS21MW04 well screen, relative to the water table at the time of sampling; the deeper sample was collected at a depth representative of the IS21MW04 well screen, relative to the water table in August 2000. All samples were submitted to an off site laboratory for perchlorate analysis using United States Environmental Protection Agency (USEPA) Method 314.

Soil samples were collected at the surface and at the interval identified as having the highest silt and clay content, the most likely interval in which to find residual perchlorate. Soil samples were withheld from the analytical laboratory pending the results of groundwater sampling. The decision to analyze soil samples was made by the IHIRT during the December 13, 2002 conference call. It was determined that the data would be analyzed for future needs. One surface soil (location IS2107) and six subsurface soil (all locations) samples were submitted to an off site laboratory for perchlorate analysis using USEPA Method 314.

Results

The perchlorate analytical results for groundwater are presented in Table 1 and shown on Figure 1. On Table 1, sample depths are defined by the last four digits in the sample identification (e.g., IS2103GP4044 indicates the groundwater sample collected from a depth interval of 40 to 44 feet below ground surface). Perchlorate was detected in all six shallow groundwater samples at concentrations that ranged from 35 µg/L to 1,800 µg/L and in all six deep groundwater samples at concentrations that ranged from 29 µg/L to 1,500 µg/L (Figure 1).

The perchlorate analytical results for surface and subsurface soil are provided in Tables 2 and 3, respectively. The results are also shown on Figure 1. Except for location IS2107 with a subsurface soil perchlorate concentration of 8.6 µg/kg, all other soil (surface and subsurface) samples are non-detect for perchlorate.

Conclusion

Perchlorate concentrations at the locations sampled show very low values to the north and northwest of well IS21MW04 and a decrease in concentration from well IS21MW04 to the west and southwest of IS21MW04. This pattern implies that groundwater flow direction is to the west and southwest, which in turn suggests that the perchlorate detected at well IS21MW04 is not associated with the landfill.

As discussed during the December 13, 2002 conference call the goal of the investigation was met. During the conference call it was agreed that the perchlorate detected is not associated with the landfill and, hence, will be investigated as a future site. It was further agreed by the IHIRT, during the conference call, to proceed with the Feasibility Study for Site 21.

References

CH2M HILL. *Draft Final Remedial Investigation Report, Sites 11, 13, 17, 21, and 25, Indian Head Division–NSWC,* Indian Head, Maryland. August 2002.

CH2M HILL. Technical Memorandum: *Pre-Feasibility Study Groundwater Sampling Activities Site 21 (Bronson Road Landfill), Indian Head Division-NSWC,* Indian Head, Maryland October 2002

CH2M HILL. Technical Memorandum: *Final Work Plan Investigation of Groundwater Flow and Perchlorate at Site 21, Indian Head Division-NSWC,* Indian Head, Maryland. November 2002.

Table 1
Perchlorate Concentration in Groundwater Samples
Investigation of Groundwater Flow and Perchlorate at Site 21
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS2101		IS2102			IS2103		IS2104		IS2105			IS2107	
Sample ID	IS2101GP4448	IS2101GP4953	IS2102GP4246	IS2102GP4246P	IS2102GP4852	IS2103GP4044	IS2103GP4650	IS2104GP3640	IS2104GP4650	IS2105GP4852	IS2105GP4852P	IS2105GP4044	IS2107GP4448	IS2107GP5054
Sample Date	12/05/02	12/06/02	12/05/02	12/05/02	12/06/02	12/04/02	12/04/02	12/03/02	12/03/02	12/09/02	12/09/02	12/06/02	12/10/02	12/11/02
Chemical Name														
Explosives (µg/L)														
Perchlorate	1,800	88	480	480	29	1,500	1,500	41	42	38	35	35	530	190

Notes:
µg/L = microgram per liter
A shaded cell indicates that perchlorate is detected.
P = Duplicate sample

Table 2
Perchlorate Concentration in Surface Soil Sample
Investigation of Groundwater Flow and Perchlorate at Site 21
IHDIV-NSWC
Indian Head, Maryland

Station ID **Sample ID** **Sample Date**	IS2107 IS2107SS0002 12/09/02
Chemical Name	
Explosives (µg/kg)	
Perchlorate	9.4 U
Wet Chemistry (mg/kg)	
% Solids	85

Note:
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram

Table 3
Perchlorate Concentration in Subsurfcae Soil Samples
Investigation of Groundwater Flow and Perchlorate at Site 21
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS2101		IS2102	IS2103	IS2104	IS2105	IS2107
Sample ID	IS2101SB1517	IS2101SB1517P	IS2102SB0507	IS2103SB1315	IS2104SB1416	IS2105SB1012	IS2107SB0507
Sample Date	12/05/02	12/05/02	12/04/02	12/03/02	12/03/02	12/06/02	12/09/02
Chemical Name							
Explosives (µg/kg)							
Perchlorate	9.5 U	9.2 U	9.3 U	9.5 U	9.3 U	8.9 U	8.6
Wet Chemistry (mg/kg)							
% Solids	84	87	86	85	86	90	95

Notes:
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
A shaded cell indicates that perchlorate is detected.

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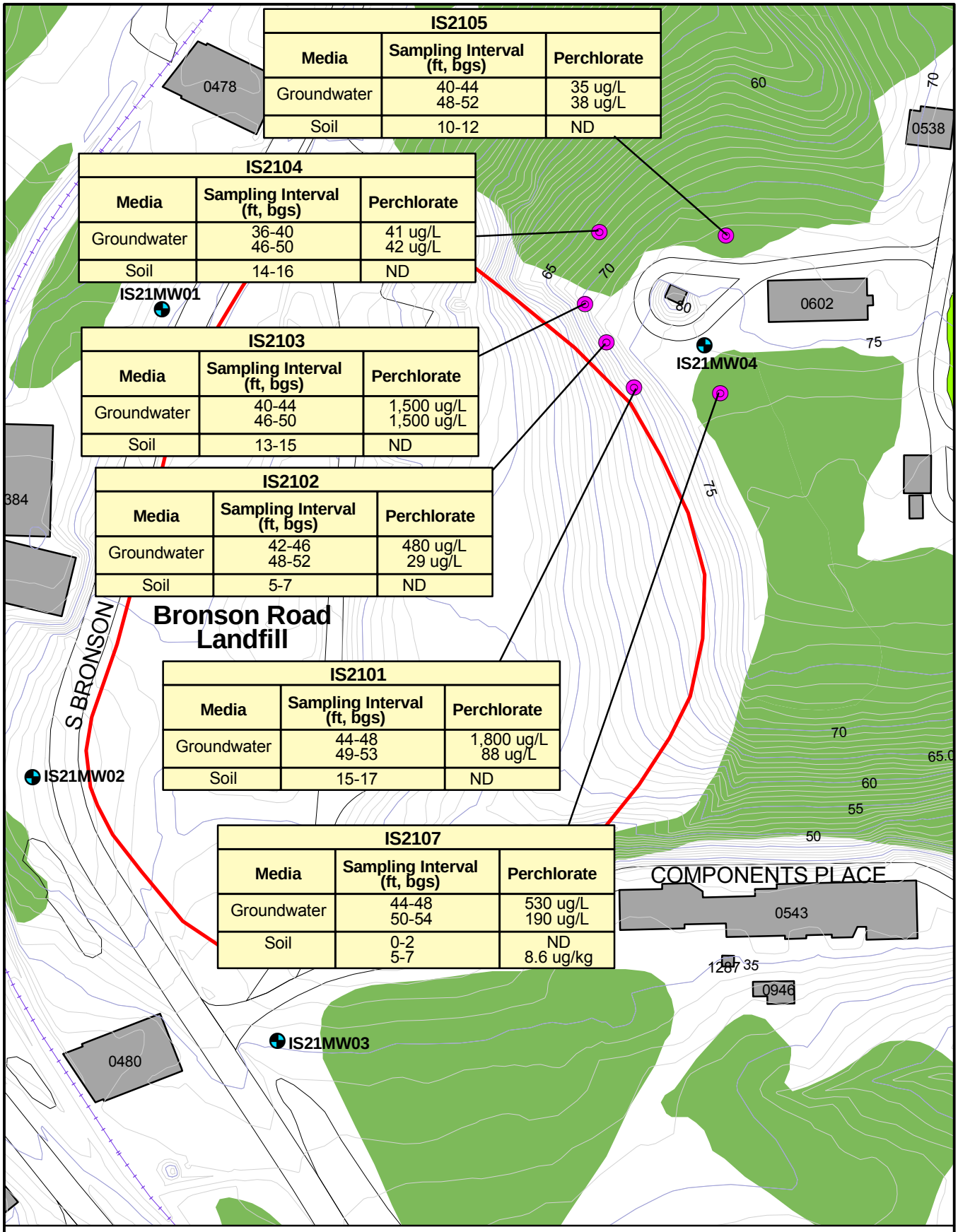

LEGEND

- Monitoring Well Location
- Sampling Locations
- IR Site Location
- Buildings

ND = Not Detected
ug/L = micrograms per liter

N

50 0 50 100 150 Feet

Figure 1
Perchlorate Concentrations in Groundwater and Soil Samples Collected in December 2002
Site 21
IHDIV-NSWC
Indian Head, Maryland

CH2MHILL

Appendix A – Boring Logs

	PROJECT NUMBER	Site 21 Perchlorate Investigation
CH2MHILL	156175.FI.FI	Boring Number: IS2101

BORING LOG

PROJECT : Indian Head — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR : Parrett Wolff

DRILLING METHOD AND EQUIPMENT USED : Drill Rig 2" split spoon

START : 12/05/2002 — END : 12/05/2002 — LOGGER : Ed Carpenetti

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (FT)	USGS CODE	Moisture Content	Munsell Code	CORE DESCRIPTION: SOIL NAME, COLOR RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0-2'	1.0'		Dry	Brown 10YR4/4	0-1' Find sand with pebbles.	
5'-7'	2.0'		Dry	Yellowish Brown 10YR5/6	Silty clay with black organic matter and rounded pebbles.	
10'-12'	2.0'		Dry	Brownish Yellow 10YR6/6	Silty clay with some black organic material.	
15'-17'	2.0'		Dry	Dark Yellowish Brown 10YR4/4	Silty clay with some pebbles present.	Collect a soil sample.
20'-22'	2.0'		Dry	NA	Fine black silty, ashy organic material with well rounded pebbles.	
25'-27'	2.0'		Dry	Yellowish Red 10YR5/6	Dark grey clayey silt 5YR 4/1 grading to a yellowish red 10YR5/6 clayey silt.	
30'-32'	0.5'		Dry	Black	Fine silty organic material with some plastic in the spoon.	
35'-37'	2.0'		Damp	Yellowish Brown 10YR5/4	Fine to medium sand with gravel and pebbles present.	
40'-42'	1.0'		Wet	Strong Brown 7.5YR5/8	Silt.	Groundwater level @ 42' bgs.
44'-48'						Collect groundwater sample
49'-53'						Collect groundwater sample
					End Boring @ 53' bgs	

	PROJECT NUMBER 156175.FI.FI	Site 21 Perchlorate Investigation Boring Number: IS2102

BORING LOG

PROJECT : Indian Head LOCATION : Indian Head, Maryland

ELEVATION : DRILLING CONTRACTOR : Parrett Wolff

DRILLING METHOD AND EQUIPMENT USED : Drill Rig 2" split spoon

START : 12/04/2002 END : 12/04/2002 LOGGER : Ed Carpenetti

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (FT)	USGS CODE	Moisture Content	Munsell Code	CORE DESCRIPTION: SOIL NAME, COLOR RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0-2'	1.6'		Dry	Brown 10YR4/3	0 - 6" Top Soil 6" - 2' Fine to medium sand with some gravel.	
5'-7'	2.0'		Dry	Dark Yellowish Brown 10YR3/4	Brown fine to medium sand from 5.0 to 5.5' bgs. Clay to clayey sand with black organic material.	Collected a soil sample.
10'-12'	2.0'		Dry	Brownish Yellow 10YR6/6	A brownish yellow 10YR6/6 to a dark yellowish brown 10 YR 3/4 silty clay. Some black organic matter present.	
15'-17'	0.5'		Dry	Black	Black ash and gravel.	
20-22'	0		NA	NA	No recovery.	
25'-27'	2.0'		Dry	Yellowish Brown 10YR4/4	Fine to course sand with gravel and pebbles.	
30'-32'	2.0'		Damp	Yellowish Brown 10YR4/4	Fine to course angular sand with pebbles and gravel.	
35'-37'	2.0'		Damp	Yellowish Brown 10YR5/4	Fine to medium sand with gravel present. Color ranges from dark brown 10YR3/3 (find sand) to yellowish brown 10YR5/4 course sand.	
40'-42'	1.0'		Wet	Dark Yellowish Brown 10YR4/6	41'-42' Very wet gravely sand.	Groundwater level @ 41' bgs.
42'-46'						Collect groundwater sample
48'-52'						Collect groundwater sample
					End Boring @ 52' bgs	

	PROJECT NUMBER 156175.FI.FI	Site 21 Perchlorate Investigation Boring Number: IS2103

BORING LOG

PROJECT : Indian Head — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR : Parrett Wolff

DRILLING METHOD AND EQUIPMENT USED : Drill Rig 2" split spoon

START : 12/03/2002 — END : 12/03/2002 — LOGGER : Ed Carpenetti

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (FT)	USGS CODE	Moisture Content	Munsell Code	CORE DESCRIPTION: SOIL NAME, COLOR RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0-2'	1.5'		Dry	Brown 7.5YR5/8	0 - 6" Top Soil 6" - 2' Clayey silt.	
3-5'	2.0'		Dry	Yellowish Red 5YR4/6	Silty Clay.	
8'-10'	2.0'		Dry	Yellowish Brown 5YR4/6	Silty clay with some gravel present.	
13'-15'	2.0'		Dry	Reddish Brown 5YR4/4	Clayey silt with some white flakes.	Collect a soil sample.
18'-20'	2.0'		Dry	Yellowish Brown 7.5YR5/8	Medium to course angular sand with gravel and pebbles.	
23'-25'	2.0'		Dry	Strong Brown 7.5YR5/6	Medium to course angular sand with quartz gravel and pebbles.	
28'-30'	2.0'		Dry	Yellowish Brown 10YR4/4	Fine to course sand ranging in color from yellow 10YR8/8 to dark yellowish brown 10YR4/4. Some quartz gravel is present. There is a 4" layer of ash at 29' bgs.	
33'-35'	2.0'		Damp	Yellowish Brown 10YR5/8	Fine sand mixed with pebbles and gravel.	
38'-40'	2.0'		Wet	Pale Brown 10YR6/3	Fine to medium sand.	Groundwater table @ 39' bgs.
40'-44'						Collect groundwater sample
46'-50'					End Boring @ 50' bgs	Collect groundwater sample

	PROJECT NUMBER	Site 21 Perchlorate Investigation
CH2MHILL	156175.FI.FI	Boring Number: IS2104

BORING LOG

PROJECT : Indian Head — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR : Parrett Wolff

DRILLING METHOD AND EQUIPMENT USED : Drill Rig 2" split spoon

START : 12/03/2002 — END : 12/03/2002 — LOGGER : Ed Carpenetti

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (FT)	USGS CODE	Moisture Content	Munsell Code	CORE DESCRIPTION: SOIL NAME, COLOR RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0-2'	1.5'		Dry	Brown 7.5YR5/8	0 - 6" Top Soil 6" - 2' Clay, clayey silt towards the bottom part of the spoon.	
4'-6'	1.0'		Dry	Red 2.5YR 4/8	Clay, strong brown in color grading to clayey silt to silty clay Some gravel is present.	
9'-11'	2.0'		Dry	Yellowish Red 5YR5/6 Yellowish Red	Silty Clay	
14'-16'	2.0'		Dry	5YR5/6	Clayey silt grading to silt.	Collect a soil sample.
19'-21'	2.0'		Dry	Strong Brown 7.5YR5/6	Fine sand mixed with course sand and gravel.	No odor
24'-26'	2.0'		Dry	Yellowish Brown 7.5YR5/8	Fine sand grading to course angular sand with pebbles and gravel mixed in.	No odor
29'-31'	1.5'		Damp	Yellowish Brown 7.5YR5/8	Fine to course angular sand with pebbles and gravel present.	
34'-36'	2.0'		Wet	reddish yellow 7.5YR7/6	Silty clay with gravel from 34'-34.5', strong brown 7.5YR5/6. Grading to clay to silty clay from 34.5'-35', grading to medium to fine sand with pebbles.	Groundwater table at 36' bgs.
36'-40'						Collect groundwater sample
39'-41'	2.0'		Wet	reddish yellow 7.5YR7/6	Fine to medium angular sand.	
46'-50'					End Boring @ 50' bgs	Collect groundwater sample

PROJECT NUMBER	Site 21 Perchlorate Investigation
156175.FI.FI	Boring Number: IS2105

BORING LOG

PROJECT : Indian Head — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR : Parrett Wolff

DRILLING METHOD AND EQUIPMENT USED : Drill Rig 2" split spoon

START : 12/05/2002 — END : 12/05/2002 — LOGGER : Ed Carpenetti

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (FT)	USGS CODE	Moisture Content	Munsell Code	CORE DESCRIPTION: SOIL NAME, COLOR RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0-2'	1.0'		Dry	Brown 7.5YR4/4	0-0.5' Top Soil 0.5'-2.0' Clayey silt grading to clay mixed with gravel.	Soil sample was collected.
5'-7'	2.0'		Dry	Yellowish Red 5YR5/6	Clayey silt.	
10'-12'	2.0'		Dry	Yellowish Red 5YR5/6	Clayey silt.	Soil sample was collected.
15'-17'	2.0'		Dry	Strong Brown 7.5YR5/8	Silt.	
20'-22'	2.0'		Dry	Yellowish Brown 10YR4/4	Fine silty sand strong brown in color 7.5YR5/8 grading to fine to course sand with angular gravel. Yellowish Brown	
25'-27'	0.5'		Dry	Yellowish Brown 10YR4/4	Fine to course sand with angular gravel.	
30'-32'	2.0'		Dry	Yellowish Brown 10YR4/4	Fine to course sand with pebbles and gravel.	
35'-37'	2.0'		Damp	Yellowish Brown 10YR4/4	35'-36.5' Same as above. 36.5'-37' Medium to fine sand strong brown 10YR5/8.	
40'-42' 40'-44'	2.0'		Wet	Strong Brown 10YR5/8	40'-41' Clay. 41'-42' Medium sand.	Groundwater level @ 42' bgs. Collect groundwater sample
48'-52'						Collect groundwater sample
					End Boring @ 52' bgs	

PROJECT NUMBER	Site 21 Perchlorate Investigation
156175.FI.FI	Boring Number: IS2107

BORING LOG

PROJECT : Indian Head
LOCATION : Indian Head, Maryland
ELEVATION :
DRILLING CONTRACTOR : Parrett Wolff
DRILLING METHOD AND EQUIPMENT USED : Drill Rig 2" split spoon
START : 12/09/2002 END : 12/09/2002 LOGGER : Ed Carpenetti

DEPTH BELOW SURFACE (FT) INTERVAL (FT)	RECOVERY (FT)	USGS CODE	Moisture Content	Munsell Code	CORE DESCRIPTION: SOIL NAME, COLOR RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm)
0-2'	1.0'		Dry	Brown 7.5YR5/6	0-0.5' Top Soil 0.5'-2.0' Clayey silt.	Soil sample was collected.
5'-7'	2.0'		Dry	Yellowish Red 5YR5/6	5'-6' Same as above. 6'-7' fine silty sand mixed with gravel.	Soil sample was collected.
10'-12'	0		NA	NA	NA	
15'-17'	2.0'		Dry	Strong Brown 7.5YR4/6	Clayey silt.	
20'-22'	1.0'		Dry	Brownish Yellow 10YR6/6	Fine silty sand with some gravel present.	
25'-27'	1.0'		Dry	Strong Brown 7.5YR4/6	Fine sand and gravel.	
30'-32'	2.0'		Dry	Yellowish Brown 10YR4/4	Fine to course sand with quartz gravel.	
35'-37'	2.0'		Damp	Strong Brown 10YR5/8	Medium to fine sand.	
40'-42'	2.0'		Wet	Strong Brown 10YR4/6	Fine to course sand with gravel.	Groundwater level @ 42' bgs.
44'-48'						Collect groundwater sample
50'-54'					End Boring @ 54' bgs	Collect groundwater sample

Table 1-1
Raw Compounds and Analytes for Site 11 Insitu Groundwater Samples
IHDIV-NSWC
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2- trifluoroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromoethane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		10	U
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	10	U
Acetone	10	U	3	B	2.5	B	3.7	B	2.4	B	3.2	B
Benzene	10	U	10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U	10	U	10	U	10	U
Carbon tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U	12		10	U
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Cumene	10	U	10	U	10	U	10	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UJ

Table 1-1
Raw Compounds and Analytes for Site 11 Insitu Groundwater Samples
IHDIV-NSWC
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
Cyclohexane	10	U	10	U	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane	10	U	10	U	10	U	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U
Methyl acetate	10	U	10	U	10	U	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U	10	U	10	U	10	U
Methylene chloride	1.7	J	10	U	10	U	10	U	10	U	10	U
Styrene	10	U	10	U	10	U	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U	10	U	10	U	10	U
Toluene	1.5	J	1.7	J	10	U	10	U	10	U	10	U
Trichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
Trichlorofluoromethane	10	U	10	U	10	U	10	U	10	U	10	U
Vinyl chloride	10	U	10	U	10	U	10	U	10	U	10	U
Xylene, total	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U
Semi-volatile Organic Compounds (UG/L)												
1,1-Biphenyl	10	U	10	UJ	10	U	10	U	200	U	10	U
2,2'-Oxybis(1-chloropropane)	10	U	10	UJ	10	U	10	U	200	U	10	U
2,4,5-Trichlorophenol	25	U	25	UJ	25	U	25	U	500	U	25	U
2,4,6-Trichlorophenol	10	U	10	UJ	10	U	10	U	200	U	10	U
2,4-Dichlorophenol	10	U	10	UJ	10	U	10	U	200	U	10	U
2,4-Dimethylphenol	10	U	10	UJ	10	U	10	U	200	U	10	U
2,4-Dinitrophenol	25	UJ	25	UJ	25	UJ	25	UJ	500	U	25	UJ
2,4-Dinitrotoluene	NA		NA		NA		NA		NA		10	UJ
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		10	UJ
2-Chloronaphthalene	10	U	10	UJ	10	U	10	U	200	U	10	U
2-Chlorophenol	10	U	10	UJ	10	U	10	U	200	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UJ

Table 1-1
Raw Compounds and Analytes for Site 11 Insitu Groundwater Samples
IHDIV-NSWC
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
2-Methylnaphthalene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
2-Methylphenol	10	U	10	UJ	10	U	10	U	200	U	10	UJ
2-Nitroaniline	25	U	25	UJ	25	U	25	U	500	U	25	UJ
2-Nitrophenol	10	U	10	UJ	10	U	10	U	200	U	10	UJ
3,3'-Dichlorobenzidine	10	U	10	UJ	10	U	10	U	200	U	10	U
3-Nitroaniline	25	U	25	UJ	25	U	25	U	500	U	25	UJ
4,6-Dinitro-2-methylphenol	25	UJ	25	UJ	25	UJ	25	U	500	U	25	U
4-Bromophenyl-phenylether	10	U	10	UJ	10	U	10	U	200	U	10	U
4-Chloro-3-methylphenol	10	U	10	UJ	10	U	10	U	200	U	10	U
4-Chloroaniline	10	U	10	UJ	10	U	10	U	200	U	10	U
4-Chlorophenyl-phenylether	10	U	10	UJ	10	U	10	U	200	U	10	U
4-Methylphenol	7	J	4	J	10	U	10	U	200	U	10	UJ
4-Nitroaniline	25	U	25	UJ	25	U	25	U	500	U	25	UJ
4-Nitrophenol	25	U	25	UJ	25	U	25	U	500	U	25	UJ
Acenaphthene	10	U	10	UJ	10	U	10	U	200	U	10	U
Acenaphthylene	10	U	10	UJ	10	U	10	U	200	U	10	U
Acetophenone	10	U	10	UJ	10	U	10	U	200	U	10	U
Anthracene	10	U	10	UJ	10	U	10	U	200	U	10	U
Atrazine	10	U	10	UJ	10	U	10	U	200	U	10	U
Benzaldehyde	10	U	10	UJ	10	U	10	U	200	U	10	U
Benzo(a)anthracene	10	U	10	UJ	10	U	10	U	200	U	10	U
Benzo(a)pyrene	10	U	10	UJ	10	U	10	U	200	U	10	U
Benzo(b)fluoranthene	10	U	10	UJ	10	U	10	U	200	U	10	U
Benzo(g,h,i)perylene	10	U	10	UJ	10	U	10	U	200	U	10	U
Benzo(k)fluoranthene	10	U	10	UJ	10	U	10	U	200	U	10	U
Butylbenzylphthalate	10	U	10	UJ	10	U	10	U	200	U	10	U
Caprolactam	10	U	10	UJ	10	U	10	U	200	U	10	U
Carbazole	10	U	10	UJ	10	U	10	U	200	U	10	U
Chrysene	10	U	10	UJ	10	U	10	U	200	U	10	U
Di-n-butylphthalate	10	U	10	UJ	10	U	10	U	200	U	10	U
Di-n-octylphthalate	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Dibenz(a,h)anthracene	10	U	10	UJ	10	U	10	U	200	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UJ

Table 1-1
Raw Compounds and Analytes for Site 11 Insitu Groundwater Samples
IHDIV-NSWC
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
Dibenzofuran	10	U	10	UJ	10	U	10	U	200	U	10	U
Diethylphthalate	10	U	10	UJ	3	J	10	U	200	U	2	U
Dimethyl phthalate	10	U	10	UJ	10	U	10	U	200	U	10	U
Fluoranthene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Fluorene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Hexachlorobenzene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Hexachlorobutadiene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Hexachlorocyclopentadiene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Hexachloroethane	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Indeno(1,2,3-cd)pyrene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Isophorone	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Naphthalene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Nitrobenzene	10	U	10	UJ	10	U	10	U	200	U	10	UJ
Pentachlorophenol	25	U	25	UJ	25	U	25	U	500	U	25	U
Phenanthrene	10	U	10	UJ	10	U	10	U	200	U	10	U
Phenol	10	U	5	J	10	U	10	U	200	U	10	U
Pyrene	10	U	10	UJ	10	U	10	U	200	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	UJ	10	U	10	U	200	U	10	U
bis(2-Chloroethyl)ether	10	U	10	UJ	10	U	10	U	200	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	2	B	3	B	3	B	1,100		310	
n-Nitroso-di-n-propylamine	10	U	10	UJ	10	U	10	U	200	U	10	U
n-Nitrosodiphenylamine	10	U	10	UJ	2	J	10	U	200	U	10	U
Explosives (UG/L)												
1,3,5-Trinitrobenzene	0.2	U	0.45	U	0.2	U	0.2	U	0.2	U	0.2	U
1,3-Dinitrobenzene	0.1	J	0.2	U	0.2	U	0.044	J	0.2	U	0.2	U
2,4,6-Trinitrotoluene	0.2	U	4.1	K	0.2	U	0.2	U	0.2	U	0.11	J
2,4-Dinitrotoluene	0.2	U	6.2	K	0.2	U	0.068	J	0.22		NA	
2,6-Dinitrotoluene	0.2	U	2.7	K	0.2	U	0.2	U	0.13	J	NA	
2-Amino-4,6-dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Nitrotoluene	0.2	U	1.7	K	0.14	J	0.2	U	1.7	U	1.4	U
3-Nitrotoluene	0.2	U	0.32	K	0.2	U	0.2	U	0.2	U	0.2	R

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Table 1-1
Raw Compounds and Analytes for Site 11 Insitu Groundwater Samples
IHDIV-NSWC
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
4-Amino-2,6-dinitrotoluene	0.2	U	0.2	U	0.2	U	0.1	J	0.2	U	0.2	U
4-Nitrotoluene	0.2	U	1.5		0.39		0.2	U	1.5	U	1	U
Ammonium perchlorate	4	U	4	U	4	U	4	U	0.25	J	4	U
HMX	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Nitrobenzene	0.2	U	0.2	U	0.13	J	0.077	J	0.2	U	0.2	U
Nitroglycerin	30	U	30	U	30	U	30	U	30	U	30	U
Nitroguanidine	20	U	20	U	20	U	20	U	20	U	20	U
PETN	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
RDX	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetryl	0.2	U	0.2	U	0.2	U	0.068	J	0.2	U	0.2	U
Total Metals (UG/L)												
Aluminum	80,900		38,200		15,700		6,300		2,930		3,250	
Antimony	6.7	L	6.1	L	254	L	15.6	L	4.3	U	82.7	
Arsenic	44.4	J	39.7		24.5		10.3		3.6	U	9.4	J
Barium	647	J	1,980		7,900		1,650		2,200		1,520	
Beryllium	3.6	B	10.3		0.2	U	0.31	B	0.2	U	0.2	U
Cadmium	2.2	B	3	J	27.1		9.2		1.7	B	10.5	
Calcium	37,600		186,000		226,000		46,800		76,800		65,100	
Chromium	91.3		94.8		97.5		19.2		11.8		14.4	
Cobalt	56.3	J	83.2		31	J	6.2	J	6	J	3.8	J
Copper	105		56.8		802		133		6.8	J	238	
Cyanide	1.3	B	1.2		1.8		10	U	2.8		5.7	
Iron	125,000		211,000		165,000		26,500		84,000		23,100	
Lead	288		222		4,170		684		157		673	
Magnesium	17,300		120,000		60,500		38,000		38,000		44,600	
Manganese	2,710		7,460		3,980		349		884		456	
Mercury	0.81		107		8.3		0.35		0.18	J	1.1	
Nickel	69.9		120		124		18.6	J	29.4	J	25.7	J
Potassium	10,400		20,200		59,700		32,300		30,700		40,900	
Selenium	4.3	U	5.3		4.3	U	4.3	U	4.3	U	4.3	U
Silver	7.5	J	16.3		170		10.4		4.7	J	50.8	

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IHDIV-NSWC
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Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
Sodium	25,000		45,000		108,000		104,000		100,000		113,000	
Thallium	9.4	J	16.5		9	J	5.3	U	7.8	J	5.3	U
Vanadium	141		226		39.7	J	33.1	J	5.5	J	10.6	J
Zinc	412	J	767	J	13,900	J	1,240		1,500	J	1,090	
Dissolved Metals (UG/L)												
Aluminum	160	B	82.4	B	25.1	B	26.5	B	18.8	U	18.8	U
Antimony	4.3	U	4.3	U	14.2	B	4.3	U	4.3	U	55.1	J
Arsenic	8.7	J	3.6	U	4.9	J	3.6	U	4.2	J	3.6	U
Barium	133	J	208		2,510		1,600		1,770		1,190	
Beryllium	0.2	U	0.23	B	0.2	U	0.2	U	0.2	U	0.2	U
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Calcium	35,800		69,400		55,900		46,900		58,600		53,100	
Chromium	2	U	2	U	2	U	2	U	2	U	2	U
Cobalt	3.8	J	2.5	J	2.2	U	2.2	U	2.2	U	2.2	U
Copper	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	4.7	J
Iron	24,300		33,600		7,610		2,010		16,700		96.6	B
Lead	1.3	U	1.3	U	4.6		1.3	U	1.3	U	3.5	
Magnesium	11,500		29,200		35,000		39,200		34,300		44,600	
Manganese	2,230		2,450		282		110		125		210	
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	4.1	J	4.4	J	3.2	J	1.9	J	2.7	J	8.7	J
Potassium	6,100		8,070		45,100		33,000		28,000		41,600	
Selenium	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U
Silver	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U
Sodium	27,800		32,700		94,600		106,000		97,700		121,000	
Thallium	5.3	U	5.3	U	5.3	U	5.3	U	5.3	J	5.3	U
Vanadium	2.3	J	1.4	U	1.4	U	1.4	U	1.4	J	1.4	U
Zinc	19.1		11.5	B	72.6		17.1	B	26.5	J	42.4	
Total Petroleum Hydrocarbons (UG/L)												
TPH-diesel range	310		530		1,400		190		770		1,200	

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IHDIV-NSWC
Sites 11, 13, 17, 21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11GW01		IS11GW02		IS11GW03		IS11GW04		IS11GW05		IS11GW06	
Sample ID	IS11GW010700		IS11GW020700		IS11GW030700		IS11GW040700		IS11GW050700		IS11GW060700	
Sample Date	07/24/00		07/25/00		07/25/00		07/25/00		07/25/00		07/25/00	
Chemical Name												
TPH-gas range	100	U	100	U	100	U	100	U	100	U	100	U

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Table 1-2
Raw Compounds and Analytes for Site 11 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03		IS11MW03		IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	4.5	J	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2- trifluoroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	3.8	J	10	U
1,1-Dichloroethene	10	U	10	U	10	U	10	U	2.6	J	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	R	10	R	10	R	10	R	10	R	10	U
1,2-Dibromoethane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	NA		10	U	NA		NA		NA		NA	
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	10	U
Acetone	3.6	B	2.8	B	3.6	B	3.5	B	3.1	B	2.8	B
Benzene	10	U	10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U	10	U	10	U	10	U
Carbon tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
Chloroethane	3.8	J	10	U	10	U	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Cumene	10	U	10	U	10	U	10	U	10	U	10	U
Cyclohexane	10	U	10	U	10	U	10	U	10	U	10	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03		IS11MW03		IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane	10	U	10	U	10	U	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U
Methyl acetate	10	U	10	U	4.4	J	5	J	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U	10	U	10	U	10	U
Methylene chloride	2.4	B	2.5	B	2.7	B	3	B	2.5	B	2.8	B
Styrene	10	U	10	U	10	U	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U	10	U	10	U	10	U
Toluene	10	U	10	U	16		18		10	U	10	U
Trichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
Trichlorofluoromethane	10	U	10	U	10	U	10	U	10	U	10	U
Vinyl chloride	10	U	10	U	10	U	10	U	10	U	10	U
Xylene, total	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U
Semi-volatile Organic Compounds (UG/L)												
1,1-Biphenyl	10	U	NA		10	U	10	U	10	U	10	U
2,2'-Oxybis(1-chloropropane)	10	U	NA		10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol	25	U	NA		25	U	25	U	25	U	25	U
2,4,6-Trichlorophenol	10	U	NA		10	U	10	U	10	U	10	U
2,4-Dichlorophenol	10	U	NA		10	U	10	U	10	U	10	U
2,4-Dimethylphenol	10	U	NA		10	U	10	U	10	U	10	U
2,4-Dinitrophenol	25	U	NA		25	U	25	U	25	U	25	U
2-Chloronaphthalene	10	U	NA		10	U	10	U	10	U	10	U
2-Chlorophenol	10	U	NA		10	U	10	U	10	U	10	U
2-Methylnaphthalene	10	U	NA		10	U	10	U	10	U	10	U
2-Methylphenol	10	U	NA		10	U	10	U	10	U	10	U
2-Nitroaniline	25	U	NA		25	U	25	U	25	U	25	U
2-Nitrophenol	10	U	NA		10	U	10	U	10	U	10	U

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Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03		IS11MW03		IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
3,3'-Dichlorobenzidine	10	U	NA		10	U	10	U	10	U	10	U
3-Nitroaniline	25	U	NA		25	U	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	NA		25	U	25	U	25	U	25	U
4-Bromophenyl-phenylether	10	U	NA		10	U	10	U	10	U	10	U
4-Chloro-3-methylphenol	10	U	NA		10	U	10	U	10	U	10	U
4-Chloroaniline	10	U	NA		10	U	10	U	10	U	10	U
4-Chlorophenyl-phenylether	10	U	NA		10	U	10	U	10	U	10	U
4-Methylphenol	10	U	NA		23		14		10	U	10	U
4-Nitroaniline	25	U	NA		25	U	25	U	25	U	25	U
4-Nitrophenol	25	U	NA		25	U	25	U	25	U	25	U
Acenaphthene	10	U	NA		10	U	10	U	10	U	10	U
Acenaphthylene	10	U	NA		10	U	10	U	10	U	10	U
Acetophenone	10	U	NA		10	U	10	U	10	U	10	U
Anthracene	10	U	NA		10	U	10	U	10	U	10	U
Atrazine	10	U	NA		10	U	10	U	10	U	10	U
Benzaldehyde	10	U	NA		10	U	10	U	10	U	10	U
Benzo(a)anthracene	10	U	NA		10	U	10	U	10	U	10	U
Benzo(a)pyrene	10	U	NA		10	U	10	U	10	U	10	U
Benzo(b)fluoranthene	10	U	NA		10	U	10	U	10	U	10	U
Benzo(g,h,i)perylene	10	U	NA		10	U	10	U	10	U	10	U
Benzo(k)fluoranthene	10	U	NA		10	U	10	U	10	U	10	U
Butylbenzylphthalate	10	U	NA		10	U	10	U	10	U	10	U
Caprolactam	10	U	NA		10	U	10	U	10	U	10	U
Carbazole	10	U	NA		10	U	10	U	10	U	10	U
Chrysene	10	U	NA		10	U	10	U	10	U	10	U
Di-n-butylphthalate	10	U	NA		10	U	10	U	10	U	10	U
Di-n-octylphthalate	10	U	NA		10	U	10	U	10	U	10	U
Dibenz(a,h)anthracene	10	U	NA		10	U	10	U	10	U	10	U
Dibenzofuran	10	U	NA		10	U	10	U	10	U	10	U
Diethylphthalate	10	U	NA		10	U	10	U	10	U	10	U
Dimethyl phthalate	10	U	NA		10	U	10	U	10	U	10	U
Fluoranthene	10	U	NA		10	U	10	U	10	U	10	U
Fluorene	10	U	NA		10	U	10	U	10	U	10	U

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Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03		IS11MW03		IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
Hexachlorobenzene	10	U	NA		10	U	10	U	10	U	10	U
Hexachlorobutadiene	10	U	NA		10	U	10	U	10	U	10	U
Hexachlorocyclopentadiene	10	U	NA		10	U	10	U	10	U	10	U
Hexachloroethane	10	U	NA		10	U	10	U	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	NA		10	U	10	U	10	U	10	U
Isophorone	10	U	NA		10	U	10	U	10	U	10	U
Naphthalene	10	U	NA		10	U	10	U	10	U	10	U
Pentachlorophenol	25	U	NA		25	U	25	U	25	U	25	U
Phenanthrene	10	U	NA		10	U	10	U	10	U	10	U
Phenol	10	U	NA		10	U	10	U	10	U	10	U
Pyrene	10	U	NA		10	U	10	U	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	NA		10	U	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	NA		10	U	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	17	B	NA		10	U	10	U	2	B	2	B
n-Nitroso-di-n-propylamine	10	U	NA		10	U	10	U	10	U	10	U
n-Nitrosodiphenylamine	10	U	NA		10	U	10	U	10	U	10	U
Explosives (UG/L)												
1,3,5-Trinitrobenzene	0.2	U	NA		0.2	U	0.2	U	0.2	U	0.2	U
1,3-Dinitrobenzene	0.064	J	NA		0.2	U	0.2	U	0.2	U	0.066	J
2,4,6-Trinitrotoluene	0.2	U	NA		0.2	U	0.2	U	0.2	U	0.2	U
2,4-Dinitrotoluene	0.2	U	NA		0.2	U	0.16	J	0.2	U	0.2	U
2,6-Dinitrotoluene	0.2	U	NA		0.2	U	0.11	J	0.2	U	0.2	U
2-Amino-4,6-dinitrotoluene	0.2	U	NA		0.2	U	0.2	U	0.2	U	0.2	U
2-Nitrotoluene	0.2	U	NA		0.2	U	0.2	U	0.29	U	0.15	J
3-Nitrotoluene	0.97	U	NA		1.4	U	1.2	U	0.15	J	0.2	U
4-Amino-2,6-dinitrotoluene	0.2	U	NA		0.2	U	0.2	U	0.2	U	0.2	U
4-Nitrotoluene	0.15	J	NA		0.37		0.29		0.2	U	0.2	U
Ammonium perchlorate	4	U	NA		4	U	4	U	4	U	4	U
HMX	0.5	U	NA		0.5	U	0.5	U	0.5	U	0.5	U
Nitrobenzene	0.2	U	NA		0.2	U	0.2	U	0.2	U	0.2	U
Nitroglycerin	30	U	NA		30	U	30	U	30	U	30	U
Nitroguanidine	20	U	NA		20	U	20	U	20	U	20	U

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UL

Table 1-2
Raw Compounds and Analytes for Site 11 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03				IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
PETN	2.5	U	NA		2.5	U	2.5	U	2.5	U	2.5	U
RDX	0.5	U	NA		0.5	U	0.5	U	0.16	J	0.5	U
Tetryl	0.2	U	NA		0.2	U	0.2	U	0.12	J	0.2	U
Total Metals (UG/L)												
Aluminum	1,350		53.6	B	2,180		1,100		31,400		10,700	
Antimony	3.7	J	4.2	J	3.1	U	3.1	U	3.1	U	4.3	U
Arsenic	4	J	4.5	J	3.2	U	3.2	U	8.2	J	3.6	U
Barium	1,680		685		237		218		319		319	
Beryllium	0.08	U	0.08	U	0.19	B	0.18	B	2.2	B	1.1	J
Cadmium	0.79	B	0.25	U	0.25	U	0.25	U	0.25	U	0.71	J
Calcium	56,400		62,200		85,400		80,800		8,690		6,340	J
Chromium	5.3	J	1.1	J	9.2	J	4.4	J	59.6		37.8	
Cobalt	0.83	U	1	J	2.6	J	1.5	J	59.7		17.1	J
Copper	20.7	J	1.4	J	5.1	J	4.1	J	33.9		21.1	J
Cyanide	10.1	L	10	UL	10	UL	10	UL	10	UL	10	UL
Iron	14,000		8,590		37,800		34,800		51,000		15,600	
Lead	78.6		14.5		6.1		3.5		20.7		8	
Magnesium	35,600		32,300		25,500		22,200		9,700		4,600	J
Manganese	188		2,360		2,570		2,480		928		337	J
Mercury	0.1		0.1		0.1	U	0.1	U	0.1	U	0.1	U
Nickel	4.2	J	2	J	7.3	J	2.9	J	110		61.7	
Potassium	30,900		41,200		8,710		8,110		3,350	J	2,190	J
Selenium	4	U	4	U	4	U	4	U	4	U	4.3	U
Silver	6.1	J	1.1	U	2.1	J	1.1	U	1.1	U	3.1	U
Sodium	98,400		81,300		33,400		32,200		43,500		26,100	
Thallium	9.8	B	6.8	U	6.8	U	6.8	U	6.8	U	5.3	U
Vanadium	2.2	J	0.76	U	5.3	J	2.9	J	55.4		21	J
Zinc	195		196		39.9		25.7		217		93	J
Dissolved Metals (UG/L)												
Aluminum	67	B	27.7	B	80.4	B	96	B	116	B	1,330	
Antimony	3.1	U	5	J	3.1	U	3.1	U	3.1	U	4.3	U

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Table 1-2
Raw Compounds and Analytes for Site 11 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11MW01		IS11MW02		IS11MW03		IS11MW03		IS11MW04		IS11MW05	
Sample ID	IS11MW010900		IS11MW020900		IS11MW030900		IS11MW030900P		IS11MW040900		IS11MW050900	
Sample Date	09/11/00		09/11/00		09/11/00		09/11/00		09/11/00		09/08/00	
Chemical Name												
Arsenic	3.2	U	5.1	J	3.2	U	3.2	U	3.2	U	3.6	U
Barium	1,630		792		215		223		138	J	24.5	J
Beryllium	0.08	U	0.08	U	0.15	B	0.18	B	0.61	B	0.2	U
Cadmium	0.25	U	0.25	U	0.25	U	0.25	U	0.62	J	0.47	J
Calcium	54,500		66,000		81,800		84,700		7,550		1,960	J
Chromium	1.1	U	1.2	B	1.1	U	1.7	B	1.1	U	9.2	J
Cobalt	0.83	U	1	J	0.83	U	0.83	U	35	J	3.7	J
Copper	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.9	U
Iron	10,900		9,240		34,200		35,300		76.8	B	2,040	
Lead	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.3	U
Magnesium	34,500		33,300		23,100		23,800		6,240		1,290	J
Manganese	165		2,320		2,500		2,590		712		90.3	J
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	2	U	2.6	J	2	U	2	U	58		16.2	J
Potassium	30,100		42,200		8,220		8,590		512	B	578	J
Selenium	4	U	4	U	4	U	4	U	4	U	4.3	U
Silver	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	3.1	U
Sodium	94,800		84,900		31,300		32,700		42,500		29,900	
Thallium	8.2	B	6.8	U	6.8	U	6.8	U	6.8	U	5.3	U
Vanadium	0.76	U	0.76	U	1.1	J	1.1	J	0.76	U	2.6	J
Zinc	7.6	B	181		11.9	B	9.8	B	63.3		34.5	J
Total Petroleum Hydrocarbons (UG/L)												
TPH-diesel range	370	B	220	B	300	B	110	B	100	U	100	U
TPH-gas range	100	U	100	U	100	U	100	U	100	U	100	U

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Table 1-3
Raw Compounds and Analytes for Site 11 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21,and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
1,1,1-Trichloroethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,1,2,2-Tetrachloroethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,1,2-Trichloro-1,2,2- trifluoroethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,1,2-Trichloroethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,1-Dichloroethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,1-Dichloroethene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,2,4-Trichlorobenzene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,2-Dibromo-3-chloropropane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,2-Dibromoethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,2-Dichlorobenzene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,2-Dichloroethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,2-Dichloroethene (total)	14	U	NA		NA		NA		NA		NA		28	U
1,2-Dichloropropane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,3-Dichlorobenzene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
1,4-Dichlorobenzene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
2-Butanone	14	J	13	U	13	U	13	U	17	J	24	J	42	J
2-Hexanone	14	U	13	U	13	U	13	U	26	U	21	U	28	U
4-Methyl-2-pentanone	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Acetone	8.7	B	13	U	13	U	13	U	82	J	110	J	130	J
Benzene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Bromodichloromethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Bromoform	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Bromomethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Carbon disulfide	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Carbon tetrachloride	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Chlorobenzene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Chloroethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Chloroform	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Chloromethane	14	J	13	U	13	U	13	U	12	J	10	J	28	U
Cumene	14	U	13	U	13	U	13	U	26	U	21	U	28	U

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UL

Table 1-3
Raw Compounds and Analytes for Site 11 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21,and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Cyclohexane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Dibromochloromethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Dichlorodifluoromethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Ethylbenzene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Methyl acetate	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Methyl-tert-butyl ether (MTBE)	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Methylcyclohexane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Methylene chloride	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Styrene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Tetrachloroethene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Toluene	14	U	13	U	13	U	13	U	5.5	J	21	U	28	U
Trichloroethene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Trichlorofluoromethane	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Vinyl chloride	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Xylene, total	14	U	13	U	13	U	13	U	26	U	21	U	28	U
cis-1,2-Dichloroethene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
cis-1,3-Dichloropropene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
trans-1,2-Dichloroethene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
trans-1,3-Dichloropropene	14	U	13	U	13	U	13	U	26	U	21	U	28	U
Semi-volatile Organic Compounds (UG/KG)														
1,1-Biphenyl	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2,2'-Oxybis(1-chloropropane)	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2,4,5-Trichlorophenol	1,100	U	1,100	U	1,100	U	1,100	U	2,100	U	1,700	U	2,400	U
2,4,6-Trichlorophenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2,4-Dichlorophenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2,4-Dimethylphenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2,4-Dinitrophenol	1,100	U	1,100	R	1,100	R	1,100	R	2,100	R	1,700	R	2,400	U
2-Chloronaphthalene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2-Chlorophenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2-Methylnaphthalene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
2-Methylphenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U

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Table 1-3
Raw Compounds and Analytes for Site 11 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21,and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
2-Nitroaniline	1,100	U	1,100	U	1,100	U	1,100	U	2,100	U	1,700	U	2,400	U
2-Nitrophenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
3,3'-Dichlorobenzidine	450	U	440	U	420	U	420	U	850	U	680	U	940	U
3-Nitroaniline	1,100	U	1,100	U	1,100	U	1,100	U	2,100	U	1,700	U	2,400	U
4,6-Dinitro-2-methylphenol	1,100	R	1,100	U	1,100	U	1,100	U	2,100	U	1,700	U	2,400	U
4-Bromophenyl-phenylether	450	U	440	U	420	U	420	U	850	U	680	U	940	U
4-Chloro-3-methylphenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
4-Chloroaniline	450	U	440	U	420	U	420	U	850	U	680	U	940	U
4-Chlorophenyl-phenylether	450	U	440	U	420	U	420	U	850	U	680	U	940	U
4-Methylphenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
4-Nitroaniline	1,100	U	1,100	U	1,100	U	1,100	U	2,100	U	1,700	U	2,400	U
4-Nitrophenol	1,100	U	1,100	U	1,100	U	1,100	U	2,100	U	1,700	U	2,400	U
Acenaphthene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Acenaphthylene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Acetophenone	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Anthracene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Atrazine	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Benzaldehyde	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Benzo(a)anthracene	450	U	250	J	420	U	420	U	850	U	91	J	940	U
Benzo(a)pyrene	450	U	77	J	420	U	420	U	850	U	680	U	940	U
Benzo(b)fluoranthene	450	U	400	J	51	J	420	U	850	U	130	J	940	U
Benzo(g,h,i)perylene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Benzo(k)fluoranthene	450	U	170	J	420	U	420	U	850	U	680	U	940	U
Butylbenzylphthalate	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Caprolactam	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Carbazole	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Chrysene	450	U	370	J	46	J	420	U	850	U	110	J	940	U
Di-n-butylphthalate	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Di-n-octylphthalate	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Dibenz(a,h)anthracene	450	U	55	J	420	U	420	U	850	U	680	U	940	U
Dibenzofuran	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Diethylphthalate	450	U	440	U	420	U	420	U	850	U	680	U	940	U

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Table 1-3
Raw Compounds and Analytes for Site 11 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21,and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Dimethyl phthalate	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Fluoranthene	450	U	300	J	56	J	420	U	850	U	200	J	110	J
Fluorene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Hexachlorobenzene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Hexachlorobutadiene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Hexachlorocyclopentadiene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Hexachloroethane	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Indeno(1,2,3-cd)pyrene	450	U	92	J	420	U	420	U	850	U	680	U	940	U
Isophorone	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Naphthalene	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Pentachlorophenol	1,100	U	1,100	U	1,000	U	1,000	U	2,100	U	1,600	U	2,300	U
Phenanthrene	450	U	79	J	420	U	420	U	850	U	74	J	940	U
Phenol	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Pyrene	450	U	240	J	48	J	420	U	850	U	99	J	140	J
bis(2-Chloroethoxy)methane	450	U	440	U	420	U	420	U	850	U	680	U	940	U
bis(2-Chloroethyl)ether	450	U	440	U	420	U	420	U	850	U	680	U	940	U
bis(2-Ethylhexyl)phthalate	450	U	440	U	150	J	67	J	120	J	110	J	940	U
n-Nitroso-di-n-propylamine	450	U	440	U	420	U	420	U	850	U	680	U	940	U
n-Nitrosodiphenylamine	450	U	440	U	420	U	420	U	850	U	680	U	940	U
Explosives (UG/KG)														
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	180	J	250	U	250	U	250	U	250	U	150	J	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	250	U	250	U	250	U	140	J	250	U	160	J	250	U
Ammonium perchlorate	130	U	230	U	110	U	100	U	150	U	160	U	220	U

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Table 1-3
Raw Compounds and Analytes for Site 11 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21,and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
HMX	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Nitroglycerin	1,200	U	1,200	U	1,300	U	1,200	U	2,600	U	2,100	U	3,000	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)														
Aluminum	8,230		2,450		3,740		1,900		9,720		8,940		11,100	
Antimony	22.8	L	63.9	L	33.6	L	34.4	L	3.3	L	1.8	UL	2.4	UL
Arsenic	6.7	J	15.2	J	24.5	J	18.9	J	6.5	J	7.7	J	11.8	J
Barium	169		86.4		50.4	J	112		111		89.4		140	
Beryllium	0.055	U	0.095	B	0.058	B	0.072	B	0.52	B	0.44	B	0.76	B
Cadmium	1.2	L	4.5	L	6.5	L	4.9	L	1.9	L	1.3	L	4.2	L
Calcium	3,610	J	22,100	J	632	J	1,070	J	2,250	J	3,320	J	3,510	J
Chromium	14.2	L	57.2	L	28.8	L	69.7	L	22.6	L	16.6	L	28.9	L
Cobalt	5.1	B	6.3	J	7.4	J	14		12.7	J	10.9	J	16.8	J
Copper	757	L	149	L	343	L	650	L	83.1	L	50.3	L	222	J
Cyanide	2.7	U	2.6	U	2.6	U	0.12	J	5.1	U	4.1	U	5.7	U
Iron	23,100	J	8,360	J	134,000	J	129,000	J	32,900	J	28,800	J	41,800	J
Lead	76,400	J	1,160	J	375	J	1,000	J	113	J	53.2	J	272	J
Magnesium	2,660	J	3,190	J	717	J	688	J	1,840	J	1,370	J	1,700	J
Manganese	330	J	637	J	432	J	940	J	517	J	302	J	430	J
Mercury	0.2		0.081	J	0.53		0.11	J	0.19	J	0.17	J	0.36	
Nickel	14.6	L	45.1	L	29.5	L	46.4	L	20.8	L	16.6	L	33.2	L
Potassium	454	J	182	J	164	J	131	J	780	J	673	J	1,070	J
Selenium	1.2	UL	1.1	UL	1.7	L	2.2	UL	2.2	UL	1.8	UL	2.4	UL
Silver	8.7		0.82	U	10.9		7.5		3.8	J	1.5	J	2.8	J
Sodium	428	B	332	B	226	B	378	B	638	B	603	B	807	B
Thallium	4.2		1.4	U	1.5	J	2.7	U	2.7	U	2.2	U	3	U
Vanadium	22.1		16.1		12.9		14.1	J	29		26.7		43.4	

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Table 1-3
Raw Compounds and Analytes for Site 11 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21,and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SD01		IS11SD02		IS11SD03		IS11SD04		IS11SD05		IS11SD06		IS11SD07	
Sample ID	IS11SD010001		IS11SD020001		IS11SD030001		IS11SD040001		IS11SD050001		IS11SD060001		IS11SD070001	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Zinc	1,310	J	847	J	898	J	1,910	J	258	J	147	J	800	J
Wet Chemistry (MG/KG)														
% Moisture	26.6		24.3		22.1		21.2		61.1		51.5		64.8	
Total Petroleum Hydrocarbons (MG/KG)														
TPH-diesel range	4.1	U	13		26		15		69		11		13	
TPH-gas range	0.14	U	0.13	U	0.13	U	0.13	U	0.26	U	0.21	U	0.28	U

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Table 1-4
Raw Compounds and Analytes for Site 11 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
1,1,1-Trichloroethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,1,2,2-Tetrachloroethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,1,2-Trichloro-1,2,2- trifluoroethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,1,2-Trichloroethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,1-Dichloroethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,1-Dichloroethene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,2,4-Trichlorobenzene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,2-Dibromo-3-chloropropane	14	R	12	R	12	U	12	U	14	U	13	R	13	U
1,2-Dibromoethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,2-Dichlorobenzene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,2-Dichloroethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		13	U
1,2-Dichloropropane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,3-Dichlorobenzene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
1,4-Dichlorobenzene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
2-Butanone	14	U	12	U	12	U	12	U	14	U	1.3	B	4.3	J
2-Hexanone	14	U	12	U	12	U	12	U	14	U	13	U	13	U
4-Methyl-2-pentanone	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Acetone	14	U	2.6	J	7.6	B	2.6	B	2.8	B	2	B	17	
Benzene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Bromodichloromethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Bromoform	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Bromomethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Carbon disulfide	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Carbon tetrachloride	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Chlorobenzene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Chloroethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Chloroform	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Chloromethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Cumene	14	U	12	U	12	U	12	U	14	U	13	U	13	U

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Table 1-4
Raw Compounds and Analytes for Site 11 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
Cyclohexane	4.5	J	2.3	J	12	U	12	U	14	U	13	U	13	U
Dibromochloromethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Dichlorodifluoromethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Ethylbenzene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Methyl acetate	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Methyl-tert-butyl ether (MTBE)	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Methylcyclohexane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Methylene chloride	14	U	12	U	12	U	12	U	1.5	B	13	U	13	U
Styrene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Tetrachloroethene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Toluene	14	U	12	U	3.3	J	12	U	14	U	13	U	13	U
Trichloroethene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Trichlorofluoromethane	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Vinyl chloride	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Xylene, total	1.8	J	12	U	12	U	9	J	14	U	2.4	J	13	U
cis-1,2-Dichloroethene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
cis-1,3-Dichloropropene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
trans-1,2-Dichloroethene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
trans-1,3-Dichloropropene	14	U	12	U	12	U	12	U	14	U	13	U	13	U
Semi-volatile Organic Compounds (UG/KG)														
1,1-Biphenyl	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2,2'-Oxybis(1-chloropropane)	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2,4,5-Trichlorophenol	1,200	U	970	U	970	U	980	U	1,100	U	1,000	U	1,000	U
2,4,6-Trichlorophenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2,4-Dichlorophenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2,4-Dimethylphenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2,4-Dinitrophenol	1,200	R	970	R	970	U	980	U	1,100	U	1,000	R	1,000	UJ
2-Chloronaphthalene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2-Chlorophenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2-Methylnaphthalene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
2-Methylphenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U

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Table 1-4
Raw Compounds and Analytes for Site 11 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
2-Nitroaniline	1,200	U	970	U	970	U	980	U	1,100	U	1,000	U	1,000	U
2-Nitrophenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
3,3'-Dichlorobenzidine	470	U	390	U	390	U	390	U	450	U	410	U	410	U
3-Nitroaniline	1,200	U	970	U	970	U	980	U	1,100	U	1,000	U	1,000	U
4,6-Dinitro-2-methylphenol	1,200	U	970	U	970	U	980	U	1,100	U	1,000	U	1,000	UJ
4-Bromophenyl-phenylether	470	U	390	U	390	U	390	U	450	U	410	U	410	U
4-Chloro-3-methylphenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
4-Chloroaniline	470	U	390	U	390	U	390	U	450	U	410	U	410	U
4-Chlorophenyl-phenylether	470	U	390	U	390	U	390	U	450	U	410	U	410	U
4-Methylphenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
4-Nitroaniline	1,200	U	970	U	970	U	980	U	1,100	U	1,000	U	1,000	U
4-Nitrophenol	1,200	U	970	U	970	U	980	U	1,100	U	1,000	U	1,000	U
Acenaphthene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Acenaphthylene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Acetophenone	65	J	390	U	390	U	390	U	450	U	410	U	48	J
Anthracene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Atrazine	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Benzaldehyde	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Benzo(a)anthracene	470	U	390	U	390	U	390	U	450	U	410	U	63	J
Benzo(a)pyrene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Benzo(b)fluoranthene	470	U	390	U	390	U	390	U	450	U	410	U	110	J
Benzo(g,h,i)perylene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Benzo(k)fluoranthene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Butylbenzylphthalate	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Caprolactam	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Carbazole	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Chrysene	470	U	390	U	390	U	390	U	450	U	410	U	76	J
Di-n-butylphthalate	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Di-n-octylphthalate	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Dibenz(a,h)anthracene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Dibenzofuran	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Diethylphthalate	470	U	390	U	390	U	390	U	450	U	410	U	43	J

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Table 1-4
Raw Compounds and Analytes for Site 11 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
Dimethyl phthalate	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Fluoranthene	470	U	390	U	390	U	390	U	450	U	410	U	120	J
Fluorene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Hexachlorobenzene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Hexachlorobutadiene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Hexachlorocyclopentadiene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Hexachloroethane	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Indeno(1,2,3-cd)pyrene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Isophorone	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Naphthalene	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Nitrobenzene	NA		NA		NA		NA		NA		NA		410	U
Pentachlorophenol	1,100	U	940	U	940	U	940	U	1,100	U	1,000	U	1,000	U
Phenanthrene	470	U	390	U	390	U	390	U	450	U	410	U	49	J
Phenol	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Pyrene	470	U	390	U	390	U	390	U	450	U	410	U	48	J
bis(2-Chloroethoxy)methane	470	U	390	U	390	U	390	U	450	U	410	U	410	U
bis(2-Chloroethyl)ether	470	U	390	U	390	U	390	U	450	U	410	U	410	U
bis(2-Ethylhexyl)phthalate	470	U	47	J	390	U	390	U	450	U	410	U	890	
n-Nitroso-di-n-propylamine	470	U	390	U	390	U	390	U	450	U	410	U	410	U
n-Nitrosodiphenylamine	470	U	390	U	390	U	390	U	450	U	410	U	410	U
Explosives (UG/KG)														
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	33	J	250	U	250	U	250	U	250	U	32	J	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U

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Table 1-4
Raw Compounds and Analytes for Site 11 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
Ammonium perchlorate	100	U	91	U	97	U	96	U	100	U	110	U	100	U
HMX	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Nitroglycerin	1,200	U	1,200	U	1,200	U	1,100	U	1,400	U	1,300	U	1,300	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)														
Aluminum	9,660		4,530		9,430	J	10,500	J	17,900	J	15,400		10,500	
Antimony	1.2	UL	1	UL	1	UL	1	UL	1.2	UL	1.1	UL	1.1	R
Arsenic	3		1.7	J	6.8	L	4.3	L	5.1	L	4.3		3.6	L
Barium	46.7	J	40.1	J	36.7	J	40.9	J	65.5		64		85	
Beryllium	0.17	B	0.41	B	0.25	B	0.28	J	0.36	B	0.39	J	0.59	B
Cadmium	0.77	J	0.17		0.1	J	0.095		0.14	J	0.38	B	0.82	B
Calcium	290	J	79.2	B	170	J	75.4	J	130	J	134	B	1,780	J
Chromium	13.7		6.8		12.5		12.4		19.3		15.7		20	
Cobalt	4.6	J	3.6	J	5.4	J	5.5	J	4.9	J	4.3	J	14	
Copper	12.4		3.9	J	7.5		6.3		8.6		6.4	J	57	J
Cyanide	2.8	U	2.3	U	0.59		0.59		0.68		2.5	U	0.16	B
Iron	15,400	J	7,850	J	23,800		16,100		36,800		26,000	K	25,500	
Lead	15.8	K	5.5	K	7.6		8.7		13.7		12.5	J	58.1	J
Magnesium	799	J	1,100	J	664	J	501	J	819	J	642	J	2,980	
Manganese	19.1	J	38.8	J	120		39.7		23.7		15.9	J	346	L
Mercury	0.071	UL	0.059	UL	0.059	UL	0.059	UL	0.18	L	0.063	UL	0.078	L
Nickel	7.1	J	3.9	J	7.2	J	6.5	J	8.1	J	6.4	J	23.5	
Potassium	617	J	353	J	524	J	565	J	653	J	548	J	1,040	B
Selenium	1.2	UL	1	UL	1	U	1		1.2		1.1	UL	1.1	U
Silver	0.88	U	0.73	U	0.73		0.73		0.85		0.78	U	3.2	J
Sodium	546	B	296	B	103		104		120		447	B	422	B
Thallium	1.5	U	1.2	U	1.2	U	1.3		1.4		1.3	U	1.3	U

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Table 1-4
Raw Compounds and Analytes for Site 11 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO20		IS11SO21		IS11SO39		IS11SO40		IS11SO41		IS11SO42		IS11SO43	
Sample ID	IS11SB120103		IS11SB090102		IS11SB230203		IS11SB240203		IS11SB250203		IS11SB260203		IS11SB040608	
Sample Date	07/26/00		07/26/00		08/04/00		08/04/00		08/04/00		07/27/00		07/25/00	
Chemical Name														
Vanadium	22.3		11.1	J	19.9		22.4		31.7		30.1		23.7	
Zinc	43.3	J	17.4	J	21	J	20.6	J	27.7	J	24.7	J	126	K
Wet Chemistry (MG/KG)														
% Moisture	29.6		14.5		14.5		15.3		26.6		20		20.1	
Total Petroleum Hydrocarbons (MG/KG)														
TPH-diesel range	4.3	U	3.5	U	3.5	U	3.5	U	4.1	U	3.8	U	31	
TPH-gas range	0.14	U	0.12	U	0.12	U	0.12	U	0.14	U	0.13	U	0.13	U

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Table 1-5
Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO06		IS11SO10		IS11SO13		IS11SO14		IS11SO15		IS11SO16		IS11SO17		IS11SO18	
Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
1,1,2,2-Tetrachloroethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
1,1,2-Trichloro-1,2,2- trifluoroethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
1,1,2-Trichloroethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
1,1-Dichloroethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
1,1-Dichloroethene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
1,2,4-Trichlorobenzene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
1,2-Dibromo-3-chloropropane	13	R	18	R	13	U	13	U	13	R	11	R	16	U	64	R
1,2-Dibromoethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
1,2-Dichlorobenzene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
1,2-Dichloroethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
1,3-Dichlorobenzene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
1,4-Dichlorobenzene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
2-Butanone	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
2-Hexanone	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
4-Methyl-2-pentanone	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
Acetone	13	U	18	UJ	3.6	B	3	B	13	U	1.2	B	2.7	B	27	B
Benzene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Bromodichloromethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Bromoform	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Bromomethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Carbon disulfide	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Carbon tetrachloride	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Chlorobenzene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
Chloroethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Chloroform	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Chloromethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Cumene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
Cyclohexane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Dibromochloromethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
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Station ID	IS11SO06		IS11SO10		IS11SO13		IS11SO14		IS11SO15		IS11SO16		IS11SO17		IS11SO18	
Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
Dichlorodifluoromethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Ethylbenzene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
Methyl acetate	1.7	J	4.2	J	13	U	1.6	J	13	U	11	U	16	U	24	J
Methyl-tert-butyl ether (MTBE)	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Methylcyclohexane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Methylene chloride	13	U	2.1	B	13	U	1.5	B	1.6	B	1.2	B	1.8	B	64	U
Styrene	13	U	18	UJ	13	U	13	U	13	U	11	U	32	J	23	J
TPH-gas range	NA		NA		NA		NA		NA		NA		NA		NA	
Tetrachloroethene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
Toluene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
Trichloroethene	13	U	3.9	J	13	U	13	U	13	U	11	U	16	U	64	U
Trichlorofluoromethane	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Vinyl chloride	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Xylene, total	13	U	18	UJ	13	U	13	U	13	U	11	U	16	UJ	64	U
cis-1,2-Dichloroethene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
cis-1,3-Dichloropropene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
trans-1,2-Dichloroethene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
trans-1,3-Dichloropropene	13	U	18	UJ	13	U	13	U	13	U	11	U	16	U	64	U
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2,2'-Oxybis(1-chloropropane)	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2,4,5-Trichlorophenol	1,100	U	3,000	U	1,000	U	1,100	U	1,100	U	930	U	1,300	U	1,100	U
2,4,6-Trichlorophenol	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2,4-Dichlorophenol	430	U	1,200	U	420	R	430	U	430	U	370	U	530	U	420	U
2,4-Dimethylphenol	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2,4-Dinitrophenol	1,100	R	3,000	R	1,000	U	1,100	R	1,100	R	930	R	1,300	R	1,100	R
2-Chloronaphthalene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2-Chlorophenol	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2-Methylnaphthalene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2-Methylphenol	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
2-Nitroaniline	1,100	U	3,000	U	1,000	U	1,100	U	1,100	U	930	U	1,300	U	1,100	U
2-Nitrophenol	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
3,3'-Dichlorobenzidine	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U

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Station ID	IS11SO06		IS11SO10		IS11SO13		IS11SO14		IS11SO15		IS11SO16		IS11SO17		IS11SO18	
Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
3-Nitroaniline	1,100	U	3,000	U	1,000	U	1,100	U	1,100	U	930	U	1,300	U	1,100	U
4,6-Dinitro-2-methylphenol	1,100	U	3,000	U	1,000	U	1,100	U	1,100	U	930	U	1,300	U	1,100	U
4-Bromophenyl-phenylether	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
4-Chloro-3-methylphenol	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
4-Chloroaniline	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
4-Chlorophenyl-phenylether	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
4-Methylphenol	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
4-Nitroaniline	1,100	U	3,000	U	1,000	U	1,100	U	1,100	U	930	U	1,300	U	1,100	U
4-Nitrophenol	1,100	U	3,000	U	1,000	U	1,100	U	1,100	U	930	U	1,300	U	1,100	U
4-Nitrotoluene	250	U	250	U	250	U	250		250	U	250	U	250	U	120	J
Acenaphthene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Acenaphthylene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Acetophenone	90	J	1,200	U	620		760		180	J	81	J	570		180	J
Anthracene	430	U	660	J	420	U	430	U	430	U	370	U	530	U	420	U
Atrazine	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Benzaldehyde	430	U	1,200	U	250	J	320	J	340	J	370	U	260	J	99	J
Benzo(a)anthracene	85	J	3,300		420	U	430	U	110	J	370	U	530	U	420	U
Benzo(a)pyrene	430	U	510	J	420	U	430	U	430	U	370	U	530	U	420	U
Benzo(b)fluoranthene	260	J	4,000		420	U	430	U	180	J	370	U	530	U	420	U
Benzo(g,h,i)perylene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Benzo(k)fluoranthene	86	J	2,200		420	U	430	U	430	U	370	U	530	U	420	U
Butylbenzylphthalate	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Caprolactam	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Carbazole	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Chrysene	210	J	3,500		420	U	430	U	130	J	370	U	530	U	420	U
Di-n-butylphthalate	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Di-n-octylphthalate	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Dibenz(a,h)anthracene	430	U	530	J	420	U	430	U	430	U	370	U	530	U	420	U
Dibenzofuran	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Diethylphthalate	45	J	1,200	U	420	U	430	U	430	U	160	J	530	U	420	U
Dimethyl phthalate	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Fluoranthene	300	J	6,800		420	U	430	U	180	J	370	U	530	U	420	U
Fluorene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Hexachlorobenzene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U

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Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO06		IS11SO10		IS11SO13		IS11SO14		IS11SO15		IS11SO16		IS11SO17		IS11SO18	
Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
Hexachlorobutadiene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Hexachlorocyclopentadiene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Hexachloroethane	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Indeno(1,2,3-cd)pyrene	49	J	640	J	420	U	430	U	430	U	370	U	530	U	420	U
Isophorone	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Naphthalene	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Pentachlorophenol	1,000	U	2,900	U	1,000	U	1,100	U	1,000	U	900	U	1,300	U	1,000	U
Phenanthrene	86	J	3,100		420	U	430	U	110	J	370	U	530	U	420	U
Phenol	430	U	1,200	U	120	J	430	U	430	U	370	U	530	U	420	U
Pyrene	170	J	2,400		420	U	430	U	430	U	370	U	530	U	420	U
bis(2-Chloroethoxy)methane	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
bis(2-Chloroethyl)ether	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
bis(2-Ethylhexyl)phthalate	430	U	240	J	420	U	430	U	130	J	370	U	530	U	420	U
n-Nitroso-di-n-propylamine	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
n-Nitrosodiphenylamine	430	U	1,200	U	420	U	430	U	430	U	370	U	530	U	420	U
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	150	J	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
Ammonium perchlorate	110	U	130	U	91	U	110	U	100	U	100	U	130	U	110	U
HMX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Nitroglycerin	1,300	U	1,600	U	1,100	U	1,200	U	1,200	U	1,300	U	1,400	U	1,300	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U

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Sites 11,13,17,21, and 25 RI Report
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Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)																
Aluminum	2,410		6,270		2,560		4,580		5,040		8,070		8,730		6,810	
Antimony	1.1	UL	3.2	UL	1.1	U	1.1	U	14.6	L	5.2	L	18.9	L	1.1	UL
Arsenic	2.6	L	26.2		7.1		1.9	L	8.9		5.4		9.4		5.3	
Barium	21.5	J	129		15.9	J	21.6	J	268		367		201		64.9	
Beryllium	0.052	U	0.21	B	0.11	J	0.09	B	0.086	B	0.17	B	0.48	B	0.52	B
Cadmium	1.3	J	39.9		0.21	J	0.15	J	8.7		1.4		8.6		1	J
Calcium	894	J	4,900	J	212	J	325	J	3,060	J	3,910	J	1,500	J	409	J
Chromium	5.4		24.1		8.5		5.9		28.6		21		22.7		12.2	
Cobalt	28.2	L	15	L	2.6	J	2.6	L	16.5		5.1	L	17		17.6	
Copper	20.5		520		19		4.7	J	427		337		89.8		16.8	
Cyanide	0.12	B	0.92	U	0.2	B	0.11	B	0.75	B	0.65	B	0.16	B	0.14	B
Iron	6,500		263,000		5,770		5,930		37,100		18,300		10,100		13,800	
Lead	64.8		976		93.5		19.4		1,060		849		6,010		451	
Magnesium	363	J	1,190	J	188	J	341	J	727	J	1,000	J	749	J	776	J
Manganese	240		1,330		28.7		21.9		506		167		325		362	
Mercury	0.22	L	0.3	L	0.26	L	0.066	UL	42	L	3.1	L	1.6	L	0.33	L
Nickel	5.2	J	30.7		3.5	J	4.5	J	189		17.4		19.8		10.5	
Potassium	170	J	447	J	207	J	284	J	407	J	877	J	685	J	551	J
Selenium	1.1	UL	3.2	UL	1.1	UL	1.1	UL	1.1	UL	0.96	UL	1.4	UL	1.1	UL
Silver	0.8	UL	1.6	L	0.8	J	0.82	U	22.3		10		15		1.5	J
Sodium	113	U	655	J	111	U	116	UL	115	U	167	J	142	U	113	U
Thallium	1.4	U	3.9	U	1.3	U	1.4	U	1.4	U	1.2	U	1.7	U	1.4	U
Vanadium	8.9	J	33.3	J	16.1		13.5		26.3		20.2		21.2		24.6	
Zinc	101	J	10,000	J	30.2	J	22.3	J	1,150	J	697	J	923	J	116	J
Wet Chemistry (MG/KG)																
% Moisture	22.5		45.4		20.5		24		23.5		10.7		38.2		21.9	
% Solids	NA		NA		NA		NA		NA		NA		NA		NA	
Total organic carbon (TOC)	NA		NA		NA		NA		NA		NA		NA		NA	
pH	NA		NA		NA		NA		NA		NA		NA		NA	

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Sample ID	IS11SS060001		IS11SS100001		IS11SS130001		IS11SS140001		IS11SS150001		IS11SS160001		IS11SS170001		IS11SS180001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name																
Total Petroleum Hydrocarbons (MG/KG)																
TPH-diesel range	9.4		80		18		54		310		8.8		65		82	
TPH-gas range	0.13	U	0.18	U	0.13	U	0.13	U	0.13	U	0.11	U	0.34		3.9	

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Station ID	IS11SO19		IS11SO20		IS11SO21		IS11SO22		IS11SO23		IS11SO24		IS11SO24		IS11SO25	
Sample ID	IS11SS190001		IS11SS200001		IS11SS210001		IS11SS220001		IS11SS230001		IS11SS240001		IS11SS240001P		IS11SS250001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
1,1,2,2-Tetrachloroethane	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
1,1,2-Trichloro-1,2,2- trifluoroethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
1,1,2-Trichloroethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	UJ
1,1-Dichloroethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
1,1-Dichloroethene	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
1,2,4-Trichlorobenzene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
1,2-Dibromo-3-chloropropane	18	R	13	R	12	R	11	R	12	R	14	U	14	U	18	UJ
1,2-Dibromoethane	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
1,2-Dichlorobenzene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
1,2-Dichloroethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		14	U	NA		NA	
1,2-Dichloropropane	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
1,3-Dichlorobenzene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
1,4-Dichlorobenzene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
2-Butanone	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
2-Hexanone	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
4-Methyl-2-pentanone	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Acetone	18	U	1.9	B	2.2	B	11	U	12	U	2	B	14	U	18	U
Benzene	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Bromodichloromethane	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Bromoform	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Bromomethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Carbon disulfide	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Carbon tetrachloride	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Chlorobenzene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Chloroethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Chloroform	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Chloromethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Cumene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Cyclohexane	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Dibromochloromethane	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ

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Station ID	IS11SO19		IS11SO20		IS11SO21		IS11SO22		IS11SO23		IS11SO24		IS11SO24		IS11SO25	
Sample ID	IS11SS190001		IS11SS200001		IS11SS210001		IS11SS220001		IS11SS230001		IS11SS240001		IS11SS240001P		IS11SS250001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Dichlorodifluoromethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Ethylbenzene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Methyl acetate	2.9		13	U	12	U	11	U	12	U	1.5		2.3	R	18	U
Methyl-tert-butyl ether (MTBE)	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Methylcyclohexane	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Methylene chloride	2.4	B	13	U	12	U	11	U	1.9	B	14	U	1.5	B	2.2	U
Styrene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
TPH-gas range	NA		NA		NA		NA		NA		NA		140	U	180	U
Tetrachloroethene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Toluene	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Trichloroethene	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
Trichlorofluoromethane	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Vinyl chloride	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	U
Xylene, total	18	UJ	13	U	12	UJ	11	U	12	U	14	U	14	U	18	UJ
cis-1,2-Dichloroethene	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	UJ
cis-1,3-Dichloropropene	18	U	13	U	12	UJ	11	U	12	U	14	U	14	U	18	J
trans-1,2-Dichloroethene	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	UJ
trans-1,3-Dichloropropene	18	U	13	U	12	U	11	U	12	U	14	U	14	U	18	J
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2,2'-Oxybis(1-chloropropane)	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2,4,5-Trichlorophenol	1,500	U	1,100	U	1,000	U	930	U	1,000	U	1,200	U	1,100	U	1,500	UL
2,4,6-Trichlorophenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2,4-Dichlorophenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2,4-Dimethylphenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2,4-Dinitrophenol	1,500	U	1,100	R	1,000	R	930	R	1,000	R	1,200	R	1,100	R	1,500	R
2-Chloronaphthalene	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2-Chlorophenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2-Methylnaphthalene	580	U	420	U	400	U	370	U	50	J	470	U	450	U	590	UL
2-Methylphenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
2-Nitroaniline	1,500	U	1,100	U	1,000	U	930	U	1,000	U	1,200	U	1,100	U	1,500	UL
2-Nitrophenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
3,3'-Dichlorobenzidine	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL

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Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
3-Nitroaniline	1,500	U	1,100	U	1,000	U	930	U	1,000	U	1,200	U	1,100	U	1,500	UL
4,6-Dinitro-2-methylphenol	1,500	U	1,100	U	1,000	U	930	U	1,000	U	1,200	UJ	1,100	UJ	1,500	UL
4-Bromophenyl-phenylether	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
4-Chloro-3-methylphenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
4-Chloroaniline	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
4-Chlorophenyl-phenylether	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
4-Methylphenol	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
4-Nitroaniline	1,500	U	1,100	U	1,000	U	930	U	1,000	U	1,200	U	1,100	U	1,500	UL
4-Nitrophenol	1,500	U	1,100	U	1,000	U	930	U	1,000	U	1,200	U	1,100	U	1,500	UL
4-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	NA		NA		NA	
Acenaphthene	580	U	420	U	400	U	370	U	78	J	470	U	450	U	590	UL
Acenaphthylene	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Acetophenone	190	J	420	U	710		130	J	160	J	57	J	450	U	590	UL
Anthracene	580	U	48	J	400	U	54	J	180	J	470	U	450	U	590	UL
Atrazine	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Benzaldehyde	110	J	420	U	370	J	370	U	110	J	470	U	450	U	590	UL
Benzo(a)anthracene	330	J	200	J	120	J	450		720		130	J	98	J	590	UL
Benzo(a)pyrene	81	J	420	U	400	U	79	J	150	J	470	U	450	U	590	L
Benzo(b)fluoranthene	560	J	430		440		750		940		250	J	200	J	68	UL
Benzo(g,h,i)perylene	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Benzo(k)fluoranthene	250	J	170	J	150	J	260	J	380	J	100	J	81	J	590	UL
Butylbenzylphthalate	580	U	420	U	400	U	370	U	96	J	470	U	450	U	590	UL
Caprolactam	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Carbazole	580	U	420	U	400	U	370	U	85	J	470	U	450	U	590	UL
Chrysene	390	J	320	J	240	J	530		760		180	J	150	J	590	UL
Di-n-butylphthalate	580	U	420	U	400	U	290	J	100	J	470	U	450	U	590	UL
Di-n-octylphthalate	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	L
Dibenz(a,h)anthracene	580	U	420	U	400	U	370	U	120	J	470	U	450	U	590	UL
Dibenzofuran	580	U	420	U	400	U	370	U	65	J	470	U	450	U	590	UL
Diethylphthalate	150	J	420	U	400	U	370	U	69	J	470	U	450	U	590	UL
Dimethyl phthalate	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Fluoranthene	530	J	590		210	J	750		1,500		240	J	180	J	590	
Fluorene	580	U	420	U	400	U	370	U	120	J	470	U	450	U	590	
Hexachlorobenzene	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	

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Table 1-5
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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO19		IS11SO20		IS11SO21		IS11SO22		IS11SO23		IS11SO24				IS11SO25	
Sample ID	IS11SS190001		IS11SS200001		IS11SS210001		IS11SS220001		IS11SS230001		IS11SS240001		IS11SS240001P		IS11SS250001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Hexachlorobutadiene	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	
Hexachlorocyclopentadiene	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Hexachloroethane	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Indeno(1,2,3-cd)pyrene	100	J	73	J	70	J	120	J	180	J	470	U	450	U	590	UL
Isophorone	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Naphthalene	580	U	420	U	400	U	370	U	65	J	470	U	450	U	590	UL
Pentachlorophenol	1,400	U	1,000	U	980	U	900	U	980	U	1,100	U	1,100	U	1,400	UL
Phenanthrene	180	J	230	J	400	U	290	J	1,000		69	J	450	U	590	UL
Phenol	580	U	420	U	160	J	370	U	400	U	470	U	450	U	590	UL
Pyrene	250	J	200	B	150	J	310	J	610		130	J	90	J	590	UL
bis(2-Chloroethoxy)methane	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
bis(2-Chloroethyl)ether	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
bis(2-Ethylhexyl)phthalate	580	U	1,800		400	U	250	J	360	J	71	J	51	J	1,200	L
n-Nitroso-di-n-propylamine	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
n-Nitrosodiphenylamine	580	U	420	U	400	U	370	U	400	U	470	U	450	U	590	UL
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	170	J
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	NA		NA		NA		NA		NA		250	U	250	U	250	U
Ammonium perchlorate	110	U	100	U	110	U	100	U	100	U	130	U	99	U	160	U
HMX	500	U	500	U	500	U	500	U	220	J	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Nitroglycerin	1,400	U	1,300	U	1,200	U	1,100	U	1,300	U	2,500	U	1,300	U	1,500	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	210	J	500	U	500	U	500	U	500	U	500	U	500	U

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IHDIV-NSWC
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Sample ID	IS11SS190001		IS11SS200001		IS11SS210001		IS11SS220001		IS11SS230001		IS11SS240001		IS11SS240001P		IS11SS250001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)																
Aluminum	7,490		5,320		4,480		4,740		15,100		5,810		5,240		12,700	
Antimony	3.1	L	1.5	L	1.1	UL	4.3	L	8.4	L	10.4	L	10.1	L	1.5	UL
Arsenic	13		6.1		4	L	8.1	L	21.8		11.1	L	11.9	L	5.8	L
Barium	152		58.2		71.6		70.6		202		85.4		65.8		137	
Beryllium	0.39	B	0.2	B	0.23	B	0.045	U	0.079	B	0.38	B	0.17	B	0.98	B
Cadmium	18.4		5.3		0.6	J	23.7		79.4		9.5	J	6.8	J	4.5	J
Calcium	4,010	J	983	J	130	B	6,610	J	5,820	J	1,940		1,440	J	2,470	J
Chromium	26.1		12		6.5		28.7		112		57	L	24.3	L	22.2	L
Cobalt	6.7	L	6.1	L	4.4	L	4.7	L	9.4	L	9.2	J	6.7	J	12.2	J
Copper	218		44.9		12.1		249		1,400		4,960	J	1,640	J	39.9	
Cyanide	0.48	B	0.21	B	0.11	B	0.19	B	0.27	B	0.33	J	0.39	B	0.89	U
Iron	29,300		10,400		7,210		23,300		78,500		212,000	J	62,500	J	24,100	J
Lead	501		97		61.6		132,000		1,300		278	J	174	J	94.7	J
Magnesium	1,210	J	559	J	260	J	2,210		2,810		942	J	788	J	2,200	
Manganese	281		185		29.1		192		465		423	L	325	L	156	L
Mercury	0.68	L	0.45	L	0.2	L	0.97	L	1.2	L	0.64	J	0.31	J	0.24	J
Nickel	26.2		9.4	J	5.8	J	36		63.9		28.8		24.3		21.7	
Potassium	694	J	382	J	309	J	390	J	932	J	654	J	565	J	1,130	J
Selenium	1.5	UL	1.1	UL	1.1	UL	0.97	UL	1.1	UL	1.2	UL	1.2	UL	1.5	UL
Silver	17		3.3	L	1.4	L	9.1		20.2		14		7.8		1.1	U
Sodium	154	U	112	U	107	U	120	J	593	J	185	B	233	B	471	B
Thallium	1.9	U	1.4	U	1.3	U	5.5		1.3	J	1.6	B	1.5	J	1.9	U
Vanadium	27.5		22		22.5		15.4		27.9		18.2		14.2		29.7	
Zinc	755	J	232	J	32.8	J	901	J	4,210	J	683	J	383		203	J
Wet Chemistry (MG/KG)																
% Moisture	43		21.6		18		10.9		18.4		29.3	J	26.8		44	
% Solids	NA		NA		NA		NA		NA		NA		NA		NA	
Total organic carbon (TOC)	NA		NA		NA		NA		NA		NA		NA		NA	
pH	NA		NA		NA		NA		NA		NA		NA		NA	

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IHDIV-NSWC
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Sample ID	IS11SS190001		IS11SS200001		IS11SS210001		IS11SS220001		IS11SS230001		IS11SS240001		IS11SS240001P		IS11SS250001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/18/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Total Petroleum Hydrocarbons (MG/KG)																
TPH-diesel range	74		90		34		33		94		26		57		41	
TPH-gas range	0.24		0.13	U	0.12	U	0.11	U	0.12	U	0.14	U	NA		NA	

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Station ID	IS11SO26		IS11SO27		IS11SO27		IS11SO28		IS11SO29		IS11SO30		IS11SO31		IS11SO32	
Sample ID	IS11SS260001		IS11SS270001		IS11SS270001P		IS11SS280001		IS11SS290001		IS11SS300001		IS11SS310001		IS11SS320001	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
1,1,2,2-Tetrachloroethane	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
1,1,2-Trichloro-1,2,2- trifluoroethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
1,1,2-Trichloroethane	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
1,1-Dichloroethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
1,1-Dichloroethene	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
1,2,4-Trichlorobenzene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
1,2-Dibromo-3-chloropropane	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
1,2-Dibromoethane	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
1,2-Dichlorobenzene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
1,2-Dichloroethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
1,3-Dichlorobenzene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
1,4-Dichlorobenzene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
2-Butanone	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
2-Hexanone	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
4-Methyl-2-pentanone	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
Acetone	1.6	B	12	U	1.4	B	12	U	13	UJ	1.6	B	23	J	13	U
Benzene	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Bromodichloromethane	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Bromoform	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Bromomethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Carbon disulfide	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Carbon tetrachloride	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Chlorobenzene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
Chloroethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Chloroform	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Chloromethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Cumene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
Cyclohexane	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Dibromochloromethane	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ

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Sample ID	IS11SS260001		IS11SS270001		IS11SS270001P		IS11SS280001		IS11SS290001		IS11SS300001		IS11SS310001		IS11SS320001	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Dichlorodifluoromethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Ethylbenzene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
Methyl acetate	13	U	12	U	12	U	2.2		13	UJ	13	U	16	J	3.1	J
Methyl-tert-butyl ether (MTBE)	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Methylcyclohexane	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Methylene chloride	4	B	5.2	B	3.2	B	2.1	B	5.7	B	2	B	33	UJ	4.5	B
Styrene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
TPH-gas range	130	U	120	U	120	U	120	U	130	U	130	U	330	U	130	U
Tetrachloroethene	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
Toluene	13	UJ	12	UJ	12	UJ	1.6		13	UJ	13	U	33	UJ	13	UJ
Trichloroethene	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	1.6	J
Trichlorofluoromethane	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Vinyl chloride	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
Xylene, total	13	UJ	12	UJ	12	UJ	12	U	13	UJ	13	U	33	UJ	13	UJ
cis-1,2-Dichloroethene	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
cis-1,3-Dichloropropene	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
trans-1,2-Dichloroethene	13	U	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	U
trans-1,3-Dichloropropene	13	UJ	12	U	12	U	12	U	13	UJ	13	U	33	UJ	13	UJ
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2,2'-Oxybis(1-chloropropane)	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2,4,5-Trichlorophenol	1,100	U	1,000	U	1,000	U	1,000	U	2,100	U	1,100	U	2,700	U	1,100	U
2,4,6-Trichlorophenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2,4-Dichlorophenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2,4-Dimethylphenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2,4-Dinitrophenol	1,100	R	1,000	R	1,000	R	1,000	R	2,100	R	1,100	R	2,700	R	1,100	R
2-Chloronaphthalene	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2-Chlorophenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2-Methylnaphthalene	80	J	68	J	400	U	410	U	850	U	420	U	130	J	430	U
2-Methylphenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
2-Nitroaniline	1,100	U	1,000	U	1,000	U	1,000	U	2,100	U	1,100	U	2,700	U	1,100	U
2-Nitrophenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
3,3'-Dichlorobenzidine	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U

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Sample ID	IS11SS260001		IS11SS270001		IS11SS270001P		IS11SS280001		IS11SS290001		IS11SS300001		IS11SS310001		IS11SS320001	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
3-Nitroaniline	1,100	U	1,000	U	1,000	U	1,000	U	2,100	U	1,100	U	2,700	U	1,100	U
4,6-Dinitro-2-methylphenol	1,100	UJ	1,000	UJ	1,000	UJ	1,000	UJ	2,100	UJ	1,100	UJ	2,700	UJ	1,100	UJ
4-Bromophenyl-phenylether	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
4-Chloro-3-methylphenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
4-Chloroaniline	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
4-Chlorophenyl-phenylether	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
4-Methylphenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
4-Nitroaniline	1,100	U	1,000	U	1,000	U	1,000	U	2,100	U	1,100	U	2,700	U	1,100	U
4-Nitrophenol	1,100	U	1,000	U	1,000	U	1,000	U	2,100	U	1,100	U	2,700	U	1,100	U
4-Nitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
Acenaphthene	430	U	410	U	400	U	410	U	130	J	420	U	250	J	430	U
Acenaphthylene	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Acetophenone	89	J	82	J	61	J	410	U	850	U	420	U	1,100	U	430	U
Anthracene	430	U	410	U	45	J	410	U	540	J	420	U	500	J	430	U
Atrazine	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Benzaldehyde	97	J	58	J	55	J	110	J	850	U	420	U	1,100	U	430	U
Benzo(a)anthracene	210	J	210	J	290	J	210	J	2,600		66	J	2,700		250	J
Benzo(a)pyrene	47	J	63	J	76	J	58	J	510	J	100	J	860	J	110	J
Benzo(b)fluoranthene	370	J	350	J	460		350	J	2,800		170	J	4,300		460	
Benzo(g,h,i)perylene	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Benzo(k)fluoranthene	130	J	150	J	180	J	140	J	1,500		61	J	1,400		130	J
Butylbenzylphthalate	430	U	67	J	86	J	410	U	850	U	420	U	1,100	U	430	U
Caprolactam	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Carbazole	430	U	410	U	400	U	410	U	180	J	420	U	210	J	430	U
Chrysene	240	J	250	J	340	J	240	J	2,400		110	J	2,900		280	J
Di-n-butylphthalate	94	J	82	J	78	J	410	U	280	J	420	U	1,100	U	430	U
Di-n-octylphthalate	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Dibenz(a,h)anthracene	51	J	48	J	66	J	47	J	390	J	420	U	590	J	57	J
Dibenzofuran	430	U	410	U	400	U	410	U	110	J	420	U	130	J	430	U
Diethylphthalate	430	U	46	J	400	U	410	U	850	U	420	U	1,100	U	430	U
Dimethyl phthalate	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Fluoranthene	300	J	330	J	450		370	J	5,000		140	J	4,000		410	J
Fluorene	430	U	410	U	400	U	410	U	140	J	420	U	200	J	430	U
Hexachlorobenzene	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U

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Table 1-5
Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO26		IS11SO27		IS11SO27		IS11SO28		IS11SO29		IS11SO30		IS11SO31		IS11SO32	
Sample ID	IS11SS260001		IS11SS270001		IS11SS270001P		IS11SS280001		IS11SS290001		IS11SS300001		IS11SS310001		IS11SS320001	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Hexachlorobutadiene	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Hexachlorocyclopentadiene	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Hexachloroethane	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Indeno(1,2,3-cd)pyrene	80	J	82	J	100	J	80	J	510	J	80	J	990	J	120	J
Isophorone	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Naphthalene	52	J	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Pentachlorophenol	1,000	U	990	U	980	U	1,000	U	2,100	U	1,000	U	2,600	U	1,000	U
Phenanthrene	130	J	160	J	220	J	160	J	2,300		53	J	1,900		170	J
Phenol	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
Pyrene	170	J	200	J	240	J	200	J	2,100		240	J	1,700		210	J
bis(2-Chloroethoxy)methane	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
bis(2-Chloroethyl)ether	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
bis(2-Ethylhexyl)phthalate	260	J	380	J	290	J	210	J	150	J	280	J	2,600		210	J
n-Nitroso-di-n-propylamine	430	U	410	U	400	U	410	U	850	U	420	U	1,100	U	430	U
n-Nitrosodiphenylamine	430	U	66	J	400	U	410	U	130	J	420	U	1,100	U	430	U
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	360		250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	90	J	250	U	98	J	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	130	J	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	170	J	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Ammonium perchlorate	480,000		78	J	110		97	U	140		100	U	280	U	120	U
HMX	3,700		1,900		2,100		500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Nitroglycerin	1,200	U	1,200	U	1,200	U	1,200	U	1,200	U	1,200	U	2,700	U	1,200	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	530		730		860		500	U	190	J	500	U	500	U	500	U

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Table 1-5
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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO26	IS11SO27		IS11SO28	IS11SO29	IS11SO30	IS11SO31	IS11SO32
Sample ID	IS11SS260001	IS11SS270001	IS11SS270001P	IS11SS280001	IS11SS290001	IS11SS300001	IS11SS310001	IS11SS320001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Tetryl	650 U	650 U	650 U	650 U	650 U	650 U	650 U	650 U
Total Metals (MG/KG)								
Aluminum	25,600	21,100	25,300	8,070	8,450	11,100	14,500	14,100
Antimony	11.8 L	17 L	12.5 L	1.7 L	7.2 L	1.1 L	18.9 L	6.2 L
Arsenic	42.7 L	35.8 L	31.6 L	6.3 L	12.8 L	11.6 L	13.4 L	12.4 L
Barium	248	264	249	52.2	286	67.6	160	120
Beryllium	0.053 U	0.05 U	0.049	0.05 U	0.052 U	0.26 B	0.39 B	0.096 B
Cadmium	145 J	147 J	130 J	17.3 J	35 J	5.2 J	48.3 J	49.2 J
Calcium	8,300 J	7,870 J	7,520 J	1,080 J	5,250 J	2,480 J	7,330 J	2,310 J
Chromium	156 L	128 L	143 L	19.6 L	58.6 L	46.7 L	56 L	71.1 L
Cobalt	12.9	14.3	12 J	5.1 J	6.8 J	5.3 J	11.6 J	10.2 J
Copper	1,840 J	2,680 J	4,320 J	136 J	441 J	39.6 J	560 J	857 J
Cyanide	0.52 J	0.3 J	0.093 J	0.62 U	0.09 J	0.094 J	0.19 J	0.21 J
Iron	108,000 J	110,000 J	155,000 J	21,900 J	66,600 J	20,100 J	40,300 J	64,600 J
Lead	1,540 J	2,580 J	1,610 J	351 J	2,260 J	141 J	945 J	638 J
Magnesium	5,300	11,500	4,640	1,100 J	3,030	1,020 J	4,130	3,830
Manganese	728 L	892 L	710 L	136 L	295 L	142 L	295 L	446 L
Mercury	1.7 J	2.1 J	2 J	0.94 J	8.6 J	0.55 J	1.2 J	1.7 J
Nickel	115	127	157	15.6	42.6	13.1	56.4	65
Potassium	1,290 J	903 J	794 J	463 J	771 J	617 J	1,120 J	780 J
Selenium	1.1 UL	1.1 UL	1.1 UL	1.1 UL	1.1 UL	1.1 UL	2.8 UL	1.1 UL
Silver	27.4	22.2	44.5	6.4	10.6	8.1	62.5	18.4
Sodium	1,270 J	1,220 J	857 B	297 B	454 B	208 B	894 B	395 B
Thallium	1.4 U	1.8 J	1.6 J	1.3 U	1.4 U	1.4 U	3.5 U	1.4 U
Vanadium	36.8	36.4	43.3	24.2	33.1	25.6	60.2	45.6
Zinc	4,980 J	8,820 J	5,720 J	396 J	2,120 J	181 J	1,880 J	1,820 J
Wet Chemistry (MG/KG)								
% Moisture	23.8	19.1	18.2	19.6	22.3	21.2	69.7	22.5
% Solids	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO26	IS11SO27		IS11SO28	IS11SO29	IS11SO30	IS11SO31	IS11SO32
Sample ID	IS11SS260001	IS11SS270001	IS11SS270001P	IS11SS280001	IS11SS290001	IS11SS300001	IS11SS310001	IS11SS320001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Total Petroleum Hydrocarbons (MG/KG)								
TPH-diesel range	240	150	94	44	160	20	400	34
TPH-gas range	NA	NA	NA	NA	NA	NA	NA	NA

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Table 1-5
Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO33		IS11SO34	IS11SO35	IS11SO36	IS11SO37	IS11SO38	IS11SO39
Sample ID	IS11SS330001	IS11SS330001P	IS11SS340001	IS11SS350001	IS11SS360001	IS11SS370001	IS11SS380001	IS11SS390001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	08/04/00
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
1,1,2,2-Tetrachloroethane	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
1,1,2-Trichloro-1,2,2- trifluoroethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
1,1,2-Trichloroethane	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
1,1-Dichloroethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
1,1-Dichloroethene	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
1,2,4-Trichlorobenzene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
1,2-Dibromo-3-chloropropane	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
1,2-Dibromoethane	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
1,2-Dichlorobenzene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
1,2-Dichloroethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
1,3-Dichlorobenzene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
1,4-Dichlorobenzene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
2-Butanone	13 U	16 UJ	21 B	18 UJ	16 U	12 U	16 U	13 U
2-Hexanone	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
4-Methyl-2-pentanone	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
Acetone	13 U	16 UJ	65 J	18 UJ	16 U	3.1 J	9.9 J	16 B
Benzene	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Bromodichloromethane	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Bromoform	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Bromomethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Carbon disulfide	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Carbon tetrachloride	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Chlorobenzene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
Chloroethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Chloroform	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Chloromethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Cumene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
Cyclohexane	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Dibromochloromethane	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO33		IS11SO34	IS11SO35	IS11SO36	IS11SO37	IS11SO38	IS11SO39
Sample ID	IS11SS330001	IS11SS330001P	IS11SS340001	IS11SS350001	IS11SS360001	IS11SS370001	IS11SS380001	IS11SS390001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	08/04/00
Chemical Name								
Dichlorodifluoromethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Ethylbenzene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
Methyl acetate	1.6	16 UJ	8.5 J	18 UJ	16 U	12 U	16 U	2.3 J
Methyl-tert-butyl ether (MTBE)	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Methylcyclohexane	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Methylene chloride	1.4 B	1.8 B	28 UJ	3.3 B	16 U	12 U	16 U	13 U
Styrene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
TPH-gas range	130 U	160 U	280 U	180 U	160 U	120 U	NA	NA
Tetrachloroethene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
Toluene	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	70
Trichloroethene	4.4	9.6 J	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Trichlorofluoromethane	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Vinyl chloride	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
Xylene, total	13 UJ	16 UJ	28 UJ	18 UJ	16 UJ	12 UJ	16 UJ	13 U
cis-1,2-Dichloroethene	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
cis-1,3-Dichloropropene	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
trans-1,2-Dichloroethene	13 U	16 UJ	28 UJ	18 UJ	16 U	12 U	16 U	13 U
trans-1,3-Dichloropropene	13 U	16 UJ	28 UJ	18 UJ	16 UJ	12 U	16 UJ	13 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2,2'-Oxybis(1-chloropropane)	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2,4,5-Trichlorophenol	1,100 U	1,400 U	2,300 U	1,500 U	1,300 U	970 U	1,300 U	1,100 U
2,4,6-Trichlorophenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2,4-Dichlorophenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2,4-Dimethylphenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2,4-Dinitrophenol	1,100 R	1,400 R	2,300 R	1,500 R	1,300 R	970 R	1,300 U	1,100 U
2-Chloronaphthalene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2-Chlorophenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2-Methylnaphthalene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2-Methylphenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
2-Nitroaniline	1,100 U	1,400 U	2,300 U	1,500 U	1,300 U	970 U	1,300 U	1,100 U
2-Nitrophenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
3,3'-Dichlorobenzidine	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U

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Station ID	IS11SO33		IS11SO34	IS11SO35	IS11SO36	IS11SO37	IS11SO38	IS11SO39
Sample ID	IS11SS330001	IS11SS330001P	IS11SS340001	IS11SS350001	IS11SS360001	IS11SS370001	IS11SS380001	IS11SS390001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	08/04/00
Chemical Name								
3-Nitroaniline	1,100 U	1,400 U	2,300 U	1,500 U	1,300 U	970 U	1,300 U	1,100 U
4,6-Dinitro-2-methylphenol	1,100 UJ	1,400 UJ	2,300 UJ	1,500 UJ	1,300 UJ	970 UJ	1,300 U	1,100 U
4-Bromophenyl-phenylether	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
4-Chloro-3-methylphenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
4-Chloroaniline	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
4-Chlorophenyl-phenylether	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
4-Methylphenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
4-Nitroaniline	1,100 U	1,400 U	2,300 U	1,500 U	1,300 U	970 U	1,300 U	1,100 U
4-Nitrophenol	1,100 U	1,400 U	2,300 U	1,500 U	1,300 U	970 U	1,300 U	1,100 U
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	110 J	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Acenaphthylene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Acetophenone	440 U	540 U	930 U	590 U	520 U	380 U	64 J	430 U
Anthracene	230 J	77 J	930 U	140 J	520 U	90 J	530 U	430 U
Atrazine	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Benzaldehyde	440 U	540 U	150 J	63 J	520 U	47 J	56 J	430 U
Benzo(a)anthracene	880	160 J	240 J	880	520 U	400	530 U	430 U
Benzo(a)pyrene	210 J	540 U	390 J	170 J	520 U	79 J	530 U	430 U
Benzo(b)fluoranthene	1,100	160 J	810 J	1,100	520 U	620	530 U	430 U
Benzo(g,h,i)perylene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Benzo(k)fluoranthene	610	83 J	280 J	560 J	520 U	300 J	530 U	430 U
Butylbenzylphthalate	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Caprolactam	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Carbazole	89 J	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Chrysene	870	160 J	390 J	950	520 U	570	530 U	430 U
Di-n-butylphthalate	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Di-n-octylphthalate	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Dibenz(a,h)anthracene	130 J	540 U	930 U	130 J	520 U	77 J	530 U	430 U
Dibenzofuran	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Diethylphthalate	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Dimethyl phthalate	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Fluoranthene	1,600	380 J	480 J	1,300	520 U	940	530 U	430 U
Fluorene	88 J	540 U	930 U	590 U	520 U	47 J	530 U	430 U
Hexachlorobenzene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U

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Table 1-5
Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO33		IS11SO34	IS11SO35	IS11SO36	IS11SO37	IS11SO38	IS11SO39
Sample ID	IS11SS330001	IS11SS330001P	IS11SS340001	IS11SS350001	IS11SS360001	IS11SS370001	IS11SS380001	IS11SS390001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	08/04/00
Chemical Name								
Hexachlorobutadiene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Hexachlorocyclopentadiene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Hexachloroethane	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Indeno(1,2,3-cd)pyrene	240 J	540 U	390 J	160 J	520 U	100 J	530 U	430 U
Isophorone	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Naphthalene	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Pentachlorophenol	1,100 U	1,300 U	2,200 U	1,400 U	1,300 U	930 U	1,300 U	1,100 U
Phenanthrene	920	310 J	210 J	390 J	520 U	410	530 U	430 U
Phenol	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Pyrene	680	130 J	900 J	610	60 J	400	530 U	430 U
bis(2-Chloroethoxy)methane	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
bis(2-Chloroethyl)ether	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
bis(2-Ethylhexyl)phthalate	160 J	3,300	220 J	72 J	520 U	1,700	530 U	430 U
n-Nitroso-di-n-propylamine	440 U	540 U	930 U	590 U	520 U	380 U	530 U	430 U
n-Nitrosodiphenylamine	81 J	540 U	930 U	590 U	520 U	380 U	530 U	430 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
1,3-Dinitrobenzene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2,4,6-Trinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2,4-Dinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2,6-Dinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2-Amino-4,6-dinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2-Nitrotoluene	250 U	250 U	250 U	390 U	250 U	250 U	250 U	250 U
3-Nitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
4-Amino-2,6-dinitrotoluene	250 U	250 U	250 U	1,200 U	250 U	250 U	250 U	250 U
4-Nitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
Ammonium perchlorate	150 U	130 U	220 U	170 U	130 U	93 U	150 U	99 U
HMX	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Nitrobenzene	250 U	250 U	250 U	870 U	250 U	250 U	250 U	250 U
Nitroglycerin	1,800 U	1,600 U	3,100 U	2,400 U	1,600 U	1,200 U	1,400 U	1,300 U
Nitroguanidine	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
PETN	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U
RDX	500 U	910 U	500 U	500 U	500 U	500 U	500 U	500 U

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Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO33		IS11SO34	IS11SO35	IS11SO36	IS11SO37	IS11SO38	IS11SO39
Sample ID	IS11SS330001	IS11SS330001P	IS11SS340001	IS11SS350001	IS11SS360001	IS11SS370001	IS11SS380001	IS11SS390001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	08/04/00
Chemical Name								
Tetryl	650 U	650 U	650 U	650 U	650 U	650 U	650 U	650 U
Total Metals (MG/KG)								
Aluminum	14,600	11,200	10,900	11,700	9,050	10,100	6,590	12,900 J
Antimony	2.5 L	2.8 L	2.4 UL	1.5 UL	1.4 UL	1 R	1.4 UL	1.1 UL
Arsenic	11.3 L	10.6 L	2.3 L	1.7 L	3.8 L	4.2 L	3.5	7.1 L
Barium	107	90.2	8.4 J	7.9 J	54.6 J	42.6 J	56.3 J	52.6 J
Beryllium	0.35 B	0.39 B	0.11 U	0.072 U	0.28 B	0.31 B	0.34 B	0.5 J
Cadmium	31.3 J	25.5 J	0.24 B	0.14	0.35 B	0.26 B	0.68 J	0.2 J
Calcium	1,580 J	1,760 J	184,000 J	124,000 J	1,420 J	504 B	1,520 J	497 J
Chromium	31.4 L	38.2 L	3.8 L	3.6 L	9.5 L	9.8	11.3	16.1
Cobalt	8.2 J	11.2 J	1.2 U	0.79 U	7.6 J	7.8 J	9.4 J	7.1 J
Copper	552 J	786 J	2.1 J	3.7 J	8.8 J	10.2	17	9.5
Cyanide	0.081 J	0.21 J	0.16 J	0.23 J	0.16 J	0.21 B	0.2 B	0.66
Iron	54,100 J	54,400 J	24,700 J	33,000	15,100 J	13,000	13,000	24,400
Lead	345 J	389 J	2.6 J	3.5 J	17.1 J	28.5	32.9 K	12.5
Magnesium	2,950	7,850	1,560 J	1,510	952 J	640 J	1,040 J	714 J
Manganese	604 L	581 L	48.5 L	33 L	326 L	260	511	222
Mercury	0.3 J	0.65 J	0.14 UL	0.09 UL	0.079 UL	0.066 J	0.083 J	0.066 UL
Nickel	54.2	38.6	1.1 U	1.2 J	6.5 J	5.9 J	11.4 J	8.8 J
Potassium	387 J	496 J	123 J	95.7 J	310 J	400 J	524 J	543 J
Selenium	1.1 UL	1.4 UL	2.4 UL	1.5 UL	1.4 UL	1 U	1.4 U	1.1
Silver	6.9	7.4	1.7 U	1.1 U	0.98 U	0.72 U	1 U	0.82
Sodium	333 B	371 B	2,120 J	1,350 J	425 B	216 B	525 B	116
Thallium	1.4 U	1.7 U	3 U	1.9 U	1.7 U	1.2 U	1.7 U	1.4
Vanadium	18.5	23.5	3.9 J	3.7 J	20.7	20.3	21.5	26.7
Zinc	1,120 J	1,040 J	13.4 J	12.4 J	33 J	32.5 J	72.4 J	27 J
Wet Chemistry (MG/KG)								
% Moisture	24.9	38.9	64.4	44.2	36.7	14.2	38.1	24.1
% Solids	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA

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Table 1-5
Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO33		IS11SO34	IS11SO35	IS11SO36	IS11SO37	IS11SO38	IS11SO39
Sample ID	IS11SS330001	IS11SS330001P	IS11SS340001	IS11SS350001	IS11SS360001	IS11SS370001	IS11SS380001	IS11SS390001
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	08/04/00
Chemical Name								
Total Petroleum Hydrocarbons (MG/KG)								
TPH-diesel range	120	130	130	48	32	17	29	4 U
TPH-gas range	NA	NA	NA	NA	NA	NA	0.16 U	0.13 U

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Table 1-5
Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO40		IS11SO41				IS11SO42	
Sample ID	IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	14	U	12	U	13	U	15	U
1,1,2,2-Tetrachloroethane	14	UJ	12	U	13	U	15	U
1,1,2-Trichloro-1,2,2- trifluoroethane	14	U	12	U	13	U	15	U
1,1,2-Trichloroethane	14	U	12	U	13	U	15	U
1,1-Dichloroethane	14	U	12	U	13	U	15	U
1,1-Dichloroethene	14	U	12	U	13	U	15	U
1,2,4-Trichlorobenzene	14	UJ	12	U	13	U	15	U
1,2-Dibromo-3-chloropropane	14	UJ	12	U	13	U	15	R
1,2-Dibromoethane	14	UJ	12	U	13	U	15	U
1,2-Dichlorobenzene	14	U	12	U	13	U	15	U
1,2-Dichloroethane	14	U	12	U	13	U	15	U
1,2-Dichloroethene (total)	NA		NA		NA		NA	
1,2-Dichloropropane	14	U	12	U	13	U	15	U
1,3-Dichlorobenzene	14	UJ	12	U	13	U	15	U
1,4-Dichlorobenzene	14	UJ	12	U	13	U	15	U
2-Butanone	14	U	12	U	13	U	15	U
2-Hexanone	14	UJ	12	U	13	U	15	U
4-Methyl-2-pentanone	14	UJ	12	U	13	U	15	U
Acetone	7	B	4.7	B	2.3	B	5.3	B
Benzene	14	U	12	U	13	U	15	U
Bromodichloromethane	14	U	12	U	13	U	15	U
Bromoform	14	U	12	U	13	U	15	U
Bromomethane	14	U	12	U	13	U	15	U
Carbon disulfide	14	U	12	U	13	U	15	U
Carbon tetrachloride	14	U	12	U	13	U	15	U
Chlorobenzene	14	UJ	12	U	13	U	15	U
Chloroethane	14	U	12	U	13	U	15	U
Chloroform	14	U	12	U	13	U	15	U
Chloromethane	14	U	12	U	13	U	15	U
Cumene	14	U	12	U	13	U	15	U
Cyclohexane	14	U	12	U	13	U	3.6	J
Dibromochloromethane	14	U	12	U	13	U	15	U

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Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO40		IS11SO41		IS11SO41		IS11SO42	
Sample ID	IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name								
Dichlorodifluoromethane	14	U	12	U	13	U	15	U
Ethylbenzene	2.4	J	12	U	13	U	15	U
Methyl acetate	14	U	12	U	13	U	15	U
Methyl-tert-butyl ether (MTBE)	14	U	12	U	13	U	15	U
Methylcyclohexane	14	U	12	U	13	U	15	U
Methylene chloride	2.6	B	1.3	B	13	U	15	U
Styrene	14	UJ	12	U	13	U	15	U
TPH-gas range	NA		NA		NA		NA	
Tetrachloroethene	14	UJ	12	U	13	U	15	U
Toluene	140	J	42		23		15	U
Trichloroethene	14	U	12	U	13	U	15	U
Trichlorofluoromethane	14	U	12	U	13	U	15	U
Vinyl chloride	14	U	12	U	13	U	15	U
Xylene, total	5.2	J	1.7	J	13	U	9.9	J
cis-1,2-Dichloroethene	14	U	12	U	13	U	15	U
cis-1,3-Dichloropropene	14	U	12	U	13	U	15	U
trans-1,2-Dichloroethene	14	U	12	U	13	U	15	U
trans-1,3-Dichloropropene	14	U	12	U	13	U	15	U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	450	U	400	U	430	U	490	U
2,2'-Oxybis(1-chloropropane)	450	U	400	U	430	U	490	U
2,4,5-Trichlorophenol	1,100	U	1,000	U	1,100	U	1,200	U
2,4,6-Trichlorophenol	450	U	400	U	430	U	490	U
2,4-Dichlorophenol	450	U	400	U	430	U	490	U
2,4-Dimethylphenol	450	U	400	U	430	U	490	U
2,4-Dinitrophenol	1,100	U	1,000	U	1,100	U	1,200	R
2-Chloronaphthalene	450	U	400	U	430	U	490	U
2-Chlorophenol	450	U	400	U	430	U	490	U
2-Methylnaphthalene	450	U	400	U	430	U	490	U
2-Methylphenol	450	U	400	U	430	U	490	U
2-Nitroaniline	1,100	U	1,000	U	1,100	U	1,200	U
2-Nitrophenol	450	U	400	U	430	U	490	U
3,3'-Dichlorobenzidine	450	U	400	U	430	U	490	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO40		IS11SO41				IS11SO42	
Sample ID	IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name								
3-Nitroaniline	1,100	U	1,000	U	1,100	U	1,200	U
4,6-Dinitro-2-methylphenol	1,100	U	1,000	U	1,100	U	1,200	U
4-Bromophenyl-phenylether	450	U	400	U	430	U	490	U
4-Chloro-3-methylphenol	450	U	400	U	430	U	490	U
4-Chloroaniline	450	U	400	U	430	U	490	U
4-Chlorophenyl-phenylether	450	U	400	U	430	U	490	U
4-Methylphenol	450	U	400	U	430	U	490	U
4-Nitroaniline	1,100	U	1,000	U	1,100	U	1,200	U
4-Nitrophenol	1,100	U	1,000	U	1,100	U	1,200	U
4-Nitrotoluene	NA		NA		NA		NA	
Acenaphthene	450	U	400	U	430	U	490	U
Acenaphthylene	450	U	400	U	430	U	490	U
Acetophenone	64	J	400	U	430	U	490	U
Anthracene	450	U	400	U	430	U	490	U
Atrazine	450	U	400	U	430	U	490	U
Benzaldehyde	450	U	400	U	430	U	490	U
Benzo(a)anthracene	450	U	400	U	430	U	490	U
Benzo(a)pyrene	450	U	400	U	430	U	490	U
Benzo(b)fluoranthene	450	U	400	U	430	U	490	U
Benzo(g,h,i)perylene	450	U	400	U	430	U	490	U
Benzo(k)fluoranthene	450	U	400	U	430	U	490	U
Butylbenzylphthalate	450	U	400	U	430	U	490	U
Caprolactam	450	U	400	U	430	U	490	U
Carbazole	450	U	400	U	430	U	490	U
Chrysene	450	U	400	U	430	U	490	U
Di-n-butylphthalate	450	U	400	U	430	U	490	U
Di-n-octylphthalate	450	U	400	U	430	U	490	U
Dibenz(a,h)anthracene	450	U	400	U	430	U	490	U
Dibenzofuran	450	U	400	U	430	U	490	U
Diethylphthalate	450	U	400	U	430	U	490	U
Dimethyl phthalate	450	U	400	U	430	U	490	U
Fluoranthene	65	J	400	U	430	U	490	U
Fluorene	450	U	400	U	430	U	490	U
Hexachlorobenzene	450	U	400	U	430	U	490	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
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Station ID	IS11SO40		IS11SO41				IS11SO42	
Sample ID	IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name								
Hexachlorobutadiene	450	U	400	U	430	U	490	U
Hexachlorocyclopentadiene	450	U	400	U	430	U	490	U
Hexachloroethane	450	U	400	U	430	U	490	U
Indeno(1,2,3-cd)pyrene	450	U	400	U	430	U	490	U
Isophorone	450	U	400	U	430	U	490	U
Naphthalene	450	U	400	U	430	U	490	U
Pentachlorophenol	1,100	U	980	U	1,000	U	1,200	U
Phenanthrene	450	U	400	U	430	U	490	U
Phenol	450	U	400	U	430	U	490	U
Pyrene	120	J	400	U	430	U	490	U
bis(2-Chloroethoxy)methane	450	U	400	U	430	U	490	U
bis(2-Chloroethyl)ether	450	U	400	U	430	U	490	U
bis(2-Ethylhexyl)phthalate	450	U	400	U	430	U	490	U
n-Nitroso-di-n-propylamine	450	U	400	U	430	U	490	U
n-Nitrosodiphenylamine	450	U	400	U	430	U	490	U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U
2-Nitrotoluene	150	J	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U
4-Nitrotoluene	210	J	250	U	250	U	250	U
Ammonium perchlorate	110	U	98	U	100	U	130	U
HMX	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U
Nitroglycerin	1,400	U	1,200	U	1,200	U	1,600	U
Nitroguanidine	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U

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UL

Table 1-5
Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO40		IS11SO41		IS11SO41		IS11SO42	
Sample ID	IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name								
Tetryl	650	U	650	U	650	U	650	U
Total Metals (MG/KG)								
Aluminum	3,960	J	10,300	J	7,500	J	5,930	
Antimony	1.2	UL	1.1	UL	1.1	UL	1.3	UL
Arsenic	2.7	L	4.3	L	4.1	L	2.2	J
Barium	49.1	J	58.4		63.3		68.6	
Beryllium	0.074	B	0.46	J	0.47	J	0.15	B
Cadmium	0.12	J	0.098		0.25	J	0.24	B
Calcium	176	J	512	J	597	J	682	J
Chromium	5.6		14		11.6		7.1	
Cobalt	2.2	J	10.1	J	8.3	J	13	J
Copper	5.2	J	9.7		11.6		7.7	
Cyanide	0.073	B	0.11	B	0.17	B	0.11	B
Iron	5,680		21,300		20,100		6,870	J
Lead	24.3		13.8		15.5		29.4	K
Magnesium	256	J	837	J	743	J	484	J
Manganese	17.4		156		595		792	J
Mercury	0.093	L	0.061	UL	0.065	UL	0.11	
Nickel	3.5	J	9.5	J	18.6		8.1	J
Potassium	281	J	721	J	590	J	395	J
Selenium	1.2		1.1		1.1	U	1.3	U
Silver	0.84		0.76		0.81		0.92	U
Sodium	120		108		115		358	B
Thallium	1.4		1.3		1.4		1.6	U
Vanadium	13.9		24.8		22		24	
Zinc	17.3	J	33.5	J	33.6	J	21.3	J
Wet Chemistry (MG/KG)								
% Moisture	26.5		18.3		23.4		32.9	
% Solids	NA		NA		NA		66	
Total organic carbon (TOC)	NA		NA		NA		40,100	
pH	NA		NA		NA		5.7	

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Raw Compounds and Analytes for Site 11 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SO40		IS11SO41		IS11SO41		IS11SO42	
Sample ID	IS11SS400001		IS11SS410001		IS11SS410001P		IS11SS420001	
Sample Date	08/04/00		08/04/00		08/04/00		07/27/00	
Chemical Name								
Total Petroleum Hydrocarbons (MG/KG)								
TPH-diesel range	47		3.8		4.8		15	
TPH-gas range	0.14	U	0.18		0.13	U	0.17	

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UL

Table 1-6
Raw Compounds and Analytes for Site 11 Surface Water Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2- trifluoroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromoethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		10	U
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Acetone	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Carbon tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cumene	10	U	10	U	10	U	10	U	10	U	10	U	10	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Cyclohexane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methyl acetate	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	1	J	10	U	10	U	10	U	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methylene chloride	10	U	10	U	10	U	10	U	1.7	B	1.9	B	1.9	B
Styrene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Toluene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Trichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Trichlorofluoromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Vinyl chloride	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Xylene, total	10	U	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Semi-volatile Organic Compounds (UG/L)														
1,1-Biphenyl	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2,4-Trichlorobenzene	NA		NA		NA		NA		NA		10	R	NA	
1,4-Dichlorobenzene	NA		NA		NA		NA		NA		10	R	NA	
2,2'-Oxybis(1-chloropropane)	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U	25	U	25	U	25	U	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2,4-Dichlorophenol	10	R	10	U	10	U	10	U	10	U	10	R	10	U
2,4-Dimethylphenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2,4-Dinitrophenol	25	R	25	R	25	R	25	R	25	R	25	R	25	R
2-Chloronaphthalene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Chlorophenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
2-Methylnaphthalene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Methylphenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Nitroaniline	25	U	25	U	25	U	25	U	25	U	25	U	25	U
2-Nitrophenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U	10	U	10	U	10	U	10	U	10	U
3-Nitroaniline	25	U	25	U	25	U	25	U	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U	25	U	25	U	25	U	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Chloroaniline	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Methylphenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Nitroaniline	25	U	25	U	25	U	25	U	25	U	25	U	25	U
4-Nitrophenol	25	U	25	U	25	U	25	U	25	U	25	U	25	U
Acenaphthene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Acenaphthylene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Acetophenone	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Anthracene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Atrazine	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzaldehyde	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)anthracene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)pyrene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Butylbenzylphthalate	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Caprolactam	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Carbazole	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chrysene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Di-n-butylphthalate	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Di-n-octylphthalate	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U	10	U	10	U	10	U	10	U	10	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Dibenzofuran	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Diethylphthalate	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dimethyl phthalate	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Fluoranthene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Fluorene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Hexachlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Hexachlorobutadiene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Hexachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Isophorone	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Nitrobenzene	10	U	NA		NA		NA		NA		NA		NA	
Pentachlorophenol	25	U	25	U	25	U	25	U	25	U	25	U	25	U
Phenanthrene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Phenol	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Pyrene	10	U	10	U	10	U	10	U	10	U	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U	10	U	10	U	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U	10	U	10	U	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	1	J	10	U	10	U	10	U	10	U	10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U	10	U	10	U	10	U	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Explosives (UG/L)														
1,3,5-Trinitrobenzene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,3-Dinitrobenzene	0.075	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2,4,6-Trinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2,4-Dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2,6-Dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Amino-4,6-dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Nitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
3-Nitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U

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IHDIV-NSWC
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Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
4-Amino-2,6-dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Nitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Ammonium perchlorate	4	U	1.6	J	2.9	J	3.6	J	4	U	4	U	4	U
HMX	0.5	U	0.5	U	0.5	U	0.5	U	0.4	J	0.41	J	0.5	U
Nitrobenzene	NA		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nitroglycerin	30	U	30	U	30	U	30	U	30	U	30	U	30	U
Nitroguanidine	20	U	20	U	20	U	20	U	20	U	20	U	20	U
PETN	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
RDX	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetryl	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Metals (UG/L)														
Aluminum	457		239		276		366		995		694		909	
Antimony	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U
Arsenic	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	29	J	24	J	24.7	J	26	J	59.1	J	54.2	J	65.5	J
Beryllium	0.2	U	0.2	U	0.35	B	0.2	U	0.2	U	0.2	U	0.2	U
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Calcium	11,500		10,400		10,700		10,100		18,000		16,800		18,100	
Chromium	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Cobalt	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
Copper	4.3	B	1.9	U	4.2	J	5.2	J	10.6	J	7.3	J	7.1	J
Cyanide	1.6	B	4.9	B	1.5	B	1.5	B	2.2	B	1.4	B	1.5	B
Iron	772		475		564		726		3,180		2,410		3,100	
Lead	38.4		1.6	J	1.3	J	6.1		5.1		2.6	J	2.4	J
Magnesium	5,920		5,380		5,360		5,190		4,390	J	3,760	J	3,960	J
Manganese	127		98.3		103		111		134		95.3		117	
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	3.5	B	2.6	B	2.6	B	3.1	B	8	B	5.2	B	7.6	B
Potassium	2,950	J	2,670	J	2,630	J	2,650	J	2,250	J	2,090	J	2,250	J
Selenium	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U
Silver	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 1-6
Raw Compounds and Analytes for Site 11 Surface Water Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
Sodium	13,300		12,200		12,000		11,900		20,000		16,700		16,800	
Thallium	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U
Vanadium	2	J	1.5	J	1.5	J	2.1	B	3.8	J	3.4	J	3.4	J
Zinc	42.3	B	10.8	B	18.5	B	53.5	B	36.9	B	12.6	B	19.8	B
Dissolved Metals (UG/L)														
Aluminum	31.6	B	23.1	B	32.5	B	22.3	B	123	B	39.3	B	18.8	U
Antimony	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U
Arsenic	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	23.6	J	21.2	J	22	J	22.9	J	46.9	J	53.2	J	55.7	J
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.54	B
Cadmium	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Calcium	12,000		11,600		11,900		11,400		16,800		18,400		16,900	
Chromium	4.4	B	2	U	2	U	2	U	2	U	2	U	2	U
Cobalt	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
Copper	1.9	U	1.9	U	2.4	J	1.9	U	5	J	3.5	J	5.9	J
Iron	47.3	B	27.3	U	32.3	B	34	B	613		229		186	
Lead	1.3		1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U
Magnesium	6,050	B	5,960	B	5,980		5,910		4,130	J	4,070	J	3,600	J
Manganese	4.5	J	2.2	J	3.6	B	2.5	B	83		88.6		74.5	
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	5.3	B	3.7	B	2.2	B	1.9	U	9	B	6.6	B	3.6	B
Potassium	2,940	J	2,910	J	2,870	J	2,910	J	2,080	J	2,250	J	2,010	J
Selenium	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U
Silver	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U
Sodium	13,900		14,000		13,900		14,300		19,200		18,400		16,600	
Thallium	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U
Vanadium	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U
Zinc	33.8	B	24	B	15.2	B	7.2	B	12.7	B	8.6	B	11.6	B
Total Petroleum Hydrocarbons (UG/L)														
TPH-diesel range	160		160		100		120		100	U	100	U	100	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 1-6
Raw Compounds and Analytes for Site 11 Surface Water Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample ID	IS11SW01		IS11SW02		IS11SW03		IS11SW04		IS11SW05		IS11SW06		IS11SW07	
Sample Date	07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00		07/20/00	
Chemical Name														
TPH-gas range	100	U	100	U	100	U	100	U	100	U	100	U	100	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 1-3
Raw Compounds and Analytes for Site 11 Waste Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
Volatile Organic Compounds (UG/KG)				
1,1,1-Trichloroethane	11	U	11	U
1,1,2,2-Tetrachloroethane	11	U	11	U
1,1,2-Trichloro-1,2,2- trifluoroethane	11	U	11	U
1,1,2-Trichloroethane	11	U	11	U
1,1-Dichloroethane	11	U	11	U
1,1-Dichloroethene	11	U	11	U
1,2,4-Trichlorobenzene	11	U	11	U
1,2-Dibromo-3-chloropropane	11	U	11	U
1,2-Dibromoethane	11	U	11	U
1,2-Dichlorobenzene	11	U	11	U
1,2-Dichloroethane	11	U	11	U
1,2-Dichloropropane	11	U	11	U
1,3-Dichlorobenzene	11	U	11	U
1,4-Dichlorobenzene	11	U	11	U
2-Butanone	2	J	17	
2-Hexanone	11	U	11	U
4-Methyl-2-pentanone	11	U	11	U
Acetone	18	B	84	
Benzene	11	U	2.1	J
Bromodichloromethane	11	U	11	U
Bromoform	11	U	11	U
Bromomethane	11	U	11	U
Carbon disulfide	11	U	5.4	J
Carbon tetrachloride	11	U	11	U
Chlorobenzene	11	U	11	U
Chloroethane	11	U	11	U
Chloroform	11	U	11	U
Chloromethane	11	U	11	U
Cumene	11	U	11	U
Cyclohexane	11	U	13	
Dibromochloromethane	11	U	11	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table 1-3
Raw Compounds and Analytes for Site 11 Waste Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
Dichlorodifluoromethane	11	U	11	U
Ethylbenzene	11	U	5.2	J
Methyl acetate	11	U	11	U
Methyl-tert-butyl ether (MTBE)	11	U	11	U
Methylcyclohexane	11	U	11	U
Methylene chloride	11	U	2.8	B
Styrene	11	U	11	U
Tetrachloroethene	11	U	11	U
Toluene	11	U	7.3	J
Trichloroethene	11	U	24	
Trichlorofluoromethane	11	U	11	U
Vinyl chloride	11	U	7.3	J
Xylene, total	11	U	29	
cis-1,2-Dichloroethene	11	U	35	
cis-1,3-Dichloropropene	11	U	11	U
trans-1,2-Dichloroethene	11	U	11	U
trans-1,3-Dichloropropene	11	U	11	U
Semi-volatile Organic Compounds (UG/KG)				
1,1-Biphenyl	370	U	360	U
2,2'-Oxybis(1-chloropropane)	370	U	360	U
2,4,5-Trichlorophenol	940	U	910	U
2,4,6-Trichlorophenol	370	U	360	U
2,4-Dichlorophenol	370	U	360	U
2,4-Dimethylphenol	370	U	360	U
2,4-Dinitrophenol	940	U	910	U
2-Chloronaphthalene	370	U	360	U
2-Chlorophenol	370	U	360	U
2-Methylnaphthalene	370	U	200	B
2-Methylphenol	370	U	360	U
2-Nitroaniline	940	U	910	U
2-Nitrophenol	370	U	360	U
3,3'-Dichlorobenzidine	370	U	360	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table 1-3
Raw Compounds and Analytes for Site 11 Waste Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
3-Nitroaniline	940	U	910	U
4,6-Dinitro-2-methylphenol	940	U	910	U
4-Bromophenyl-phenylether	370	U	360	U
4-Chloro-3-methylphenol	370	U	360	U
4-Chloroaniline	370	U	360	U
4-Chlorophenyl-phenylether	370	U	360	U
4-Methylphenol	370	U	59	J
4-Nitroaniline	940	U	910	U
4-Nitrophenol	940	U	910	U
Acenaphthene	370	U	52	J
Acenaphthylene	370	U	360	U
Acetophenone	370	U	64	J
Anthracene	370	U	86	J
Atrazine	370	U	360	U
Benzaldehyde	370	U	360	U
Benzo(a)anthracene	99	J	430	
Benzo(a)pyrene	370	U	110	J
Benzo(b)fluoranthene	86	J	570	
Benzo(g,h,i)perylene	370	U	360	U
Benzo(k)fluoranthene	45	J	260	J
Butylbenzylphthalate	370	U	360	U
Caprolactam	370	U	360	U
Carbazole	370	U	40	J
Chrysene	100	J	460	
Di-n-butylphthalate	370	U	38	J
Di-n-octylphthalate	370	U	360	U
Dibenz(a,h)anthracene	370	U	360	U
Dibenzofuran	370	U	360	U
Diethylphthalate	140	J	120	J
Dimethyl phthalate	370	U	360	U
Fluoranthene	170	J	750	
Fluorene	370	U	60	J
Hexachlorobenzene	370	U	360	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table 1-3
Raw Compounds and Analytes for Site 11 Waste Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
Hexachlorobutadiene	370	U	360	U
Hexachlorocyclopentadiene	370	U	360	U
Hexachloroethane	370	U	360	U
Indeno(1,2,3-cd)pyrene	370	U	100	J
Isophorone	370	U	360	U
Naphthalene	370	U	160	J
Pentachlorophenol	900	U	880	U
Phenanthrene	84	J	460	
Phenol	370	U	64	J
Pyrene	72	J	430	
bis(2-Chloroethoxy)methane	370	U	360	U
bis(2-Chloroethyl)ether	370	U	360	U
bis(2-Ethylhexyl)phthalate	28,000		14,000	
n-Nitroso-di-n-propylamine	370	U	360	U
n-Nitrosodiphenylamine	370	U	360	U
Explosives (UG/KG)				
1,3,5-Trinitrobenzene	250	UL	250	UL
1,3-Dinitrobenzene	250	UL	250	UL
2,4,6-Trinitrotoluene	250	UL	250	UL
2,4-Dinitrotoluene	250	UL	250	UL
2,6-Dinitrotoluene	420	L	120	L
2-Amino-4,6-dinitrotoluene	250	UL	250	U
2-Nitrotoluene	250	UL	250	UL
3-Nitrotoluene	250	UL	250	UL
4-Amino-2,6-dinitrotoluene	250	UL	250	UL
4-Nitrotoluene	250	UL	250	U
Ammonium perchlorate	1,200		100	U
HMX	360	L	480	L
Nitrobenzene	250	UL	250	UL
Nitroglycerin	1,300	UL	1,300	U
Nitroguanidine	100	UL	100	UL
PETN	2,500	UL	2,500	UL

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table 1-3
Raw Compounds and Analytes for Site 11 Waste Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11WS01		IS11WS02	
Sample ID	IS11WS010204		IS11WS020204	
Sample Date	08/09/00		08/09/00	
Chemical Name				
RDX	500	UL	280	L
Tetryl	650	UL	650	UL
Total Metals (MG/KG)				
Aluminum	3,580	J	24,100	J
Antimony	0.97	UL	13.6	L
Arsenic	3	L	17.1	L
Barium	79.6		147	
Beryllium	0.065	B	0.044	
Cadmium	6.5		139	
Calcium	1,440		10,400	
Chromium	7.6		212	
Cobalt	3.3	J	17.2	
Copper	28.4		1,270	
Cyanide	0.56		0.19	J
Iron	6,530		76,000	
Lead	79.2		4,200	
Magnesium	630	J	4,800	
Manganese	83.2		500	
Mercury	45.9	L	0.85	L
Nickel	6.6	J	107	
Potassium	319	J	803	J
Selenium	0.97	U	1.9	
Silver	3.4		23.8	
Sodium	106	J	847	J
Thallium	1.2		1.2	
Vanadium	9.4	J	73.5	
Zinc	304	J	4,110	J
Wet Chemistry (MG/KG)				
% Moisture	11.4		9	
Total Petroleum Hydrocarbons (MG/KG)				

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table 1-3
Raw Compounds and Analytes for Site 11 Waste Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS11WS01	IS11WS02
Sample ID	IS11WS010204	IS11WS020204
Sample Date	08/09/00	08/09/00
Chemical Name		
TPH-diesel range	92	450
TPH-gas range	0.52	0.27

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table 2-1
Raw Compounds and Analytes for Site 13 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02		IS13SO03		IS13SO04B		IS13SO05	
Sample ID	IS13SB011920		IS13SB021719		IS13SB032527		IS13SB042830		IS13SB052425	
Sample Date	07/17/00		07/31/00		07/31/00		07/31/00		07/31/00	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,1,1-Trichloroethane	11	U	11	U	11	U	11	U	110	U
1,1,2,2-Tetrachloroethane	11	U	11	U	11	U	11	U	110	U
1,1,2-Trichloro-1,2,2- trifluoroethane	11	U	11	U	11	U	11	U	110	U
1,1,2-Trichloroethane	11	U	11	U	11	U	11	U	110	U
1,1-Dichloroethane	11	U	11	U	11	U	11	U	110	U
1,1-Dichloroethene	11	U	11	U	11	U	11	U	110	U
1,2,4-Trichlorobenzene	11	U	11	U	11	U	11	U	110	U
1,2-Dibromo-3-chloropropane	11	R	11	R	11	R	11	R	110	R
1,2-Dibromoethane	11	U	11	U	11	U	11	U	110	U
1,2-Dichlorobenzene	11	U	11	U	11	U	11	U	110	U
1,2-Dichloroethane	11	U	11	U	11	U	11	U	110	U
1,2-Dichloroethene (total)	NA		11	U	NA		NA		NA	
1,2-Dichloropropane	11	U	11	U	11	U	11	U	110	U
1,3-Dichlorobenzene	11	U	11	U	11	U	11	U	110	U
1,4-Dichlorobenzene	11	U	11	U	11	U	11	U	110	U
2-Butanone	11	U	11	U	11	U	11	U	110	U
2-Hexanone	11	U	11	U	11	U	11	U	110	U
4-Methyl-2-pentanone	11	U	11	U	11	U	11	U	110	U
Acetone	1.8	B	3	B	2.2	B	2.2	B	38	B
Benzene	11	U	11	U	11	U	11	U	110	U
Bromodichloromethane	11	U	11	U	11	U	11	U	110	U
Bromoform	11	U	11	U	11	U	11	U	110	U
Bromomethane	11	U	11	U	11	U	11	U	110	U
Carbon disulfide	11	U	11	U	11	U	11	U	110	U
Carbon tetrachloride	11	U	11	U	11	U	11	U	110	U
Chlorobenzene	11	U	11	U	11	U	11	U	110	U
Chloroethane	11	U	11	U	11	U	11	U	110	U
Chloroform	11	U	11	U	11	U	11	U	110	U
Chloromethane	11	U	11	U	11	U	11	U	110	U
Cumene	11	U	11	U	11	U	11	U	110	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UL

Table 2-1
Raw Compounds and Analytes for Site 13 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02		IS13SO03		IS13SO04B		IS13SO05	
Sample ID	IS13SB011920		IS13SB021719		IS13SB032527		IS13SB042830		IS13SB052425	
Sample Date	07/17/00		07/31/00		07/31/00		07/31/00		07/31/00	
Chemical Name										
Cyclohexane	11	U	11	U	11	U	11	U	110	U
Dibromochloromethane	11	U	11	U	11	U	11	U	110	U
Dichlorodifluoromethane	11	U	11	U	11	U	11	U	110	U
Ethylbenzene	11	U	11	U	11	U	11	U	110	U
Methyl acetate	11	U	11	U	11	U	11	U	110	U
Methyl-tert-butyl ether (MTBE)	11	U	11	U	11	U	11	U	110	U
Methylcyclohexane	11	U	11	U	11	U	11	U	110	U
Methylene chloride	11	U	11	U	11	U	1.2	J	110	U
Styrene	11	U	11	U	11	U	11	U	110	U
Tetrachloroethene	11	U	11	U	11	U	11	U	110	U
Toluene	11	U	11	U	11	U	11	U	110	U
Trichloroethene	11	U	11	U	11	U	11	U	110	U
Trichlorofluoromethane	11	U	11	U	11	U	11	U	110	U
Vinyl chloride	11	U	11	U	11	U	11	U	110	U
Xylene, total	11	U	11	U	11	U	11	U	110	U
cis-1,2-Dichloroethene	11	U	11	U	11	U	11	U	110	U
cis-1,3-Dichloropropene	11	U	11	U	11	U	11	U	110	U
trans-1,2-Dichloroethene	11	U	11	U	11	U	11	U	110	U
trans-1,3-Dichloropropene	11	U	11	U	11	U	11	U	110	U
Semi-volatile Organic Compounds (UG/KG)										
1,1-Biphenyl	350	U	360	U	360	U	370	U	380	U
2,2'-Oxybis(1-chloropropane)	350	U	360	U	360	U	370	U	380	U
2,4,5-Trichlorophenol	880	U	890	U	890	U	940	U	950	U
2,4,6-Trichlorophenol	350	U	360	U	360	U	370	U	380	U
2,4-Dichlorophenol	350	U	360	U	360	U	370	U	380	U
2,4-Dimethylphenol	350	U	360	U	360	U	370	U	380	U
2,4-Dinitrophenol	880	R	890	R	890	R	940	R	950	R
2,4-Dinitrotoluene	NA		360	U	360	U	370	U	380	U
2,6-Dinitrotoluene	NA		360	U	360	U	370	U	380	U
2-Chloronaphthalene	350	U	360	U	360	U	370	U	380	U
2-Chlorophenol	350	U	360	U	360	U	370	U	380	U

NA - Not analyzed
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K - Reported value may be biased high
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Table 2-1
Raw Compounds and Analytes for Site 13 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02		IS13SO03		IS13SO04B		IS13SO05	
Sample ID	IS13SB011920		IS13SB021719		IS13SB032527		IS13SB042830		IS13SB052425	
Sample Date	07/17/00		07/31/00		07/31/00		07/31/00		07/31/00	
Chemical Name										
2-Methylnaphthalene	350	U	360	U	360	U	370	U	380	U
2-Methylphenol	350	U	360	U	360	U	370	U	380	U
2-Nitroaniline	880	U	890	U	890	U	940	U	950	U
2-Nitrophenol	350	U	360	U	360	U	370	U	380	U
3,3'-Dichlorobenzidine	350	U	360	U	360	U	370	U	380	U
3-Nitroaniline	880	U	890	U	890	U	940	U	950	U
4,6-Dinitro-2-methylphenol	880	U	890	U	890	U	940	U	950	U
4-Bromophenyl-phenylether	350	U	360	U	360	U	370	U	380	U
4-Chloro-3-methylphenol	350	U	360	U	360	U	370	U	380	U
4-Chloroaniline	350	U	360	U	360	U	370	U	380	U
4-Chlorophenyl-phenylether	350	U	360	U	360	U	370	U	380	U
4-Methylphenol	350	U	360	U	360	U	370	U	380	U
4-Nitroaniline	880	U	890	U	890	U	940	U	950	U
4-Nitrophenol	880	U	890	U	890	U	940	U	950	U
Acenaphthene	350	U	360	U	360	U	370	U	380	U
Acenaphthylene	350	U	360	U	360	U	370	U	380	U
Acetophenone	350	U	360	U	360	U	370	U	380	U
Anthracene	350	U	360	U	360	U	370	U	380	U
Atrazine	350	U	360	U	360	U	370	U	380	U
Benzaldehyde	350	U	360	U	360	U	370	U	380	U
Benzo(a)anthracene	350	U	360	U	360	U	370	U	380	U
Benzo(a)pyrene	350	U	360	U	360	U	370	U	380	U
Benzo(b)fluoranthene	350	U	360	U	360	U	370	U	380	U
Benzo(g,h,i)perylene	350	U	360	U	360	U	370	U	380	U
Benzo(k)fluoranthene	350	U	360	U	360	U	370	U	380	U
Butylbenzylphthalate	350	U	360	U	360	U	370	U	380	U
Caprolactam	350	U	360	U	360	U	370	U	380	U
Carbazole	350	U	360	U	360	U	370	U	380	U
Chrysene	350	U	360	U	360	U	370	U	380	U
Di-n-butylphthalate	350	U	360	U	360	U	370	U	380	U
Di-n-octylphthalate	350	U	360	U	360	U	370	U	380	U
Dibenz(a,h)anthracene	350	U	360	U	360	U	370	U	380	U

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Table 2-1
Raw Compounds and Analytes for Site 13 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02		IS13SO03		IS13SO04B		IS13SO05	
Sample ID	IS13SB011920		IS13SB021719		IS13SB032527		IS13SB042830		IS13SB052425	
Sample Date	07/17/00		07/31/00		07/31/00		07/31/00		07/31/00	
Chemical Name										
Dibenzofuran	350	U	360	U	360	U	370	U	380	U
Diethylphthalate	310	J	110	B	130	B	92	B	380	U
Dimethyl phthalate	350	U	360	U	360	U	370	U	380	U
Fluoranthene	350	U	360	U	360	U	370	U	380	U
Fluorene	350	U	360	U	360	U	370	U	380	U
Hexachlorobenzene	350	U	360	U	360	U	370	U	380	U
Hexachlorobutadiene	350	U	360	U	360	U	370	U	380	U
Hexachlorocyclopentadiene	350	U	360	U	360	U	370	U	380	U
Hexachloroethane	350	U	360	U	360	U	370	U	380	U
Indeno(1,2,3-cd)pyrene	350	U	360	U	360	U	370	U	380	U
Isophorone	350	U	360	U	360	U	370	U	380	U
Naphthalene	350	U	360	U	360	U	370	U	380	U
Nitrobenzene	NA		360	U	360	U	370	U	380	U
Pentachlorophenol	850	U	860	U	860	U	900	U	920	U
Phenanthrene	350	U	360	U	360	U	370	U	380	U
Phenol	350	U	360	U	360	U	370	U	380	U
Pyrene	350	U	360	U	83	J	370	U	380	U
bis(2-Chloroethoxy)methane	350	U	360	U	360	U	370	U	380	U
bis(2-Chloroethyl)ether	350	U	360	U	360	U	370	U	380	U
bis(2-Ethylhexyl)phthalate	350	U	360	U	360	U	370	U	380	U
n-Nitroso-di-n-propylamine	350	U	360	U	360	U	370	U	380	U
n-Nitrosodiphenylamine	350	U	360	U	360	U	370	U	380	U
Explosives (UG/KG)										
2,4-Dinitrotoluene	350	U	NA		NA		NA		NA	
2,6-Dinitrotoluene	350	U	NA		NA		NA		NA	
Nitrobenzene	350	U	NA		NA		NA		NA	
Total Metals (MG/KG)										
Aluminum	3,970		3,680		1,330		5,820		4,590	
Antimony	0.91	UL	0.93	UL	0.93	UL	0.97	UL	0.98	UL
Arsenic	2	L	0.97	J	0.78	U	12.8		9.4	

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Table 2-1
Raw Compounds and Analytes for Site 13 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02		IS13SO03		IS13SO04B		IS13SO05	
Sample ID	IS13SB011920		IS13SB021719		IS13SB032527		IS13SB042830		IS13SB052425	
Sample Date	07/17/00		07/31/00		07/31/00		07/31/00		07/31/00	
Chemical Name										
Barium	13.5	J	14.3	J	5.8	J	25.5	J	15.6	J
Beryllium	0.23	B	0.043	U	0.043	U	0.43	B	0.25	B
Cadmium	0.2	J	0.14	B	0.086	U	0.09	U	0.39	B
Calcium	171	B	66.6	B	76.6	B	74.9	J	91.1	B
Chromium	5.3		4.7		4.4		26.8		32.1	
Cobalt	5.3	L	2.8	J	2.5	J	3.7	J	3.6	
Copper	8.8		5.3	J	2.6	J	8.3		6.7	
Cyanide	0.53	U	NA		NA		NA		NA	
Iron	13,800		10,600	J	2,790	J	31,400	J	24,900	J
Lead	3.4		4.1	K	1.2	K	7.1	K	4.6	K
Magnesium	362	J	332	J	150	J	152	J	172	J
Manganese	67.6		62.6	J	30.8	J	96.2	J	69.5	J
Mercury	0.053	UL	0.054	UL	0.054	UL	0.057	UL	0.057	UL
Nickel	6.5	J	3.5	J	2.1	J	6.1	J	5.6	J
Potassium	468	J	398	J	153	J	336	J	346	J
Selenium	0.91	UL	0.93	UL	0.93	U	0.97	U	0.98	U
Silver	0.66	UL	0.67	U	0.67	U	0.7	U	0.71	U
Sodium	93	U	307	B	351	B	248	B	311	B
Thallium	1.1	U	1.1	U	1.1	U	1.2	U	1.2	U
Vanadium	17.7		12.2		5.6	J	18.8		15	
Zinc	25.1	J	12.6	J	5.9	J	16.8	J	16.7	J
Wet Chemistry (MG/KG)										
% Moisture	5.6		7.2		7.2		11.5		12.6	
% Solids	94.7		NA		NA		NA		NA	
Total organic carbon (TOC)	106	U	NA		NA		NA		NA	
pH	5.8		NA		NA		NA		NA	
Total Petroleum Hydrocarbons (MG/KG)										
TPH-diesel range	3.2	U	3.2	U	3.2	U	3.4	U	3.4	U
TPH-gas range	0.11	U	0.11	U	0.11	U	0.11	U	66	

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Table 2-2
Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01				IS13SO02		IS13SO03		IS13SO04A		IS13SO05				IS13SO06	
Sample ID	IS13SS010001		IS13SS010001P		IS13SS020001		IS13SS030001		IS13SS040001		IS13SS050001		IS13SS050001P		IS13SS060001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00		07/31/00		07/31/00		07/31/00		07/18/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	U
1,1,2,2-Tetrachloroethane	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
1,1,2-Trichloro-1,2,2- trifluoroethane	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
1,1,2-Trichloroethane	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
1,1-Dichloroethane	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
1,1-Dichloroethene	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
1,2,4-Trichlorobenzene	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
1,2-Dibromo-3-chloropropane	13	R	15	R	17	R	14	R	13	R	12	R	12	R	12	UJ
1,2-Dibromoethane	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
1,2-Dichlorobenzene	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
1,2-Dichloroethane	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	U
1,3-Dichlorobenzene	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
1,4-Dichlorobenzene	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
2-Butanone	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
2-Hexanone	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
4-Methyl-2-pentanone	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
Acetone	1.7	B	3.4	B	37		14	B	13	U	12	U	1.8	B	3	B
Benzene	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Bromodichloromethane	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Bromoform	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Bromomethane	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Carbon disulfide	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Carbon tetrachloride	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Chlorobenzene	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	UJ
Chloroethane	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Chloroform	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Chloromethane	13	U	15	U	17	UJ	14	UJ	13	U	12	U	12	U	12	U
Cumene	13	UJ	15	UJ	17	UJ	14	UJ	13	U	12	U	12	U	12	U

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Table 2-2
Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02	IS13SO03	IS13SO04A	IS13SO05		IS13SO06
Sample ID	IS13SS010001	IS13SS010001P	IS13SS020001	IS13SS030001	IS13SS040001	IS13SS050001	IS13SS050001P	IS13SS060001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/31/00	07/31/00	07/31/00	07/18/00
Chemical Name								
Cyclohexane	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Dibromochloromethane	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Dichlorodifluoromethane	13 U	15 U	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Ethylbenzene	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 UJ
Methyl acetate	13 U	7.2 J	33 J	14 J	13 U	12 U	12 U	2.4 J
Methyl-tert-butyl ether (MTBE)	13 U	15 U	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Methylcyclohexane	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Methylene chloride	13 U	15 U	2.1 J	1.6 B	1.4 B	12 U	12 U	12 U
Styrene	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 UJ
TPH-gas range	NA	NA	NA	NA	NA	NA	NA	120 U
Tetrachloroethene	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 UJ
Toluene	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 UJ
Trichloroethene	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Trichlorofluoromethane	13 U	15 U	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Vinyl chloride	13 U	15 U	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Xylene, total	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 UJ
cis-1,2-Dichloroethene	13 U	15 U	17 UJ	14 UJ	13 U	12 U	12 U	12 U
cis-1,3-Dichloropropene	13 UJ	15 UJ	17 UJ	14 UJ	13 U	12 U	12 U	12 U
trans-1,2-Dichloroethene	13 U	15 U	17 UJ	14 UJ	13 U	12 U	12 U	12 U
trans-1,3-Dichloropropene	13 U	15 U	17 UJ	14 UJ	13 U	12 U	12 U	12 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2,2'-Oxybis(1-chloropropane)	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2,4,5-Trichlorophenol	1,100 U	1,300 U	1,400 U	1,200 U	1,100 U	1,000 U	1,000 UL	970 U
2,4,6-Trichlorophenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2,4-Dichlorophenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2,4-Dimethylphenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2,4-Dinitrophenol	1,100 R	1,300 R	1,400 R	1,200 R	1,100 R	1,000 R	1,000 UL	970 R
2,4-Dinitrotoluene	NA	NA	NA	NA	420 U	400 U	400 UL	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	420 U	400 U	400 UL	NA
2-Chloronaphthalene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U

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Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02	IS13SO03	IS13SO04A	IS13SO05		IS13SO06
Sample ID	IS13SS010001	IS13SS010001P	IS13SS020001	IS13SS030001	IS13SS040001	IS13SS050001	IS13SS050001P	IS13SS060001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/31/00	07/31/00	07/31/00	07/18/00
Chemical Name								
2-Chlorophenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2-Methylnaphthalene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2-Methylphenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
2-Nitroaniline	1,100 U	1,300 U	1,400 U	1,200 U	1,100 U	1,000 U	1,000 UL	970 U
2-Nitrophenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
3,3'-Dichlorobenzidine	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
3-Nitroaniline	1,100 U	1,300 U	1,400 U	1,200 U	1,100 U	1,000 U	1,000 UL	970 U
4,6-Dinitro-2-methylphenol	1,100 U	1,300 U	1,400 U	1,200 U	1,100 U	1,000 U	1,000 UL	970 U
4-Bromophenyl-phenylether	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
4-Chloro-3-methylphenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
4-Chloroaniline	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
4-Chlorophenyl-phenylether	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
4-Methylphenol	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
4-Nitroaniline	1,100 U	1,300 U	1,400 U	1,200 U	1,100 U	1,000 U	1,000 UL	970 U
4-Nitrophenol	1,100 U	1,300 U	1,400 U	1,200 U	1,100 U	1,000 U	1,000 UL	970 U
Acenaphthene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Acenaphthylene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Acetophenone	220 J	520	570	330 J	420 U	400 U	400 UL	120 J
Anthracene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Atrazine	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Benzaldehyde	170 J	290 J	410 J	240 J	420 U	400 U	400 UL	100 J
Benzo(a)anthracene	430 U	500 U	570 U	470 U	420 U	400 U	180 L	390 U
Benzo(a)pyrene	430 U	67 J	570 U	470 U	52 J	400 U	41 L	390 U
Benzo(b)fluoranthene	430 U	66 J	570 U	470 U	95 J	47 J	320 L	390 U
Benzo(g,h,i)perylene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Benzo(k)fluoranthene	430 U	500 U	570 U	470 U	420 U	400 U	110 L	390 U
Butylbenzylphthalate	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Caprolactam	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Carbazole	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Chrysene	430 U	69 J	570 U	470 U	52 J	40 J	240 L	390 U
Di-n-butylphthalate	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Di-n-octylphthalate	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U

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Table 2-2
Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02	IS13SO03	IS13SO04A	IS13SO05		IS13SO06
Sample ID	IS13SS010001	IS13SS010001P	IS13SS020001	IS13SS030001	IS13SS040001	IS13SS050001	IS13SS050001P	IS13SS060001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/31/00	07/31/00	07/31/00	07/18/00
Chemical Name								
Dibenz(a,h)anthracene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Dibenzofuran	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Diethylphthalate	430 U	500 U	570 U	470 U	200 B	130 J B	400 UL	390 U
Dimethyl phthalate	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Fluoranthene	430 U	58 J	570 U	470 U	55 J	56 J	380 L	46 J
Fluorene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Hexachlorobenzene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Hexachlorobutadiene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Hexachlorocyclopentadiene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Hexachloroethane	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Indeno(1,2,3-cd)pyrene	430 U	52 J	570 U	470 U	43 J	400 U	400 UL	390 U
Isophorone	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Naphthalene	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Nitrobenzene	NA	NA	NA	NA	420 U	400 U	400 UL	NA
Pentachlorophenol	1,000 U	1,200 U	1,400 U	1,100 U	1,000 U	970 U	980 UL	940 U
Phenanthrene	430 U	500 U	570 U	470 U	420 U	400 U	120 L	390 U
Phenol	430 U	110 J	150 J	470 U	420 U	400 U	400 UL	390 U
Pyrene	97 J	210 J	570 U	470 U	110 J	400 U	200 L	140 J
bis(2-Chloroethoxy)methane	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
bis(2-Chloroethyl)ether	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
bis(2-Ethylhexyl)phthalate	430 U	500 U	570 U	470 U	220 J	400 U	110 L	390 U
n-Nitroso-di-n-propylamine	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
n-Nitrosodiphenylamine	430 U	500 U	570 U	470 U	420 U	400 U	400 UL	390 U
Explosives (UG/KG)								
2,4-Dinitrotoluene	430 U	500 U	570 U	470 U	NA	NA	NA	390 U
2,6-Dinitrotoluene	430 U	500 U	600	540	NA	NA	NA	390 U
Nitrobenzene	430 U	500 U	570 U	470 U	NA	NA	NA	390 U
Total Metals (MG/KG)								
Aluminum	5,120	4,100	3,580	3,990	8,490	6,510	6,470	9,170
Antimony	1.1 UL	1.3 UL	1.5 UL	1.2 UL	1.1 UL	1 UL	1.1 UL	1 UL

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Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02	IS13SO03	IS13SO04A	IS13SO05		IS13SO06
Sample ID	IS13SS010001	IS13SS010001P	IS13SS020001	IS13SS030001	IS13SS040001	IS13SS050001	IS13SS050001P	IS13SS060001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/31/00	07/31/00	07/31/00	07/18/00
Chemical Name								
Arsenic	4.5 L	6.4 L	8.1 L	5.7 L	6.3	11	10.6	3.4 L
Barium	40.6 J	58.7 J	37.7 J	67	55.4	105	71.4	26.3 J
Beryllium	0.085 B	0.11 B	0.069 U	0.057 U	0.051 U	0.21 B	0.16 B	0.047 U
Cadmium	0.21 J	0.34 J	0.38 J	0.58 J	0.82 J	1 J	1.3	0.094 U
Calcium	695 J	1,200 J	693 J	1,500 J	2,110	4,660	2,250	235
Chromium	11.7	11.8	14.7	10.2	29.8	22.7	24.3	11.7 L
Cobalt	8 L	14.7 L	4.9 L	14.3 L	7.2 J	5.9 J	6.4 J	3.2 J
Copper	7.7	11.7	9.1	7.2 J	14.5	17	17.4	5.8 J
Cyanide	0.12 B	0.16 B	0.36 B	0.72 U	NA	NA	NA	0.59 U
Iron	8,430	11,800	16,800	7,150	13,000 J	13,900 J	15,000 J	11,700 J
Lead	47.1	84	71.4	59.1	211 K	112 K	153 K	13.2 J
Magnesium	378 J	366 J	262 J	478 J	1,510 J	2,030 J	2,550 J	521 J
Manganese	285	600	154	326	214 J	119 J	130 J	64.7 L
Mercury	0.18 L	0.17 L	0.58 L	0.27 L	0.23	0.14	0.14	0.059 UL
Nickel	4.2 J	5 J	5.1 J	6.6 J	12.8	33.8 J	34.2	4.5 J
Potassium	230 J	235 J	243 J	287 J	372 J	382 J	386 J	389 J
Selenium	1.1 UL	1.3 UL	1.5 UL	1.2 UL	1.1 U	1 U	1.1 U	1 UL
Silver	0.8 UL	0.95 UL	1.1 UL	0.89 UL	0.79 U	0.75 U	0.76 U	0.73 U
Sodium	114 U	134 U	152 U	126 U	530 B	366 B	365 B	156 B
Thallium	1.4 U	1.6 U	1.8 U	1.5 U	1.4 U	1.3 U	1.3 U	1.5 B
Vanadium	20	23.3	34.6	25.7	23.6	24.7	26	21.8
Zinc	61 J	91.9 J	39.2 J	150 J	444 J	247 J	164 J	22.2 J
Wet Chemistry (MG/KG)								
% Moisture	22.7	34.5	42.1	30.3	21.7	17.6	18	14.8
% Solids	64.8	68	60.3	70.8	79.4	81.7	82.1	86.2
Total organic carbon (TOC)	72,900	33,400	247,000	113,000	14,900	26,300	36,200	26,000
pH	5.8	5.9	4.6	4.8	6.8	6.8	6.7	5.2
Total Petroleum Hydrocarbons (MG/KG)								
TPH-diesel range	60	70	1,400	110	22	9.9	16	27
TPH-gas range	0.13 U	0.15 U	0.17 U	0.14 U	0.13 U	0.12 U	0.12 U	NA

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Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO01		IS13SO02	IS13SO03	IS13SO04A	IS13SO05		IS13SO06
Sample ID	IS13SS010001	IS13SS010001P	IS13SS020001	IS13SS030001	IS13SS040001	IS13SS050001	IS13SS050001P	IS13SS060001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/31/00	07/31/00	07/31/00	07/18/00
Chemical Name								
Total petroleum hydrocarbons (TPH)	NA	NA	NA	NA	NA	NA	NA	NA

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Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	20	UJ	12	UJ	14	UJ	15	U
1,1,2,2-Tetrachloroethane	20	UJ	12	UJ	14	UJ	15	U
1,1,2-Trichloro-1,2,2- trifluoroethane	20	U	12	U	14	UJ	15	U
1,1,2-Trichloroethane	20	I	12	UJ	14	UJ	15	U
1,1-Dichloroethane	20	U	12	U	14	UJ	15	U
1,1-Dichloroethene	20	U	12	U	14	UJ	15	U
1,2,4-Trichlorobenzene	20	UJ	12	UJ	14	U	15	U
1,2-Dibromo-3-chloropropane	20	UJ	12	UJ	14	R	15	U
1,2-Dibromoethane	20	UJ	12	UJ	14	UJ	15	U
1,2-Dichlorobenzene	20	UJ	12	UJ	14	UJ	15	U
1,2-Dichloroethane	20	U	12	U	14	UJ	15	U
1,2-Dichloroethene (total)	NA		NA		14	UJ	NA	
1,2-Dichloropropane	20	UJ	12	UJ	14	UJ	15	U
1,3-Dichlorobenzene	20	UJ	12	UJ	14	UJ	15	U
1,4-Dichlorobenzene	20	UJ	12	UJ	14	UJ	15	U
2-Butanone	20	U	12	U	14	UJ	15	U
2-Hexanone	20	UJ	12	UJ	14	UJ	15	U
4-Methyl-2-pentanone	20	UJ	12	UJ	14	UJ	15	U
Acetone	17	B	2.9	B	5.8	B	15	U
Benzene	20	UJ	12	UJ	14	UJ	15	U
Bromodichloromethane	20	UJ	12	UJ	14	UJ	15	U
Bromoform	20	UJ	12	UJ	14	UJ	15	U
Bromomethane	20	U	12	U	14	UJ	15	U
Carbon disulfide	20	U	12	U	14	UJ	15	U
Carbon tetrachloride	20	UJ	12	UJ	14	UJ	15	U
Chlorobenzene	20	UJ	12	UJ	14	UJ	15	U
Chloroethane	20	U	12	U	14	UJ	15	U
Chloroform	20	U	12	U	14	UJ	15	U
Chloromethane	20	U	12	U	14	UJ	15	U
Cumene	20	UJ	12	UJ	14	UJ	15	U

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Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
Cyclohexane	20	UJ	12	UJ	14	UJ	15	U
Dibromochloromethane	20	UJ	12	UJ	14	UJ	15	U
Dichlorodifluoromethane	20	U	12	U	14	UJ	15	U
Ethylbenzene	20	UJ	12	UJ	14	UJ	15	U
Methyl acetate	9.6	U	12	U	2.8	J	15	U
Methyl-tert-butyl ether (MTBE)	20	U	12	U	14	UJ	15	U
Methylcyclohexane	20	UJ	12	UJ	14	UJ	15	U
Methylene chloride	20	U	12	U	14	UJ	15	U
Styrene	20	UJ	12	UJ	14	UJ	15	U
TPH-gas range	200	B	120	U	NA		150	U
Tetrachloroethene	20	UJ	12	UJ	14	UJ	15	U
Toluene	3.1	J	12	UJ	1.6	J	15	U
Trichloroethene	20	UJ	12	UJ	14	UJ	15	U
Trichlorofluoromethane	20	U	12	U	14	UJ	15	U
Vinyl chloride	20	U	12	U	14	UJ	15	U
Xylene, total	20	UJ	12	UJ	14	UJ	15	U
cis-1,2-Dichloroethene	20	U	12	U	14	UJ	15	U
cis-1,3-Dichloropropene	20	UJ	12	UJ	14	UJ	15	U
trans-1,2-Dichloroethene	20	U	12	U	14	UJ	15	U
trans-1,3-Dichloropropene	20	UJ	12	UJ	14	UJ	15	U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	640	UL	400	U	470	UJ	490	U
2,2'-Oxybis(1-chloropropane)	640	UL	400	U	470	UJ	490	U
2,4,5-Trichlorophenol	1,600	UL	1,000	U	1,200	UJ	1,200	U
2,4,6-Trichlorophenol	640	UL	400	U	470	UJ	490	U
2,4-Dichlorophenol	640	UL	400	U	470	UJ	490	U
2,4-Dimethylphenol	640	UL	400	U	470	UJ	490	U
2,4-Dinitrophenol	1,600	R	1,000	R	1,200	R	1,200	R
2,4-Dinitrotoluene	NA		NA		NA		NA	
2,6-Dinitrotoluene	NA		NA		NA		NA	
2-Chloronaphthalene	640	UL	400	U	470	UJ	490	U

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Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
2-Chlorophenol	640	UL	400	U	470	UJ	490	U
2-Methylnaphthalene	640	UL	400	U	470	UJ	490	U
2-Methylphenol	640	UL	400	U	470	UJ	490	U
2-Nitroaniline	1,600	UL	1,000	U	1,200	UJ	1,200	U
2-Nitrophenol	640	UL	400	U	470	UJ	490	U
3,3'-Dichlorobenzidine	640	UL	400	U	470	UJ	490	U
3-Nitroaniline	1,600	UL	1,000	U	1,200	UJ	1,200	U
4,6-Dinitro-2-methylphenol	1,600	UL	1,000	U	1,200	UJ	1,200	U
4-Bromophenyl-phenylether	640	UL	400	U	470	UJ	490	U
4-Chloro-3-methylphenol	640	UL	400	U	470	UJ	490	U
4-Chloroaniline	640	UL	400	U	470	UJ	490	U
4-Chlorophenyl-phenylether	640	UL	400	U	470	UJ	490	U
4-Methylphenol	640	UL	400	U	470	UJ	490	U
4-Nitroaniline	1,600	UL	1,000	U	1,200	UJ	1,200	U
4-Nitrophenol	1,600	UL	1,000	U	1,200	UJ	1,200	U
Acenaphthene	640	UL	400	U	470	UJ	490	U
Acenaphthylene	640	UL	400	U	470	UJ	490	U
Acetophenone	94	L	120	J	92	J	490	U
Anthracene	640	UL	400	U	470	UJ	490	U
Atrazine	640	UL	400	U	470	UJ	490	U
Benzaldehyde	640	UL	400	U	66	J	490	U
Benzo(a)anthracene	640	UL	400	U	470	UJ	490	U
Benzo(a)pyrene	640	UL	400	U	470	UJ	490	U
Benzo(b)fluoranthene	640	UL	400	U	470	UJ	490	U
Benzo(g,h,i)perylene	640	UL	400	U	470	UJ	490	U
Benzo(k)fluoranthene	640	UL	400	U	470	UJ	490	U
Butylbenzylphthalate	640	UL	400	U	470	UJ	490	U
Caprolactam	640	UL	400	U	470	UJ	490	U
Carbazole	640	UL	400	U	470	UJ	490	U
Chrysene	640	UL	400	U	470	UJ	490	U
Di-n-butylphthalate	640	UL	400	U	470	UJ	490	U
Di-n-octylphthalate	640	UL	400	U	470	UJ	490	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
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Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
Dibenz(a,h)anthracene	640	UL	400	U	470	UJ	490	U
Dibenzofuran	640	UL	400	U	470	UJ	490	U
Diethylphthalate	640	UL	400	U	470	UJ	490	U
Dimethyl phthalate	640	UL	400	U	470	UJ	490	U
Fluoranthene	640	UL	50	J	55	J	490	U
Fluorene	640	UL	400	U	470	UJ	490	U
Hexachlorobenzene	640	UL	400	U	470	UJ	490	U
Hexachlorobutadiene	640	UL	400	U	470	U	490	U
Hexachlorocyclopentadiene	640	UL	400	U	470	UJ	490	U
Hexachloroethane	640	UL	400	U	470	UJ	490	U
Indeno(1,2,3-cd)pyrene	640	UL	400	U	470	UJ	490	U
Isophorone	640	UL	400	U	470	UJ	490	U
Naphthalene	640	UL	400	U	470	UJ	490	U
Nitrobenzene	NA		NA		NA		NA	
Pentachlorophenol	1,600	UL	970	U	1,100	UJ	1,200	U
Phenanthrene	640	UL	400	U	470	UJ	490	U
Phenol	640	UL	400	U	470	UJ	490	U
Pyrene	640	UL	400	U	470	UJ	490	U
bis(2-Chloroethoxy)methane	640	UL	400	U	470	UJ	490	U
bis(2-Chloroethyl)ether	640	UL	400	U	470	UJ	490	U
bis(2-Ethylhexyl)phthalate	640	UL	47	J	470	UJ	490	U
n-Nitroso-di-n-propylamine	640	UL	400	U	470	UJ	490	U
n-Nitrosodiphenylamine	640	UL	400	U	470	UJ	490	U
Explosives (UG/KG)								
2,4-Dinitrotoluene	640	U	400	U	470	U	490	U
2,6-Dinitrotoluene	640	U	400	U	470	U	490	U
Nitrobenzene	640	U	400	U	470	U	490	U
Total Metals (MG/KG)								
Aluminum	7,080		8,550		6,340		6,370	J
Antimony	1.7	UL	1	UL	1.2	UL	1.3	UL

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
Arsenic	5.7	L	4.1	L	10.1	L	5.1	L
Barium	30.9	J	23.9	J	21.1	J	29.3	J
Beryllium	0.078	U	0.14	B	0.08	B	0.53	B
Cadmium	0.16	U	0.22	B	0.21	J	0.34	B
Calcium	269	J	193		173	J	2,420	
Chromium	11	L	9.1	L	9.6		28.9	L
Cobalt	3.4	J	7.2	J	2.8	L	2.6	J
Copper	7	J	5.4	J	9.7		4.1	J
Cyanide	0.98	U	0.61	U	0.72	U	0.74	U
Iron	8,550	J	11,900	J	9,960		20,800	J
Lead	36	J	22.9	L	41.7		9.6	J
Magnesium	340	J	429	J	345	J	1,990	
Manganese	50.1	L	157	L	29.6		95.1	L
Mercury	0.27	J	0.12	J	0.2	L	0.074	UL
Nickel	4.9	J	3.5	J	6.3	J	3.4	J
Potassium	285	J	226	J	321	J	2,620	
Selenium	1.7	UL	1	UL	1.4	L	1.3	UL
Silver	1.2	U	0.75	U	0.89	UL	0.91	U
Sodium	448	B	260	B	126	U	327	B
Thallium	2.1	U	1.3	U	1.5	U	1.6	U
Vanadium	23.2		19.7		27.8		20.4	
Zinc	29.7	J	16.5	J	23.4	J	28.3	J
Wet Chemistry (MG/KG)								
% Moisture	48.7		17.6		30.3		32.2	
% Solids	57.4		83		59.9		76	
Total organic carbon (TOC)	165,000		49,600		127,000		7,490	
pH	4.8		4.9		4.5		7	
Total Petroleum Hydrocarbons (MG/KG)								
TPH-diesel range	110		300		30		7.1	
TPH-gas range	NA		NA		0.14	U	NA	

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J - Reported value is estimated
J B

K - Reported value may be biased high
L - Reported value may be biased low
R - Unreliable result
U - Analyte not detected
UJ UL

Table 2-2
Raw Compounds and Analytes for Site 13 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS13SO07		IS13SO08		IS13SO09		IS13SO10	
Sample ID	IS13SS070001		IS13SS080001		IS13SS090001		IS13SS100001	
Sample Date	07/18/00		07/18/00		07/18/00		07/18/00	
Chemical Name								
Total petroleum hydrocarbons (TPH)	NA		NA		30		NA	

NA - Not analyzed
B - Analyte not detected above associated blank
I
J - Reported value is estimated
J B

K - Reported value may be biased high
L - Reported value may be biased low
R - Unreliable result
U - Analyte not detected
UJ UL

Table 3-1
Raw Compounds and Analytes for Site 17 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17MW01				IS17MW02		IS17MW03	
Sample ID	IS17MW011000P		IS17MW011000		IS17MW021000		IS17MW031000	
Sample Date	10/24/00		10/24/00		10/24/00		10/20/00	
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	100	U	100	U	290	U	10	U
1,1,2,2-Tetrachloroethane	100	U	100	U	290	U	10	U
1,1,2-Trichloro-1,2,2- trifluoroethane	100	U	100	U	290	U	2.1	B
1,1,2-Trichloroethane	100	U	100	U	290	U	10	U
1,1-Dichloroethane	100	U	100	U	290	U	10	U
1,1-Dichloroethene	100	U	100	U	290	U	10	U
1,2,4-Trichlorobenzene	100	U	100	U	290	U	10	U
1,2-Dibromo-3-chloropropane	100	R	100	R	290	R	10	R
1,2-Dibromoethane	100	U	100	U	290	U	10	U
1,2-Dichlorobenzene	100	U	100	U	290	U	10	U
1,2-Dichloroethane	100	U	100	U	290	U	10	U
1,2-Dichloropropane	100	U	100	U	290	U	10	U
1,3-Dichlorobenzene	100	U	100	U	290	U	10	U
1,4-Dichlorobenzene	100	U	100	U	290	U	10	U
2-Butanone	100	U	100	U	290	U	10	U
2-Hexanone	100	U	100	U	290	U	10	U
4-Methyl-2-pentanone	100	U	100	U	290	U	10	U
Acetone	76	B	78	B	140	B	7.3	B
Benzene	100	U	100	U	290	U	10	U
Bromodichloromethane	100	U	100	U	290	U	10	U
Bromoform	100	U	100	U	290	U	10	U
Bromomethane	100	U	100	U	290	U	10	U
Carbon disulfide	100	U	100	U	290	U	10	U
Carbon tetrachloride	100	U	100	U	290	U	10	U
Chlorobenzene	100	U	100	U	290	U	10	U
Chloroethane	100	U	100	U	290	U	10	U
Chloroform	100	U	100	U	290	U	10	U
Chloromethane	100	U	100	U	290	U	10	U
Cumene	100	U	100	U	290	U	10	U
Cyclohexane	100	U	100	U	290	U	10	U
Dibromochloromethane	100	U	100	U	290	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 3-1
Raw Compounds and Analytes for Site 17 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17MW01				IS17MW02		IS17MW03	
Sample ID	IS17MW011000P		IS17MW011000		IS17MW021000		IS17MW031000	
Sample Date	10/24/00		10/24/00		10/24/00		10/20/00	
Chemical Name								
Dichlorodifluoromethane	100	U	100	U	290	U	10	U
Ethylbenzene	47	J	50	J	290	U	10	U
Methyl acetate	100	U	100	U	290	U	10	U
Methyl-tert-butyl ether (MTBE)	100	U	100	U	290	U	10	U
Methylcyclohexane	100	U	100	U	290	U	10	U
Methylene chloride	100	U	100	U	430	B	20	B
Styrene	100	U	100	U	290	U	10	U
Tetrachloroethene	100	U	100	U	290	U	10	U
Toluene	200		200		290	U	10	U
Trichloroethene	100	U	100	U	290	U	10	U
Trichlorofluoromethane	100	U	100	U	290	U	10	U
Vinyl chloride	40	J	40	J	3,000		10	U
Xylene, total	100	U	100	U	290	U	10	U
cis-1,2-Dichloroethene	37	J	37	J	4,200		10	U
cis-1,3-Dichloropropene	100	U	100	U	290	U	10	U
trans-1,2-Dichloroethene	100	U	100	U	290	U	10	U
trans-1,3-Dichloropropene	100	U	100	U	290	U	10	U
Semi-volatile Organic Compounds (UG/L)								
1,1-Biphenyl	100	U	100	U	10	U	10	U
2,2'-Oxybis(1-chloropropane)	100	U	100	U	10	U	10	U
2,4,5-Trichlorophenol	250	U	250	U	25	U	25	U
2,4,6-Trichlorophenol	100	U	100	U	10	U	10	U
2,4-Dichlorophenol	100	U	100	U	10	U	10	U
2,4-Dimethylphenol	100	U	100	U	10	U	10	U
2,4-Dinitrophenol	250	U	250	U	25	U	25	U
2-Chloronaphthalene	100	U	100	U	10	U	10	U
2-Chlorophenol	100	U	100	U	10	U	10	U
2-Methylnaphthalene	100	U	100	U	10	U	10	U
2-Methylphenol	100	U	100	U	10	U	10	U
2-Nitroaniline	250	U	250	U	25	U	25	U
2-Nitrophenol	100	U	100	U	10	U	10	U
3,3'-Dichlorobenzidine	100	U	100	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 3-1
Raw Compounds and Analytes for Site 17 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17MW01		IS17MW01		IS17MW02		IS17MW03	
Sample ID	IS17MW011000P		IS17MW011000		IS17MW021000		IS17MW031000	
Sample Date	10/24/00		10/24/00		10/24/00		10/20/00	
Chemical Name								
3-Nitroaniline	250	U	250	U	25	U	25	U
4,6-Dinitro-2-methylphenol	250	U	250	U	25	U	25	U
4-Bromophenyl-phenylether	100	U	100	U	10	U	10	U
4-Chloro-3-methylphenol	100	U	100	U	10	U	10	U
4-Chloroaniline	100	U	100	U	10	U	10	U
4-Chlorophenyl-phenylether	100	U	100	U	10	U	10	U
4-Methylphenol	62	J	42	J	4	J	10	U
4-Nitroaniline	250	U	250	U	25	U	25	U
4-Nitrophenol	250	U	250	U	25	U	25	U
Acenaphthene	100	U	100	U	10	U	10	U
Acenaphthylene	100	U	100	U	10	U	10	U
Acetophenone	100	U	100	U	10	U	10	U
Anthracene	100	U	100	U	10	U	10	U
Atrazine	100	U	100	U	10	U	10	U
Benzaldehyde	100	U	100	U	10	U	10	U
Benzo(a)anthracene	100	U	100	U	10	U	10	U
Benzo(a)pyrene	100	U	100	U	10	U	10	U
Benzo(b)fluoranthene	100	U	100	U	10	U	10	U
Benzo(g,h,i)perylene	100	U	100	U	10	U	10	U
Benzo(k)fluoranthene	100	U	100	U	10	U	10	U
Butylbenzylphthalate	100	U	100	U	10	U	10	U
Caprolactam	100	U	100	U	10	U	10	U
Carbazole	100	U	100	U	10	U	10	U
Chrysene	100	U	100	U	10	U	10	U
Di-n-butylphthalate	100	U	100	U	10	U	10	U
Di-n-octylphthalate	100	U	100	U	10	U	10	U
Dibenz(a,h)anthracene	100	U	100	U	10	U	10	U
Dibenzofuran	100	U	100	U	10	U	10	U
Diethylphthalate	100	U	100	U	10	U	10	U
Dimethyl phthalate	100	U	100	U	10	U	10	U
Fluoranthene	100	U	100	U	10	U	10	U
Fluorene	100	U	100	U	10	U	10	U
Hexachlorobenzene	100	U	100	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 3-1
Raw Compounds and Analytes for Site 17 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17MW01		IS17MW02	IS17MW03
Sample ID	IS17MW011000P	IS17MW011000	IS17MW021000	IS17MW031000
Sample Date	10/24/00	10/24/00	10/24/00	10/20/00
Chemical Name				
Hexachlorobutadiene	100 U	100 U	10 U	10 U
Hexachlorocyclopentadiene	100 U	100 U	10 U	10 U
Hexachloroethane	100 U	100 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	100 U	100 U	10 U	10 U
Isophorone	100 U	100 U	10 U	10 U
Naphthalene	100 U	100 U	10 U	10 U
Pentachlorophenol	250 U	250 U	25 U	25 U
Phenanthrene	100 U	100 U	10 U	10 U
Phenol	19 J	13 J	10 U	10 U
Pyrene	100 U	100 U	10 U	10 U
bis(2-Chloroethoxy)methane	100 U	100 U	10 U	10 U
bis(2-Chloroethyl)ether	100 U	100 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	100 U	100 U	10 U	10 U
n-Nitroso-di-n-propylamine	100 U	100 U	10 U	10 U
n-Nitrosodiphenylamine	100 U	100 U	10 U	10 U
Explosives (UG/L)				
1,3,5-Trinitrobenzene	6 U	4 J	0.2 U	0.2 U
1,3-Dinitrobenzene	1.4 J	6 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	5.8 J	4.4 J	0.2 U	1
2,4-Dinitrotoluene	1.8 J	6 U	0.28	1.2
2,6-Dinitrotoluene	6 U	6 U	0.14 J	0.12 J
2-Amino-4,6-dinitrotoluene	6 U	6 U	0.2	0.2 U
2-Nitrotoluene	6 U	6 U	0.53 U	0.32 U
3-Nitrotoluene	6 U	6 U	0.78 U	0.18 J
4-Amino-2,6-dinitrotoluene	6 U	6 U	0.2 U	0.39
4-Nitrotoluene	6.9 U	2.8 J	0.59 U	0.37 U
Ammonium perchlorate	20 U	20 U	4 U	4 U
HMX	15 U	15 U	0.5 U	0.5 U
Nitrobenzene	6 U	6 U	0.098 J	0.2 U
Nitroglycerin	30 U	30 U	30 U	30 U
Nitroguanidine	20 U	20 U	20 U	20 U
PETN	75 U	75 U	2.5 U	2.5 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 3-1
Raw Compounds and Analytes for Site 17 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17MW01		IS17MW02	IS17MW03
Sample ID	IS17MW011000P	IS17MW011000	IS17MW021000	IS17MW031000
Sample Date	10/24/00	10/24/00	10/24/00	10/20/00
Chemical Name				
RDX	15 U	3.3 J	0.5 U	0.5 U
Tetryl	5 J	5.9 J	0.12 J	0.2 U
Total Metals (UG/L)				
Aluminum	3,630	2,520	420	31,500
Antimony	3.1 U	3.6 J	3.1 U	3.1 U
Arsenic	3.2 U	3.2 U	3.2 U	4 J
Barium	93.5 J	83.7 J	138 J	202
Beryllium	0.26 B	0.17 B	0.18 J	0.99 B
Cadmium	0.35 B	0.3 J	0.54 B	0.3 B
Calcium	23,800	22,900	37,800	5,440
Chromium	42.3	22.7	5.8 J	86.9
Cobalt	4 J	3.1 J	2.6 J	32.7 J
Copper	5.7 J	4.1 J	6.3 J	39.7
Cyanide	10 U	0.1 J	10 U	10 U
Iron	27,100	24,600	71,000	31,400
Lead	4.9	3.1	1.9 U	13.9
Magnesium	11,600	11,000	15,700	5,330
Manganese	1,210	1,120	2,620	540
Mercury	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	31 J	20.4 J	7 J	73.4
Potassium	5,440	5,110	7,720	3,350 J
Selenium	4.3 J	4 U	4 U	4 U
Silver	1.1 U	1.1 U	1.1 U	1.1 U
Sodium	46,400	44,600	41,100	26,800
Thallium	6.8 U	6.8 U	6.8 U	6.8 U
Vanadium	9.4 J	6.6 J	1.4 J	49 J
Zinc	22.6 B	19.2 B	15.7 B	128
Dissolved Metals (UG/L)				
Aluminum	105 B	95.2 B	108 J	90.4 J
Antimony	3.1 U	3.1 U	3.3 J	3.1 U
Arsenic	3.2 U	3.2 U	3.2 U	3.2 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 3-1
Raw Compounds and Analytes for Site 17 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17MW01		IS17MW02	IS17MW03
Sample ID	IS17MW011000P	IS17MW011000	IS17MW021000	IS17MW031000
Sample Date	10/24/00	10/24/00	10/24/00	10/20/00
Chemical Name				
Barium	82.1 J	77.3 J	152 J	33.2 J
Beryllium	0.18 B	0.08 U	0.33 B	0.12 B
Cadmium	0.41 B	0.25 U	0.48 B	0.25 U
Calcium	26,900	25,300	42,000	3,440 J
Chromium	5.5 J	12.3	1.8 J	1.1 U
Cobalt	2.1 J	6.8 J	2.4 J	14.5 J
Copper	1.3 U	3 J	1.7 J	1.4 J
Iron	25,000	23,800	77,200	97.3 B
Lead	1.9 U	1.9 U	1.9 U	1.9 U
Magnesium	12,900	12,000	17,500	2,060 J
Manganese	1,310	1,230	2,890	339
Mercury	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	3.4 J	7 J	4.8 J	16.3 J
Potassium	5,750	5,470	8,490	495 B
Selenium	4 U	4 U	4 U	4 U
Silver	1.1 U	1.1 U	1.1 U	1.1 U
Sodium	53,200	50,100	46,300	31,400
Thallium	6.8 U	6.8 U	6.8 U	6.8 U
Vanadium	1.3 J	0.79 J	0.96 J	0.76 U
Zinc	7 B	9.8 B	10 B	17.8 B

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Table 3-2
Raw Compounds and Analytes for Site 17 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SD01		IS17SD02		IS17SD03		IS17SD04		IS17SD05		IS17SD06	
Sample ID	IS17SD010001		IS17SD020001		IS17SD030001		IS17SD040001		IS17SD050001		IS17SD060001	
Sample Date	07/21/00		07/21/00		07/21/00		07/24/00		07/24/00		07/24/00	
Chemical Name												
Explosives (UG/KG)												
1,3,5-Trinitrobenzene	250	U	94	J	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	69	J	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	100	J	250	U	250	U	66	J	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	100	J	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	220	J	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	220	J	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	150	B	250	U
4-Nitrotoluene	160	B	250	U	250	U	250	U	250	U	250	U
Ammonium perchlorate	120	U	110	U	120	U	86	U	140	U	160	U
HMX	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	98	B	250	U	250	U	250	U	250	U
Nitroglycerin	1,300	U	1,300	U	1,200	U	1,200	U	1,300	U	1,500	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U	500	U
Tetryl	650	R	650	R	650	R	650	R	650	R	650	R
Total Metals (MG/KG)												
Aluminum	837		5,440		5,360		1,560		13,100		11,900	
Antimony	1.1	U	1.1	U	1.1	U	1.3	J	3.5	J	3.2	J
Arsenic	2.1	J	3.4		3.5		7.1		17.8		32.7	
Barium	7.6	J	56.1		61.1		11	J	95		85.8	
Beryllium	0.2	J	0.14	B	0.22	B	0.061	J	0.39	J	0.39	J
Cadmium	0.13	J	0.1	B	0.12	B	0.71	J	4.2		18.7	
Calcium	198	B	349	J	441	J	362	J	1,750	E	3,350	E
Chromium	7		10.6		10		27.5		38.8		43.4	
Cobalt	2.5	J	3.9	J	7.4	J	2.9	J	12	J	12.2	J
Copper	3	J	6.5		11.7		80.4		335		483	
Cyanide	0.66	U	0.62	U	0.67	U	0.65	U	0.35	B	0.42	B

NA - Not analyzed
B - Analyte not detected above associated blank
E
J - Reported value is estimated
R - Unreliable result

U - Analyte not detected
UL - Not detected, quantitation limit is probably higher

Table 3-2
Raw Compounds and Analytes for Site 17 Sediment Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SD01		IS17SD02		IS17SD03		IS17SD04		IS17SD05		IS17SD06	
Sample ID	IS17SD010001		IS17SD020001		IS17SD030001		IS17SD040001		IS17SD050001		IS17SD060001	
Sample Date	07/21/00		07/21/00		07/21/00		07/24/00		07/24/00		07/24/00	
Chemical Name												
Iron	7,270		11,100		10,600		26,900		34,100		118,000	
Lead	4.4	J	10.9	J	21.6	J	138	J	707	J	1,140	J
Magnesium	108	J	563	J	516	J	181	J	1,550		1,510	J
Manganese	85.3		73.6		311		172		305		763	
Mercury	0.066	UL	0.062	J	0.097	J	0.065	U	0.34		0.26	
Nickel	2	B	5.6	J	6	J	9.5	J	39.4		35.7	
Potassium	91.7	J	340	J	356	J	94.8	J	796	J	581	J
Selenium	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.4	U
Silver	0.82	U	0.77	U	0.82	U	0.8	U	8.3		4.5	
Sodium	329	B	547	B	437	B	372	J	521	J	604	J
Thallium	1.4	U	1.3	U	1.4	U	1.4	U	1.4	U	1.8	U
Vanadium	7.7	J	17		17.5		11.3	J	28.1		33.6	
Zinc	8.8	J	23.5	J	25.6	J	156	E	712	E	939	E
Wet Chemistry (MG/KG)												
% Moisture	24.1		19		24.8		22.6		21.4		39.6	
% Solids	79.7		75.3		65.3		81		79.5		60.2	
Total organic carbon (TOC)	125	U	133	U	13,000		123	U	39,200		52,100	
pH	7.1		5.4		5.8		6.8		7.1		7.5	

NA - Not analyzed
B - Analyte not detected above associated blank
E
J - Reported value is estimated
R - Unreliable result

U - Analyte not detected
UL - Not detected, quantitation limit is probably higher

Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO01		IS17SO02		IS17SO03		IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SB010203		IS17SB010203P		IS17SB020203		IS17SB030203		IS17SB040203		IS17SB050203		IS17SB060203		IS17SB070203	
Sample Date	08/03/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	13	U	12	U	14	U	1.8	J	13	U	13	U	13	U	14	U
1,1,2,2-Tetrachloroethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,1,2-Trichloro-1,2,2- trifluoroethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,1,2-Trichloroethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,1-Dichloroethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,1-Dichloroethene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,2,4-Trichlorobenzene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,2-Dibromo-3-chloropropane	13	U	12	U	14	U	14	U	13	R	13	R	13	U	14	U
1,2-Dibromoethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,2-Dichlorobenzene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,2-Dichloroethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,3-Dichlorobenzene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
1,4-Dichlorobenzene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
2-Butanone	13	U	12	U	14	U	14	U	13	U	11	B	13	U	6.7	J
2-Hexanone	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
4-Methyl-2-pentanone	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Acetone	13	U	7	B	14	U	14	U	2.5	B	33		13	U	21	
Benzene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Bromodichloromethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Bromoform	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Bromomethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Carbon disulfide	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Carbon tetrachloride	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Chlorobenzene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Chloroethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Chloroform	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Chloromethane	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Cumene	13	U	12	U	14	U	14	U	13	U	13	U	13	U	14	U
Cyclohexane	13	U	12	U	1.4	J	14	U	13	U	4.5	J	7.2	J	1.9	J

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UL

Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02	IS17SO03	IS17SO04	IS17SO05	IS17SO06	IS17SO07
Sample ID	IS17SB010203	IS17SB010203P	IS17SB020203	IS17SB030203	IS17SB040203	IS17SB050203	IS17SB060203	IS17SB070203
Sample Date	08/03/00	08/03/00	08/03/00	08/03/00	07/27/00	07/27/00	07/26/00	07/26/00
Chemical Name								
Dibromochloromethane	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Dichlorodifluoromethane	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Ethylbenzene	13 U	12 U	2.3 J	2.6 J	13 U	2.4 J	3.3 J	14 U
Methyl acetate	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Methyl-tert-butyl ether (MTBE)	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Methylcyclohexane	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Methylene chloride	6.5 B	24	2.3 B	1.5 B	13 U	13 U	13 U	14 U
Styrene	13 U	12 U	14 U	14 U	2.1 J	13 U	13 U	14 U
Tetrachloroethene	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Toluene	13 U	12 U	14 U	14 U	13 U	1.5 J	13 U	14 U
Trichloroethene	13 U	12 U	3.5 J	30	13 U	4.1 J	3.3 J	14 U
Trichlorofluoromethane	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Vinyl chloride	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Xylene, total	5.4 J	5.1 J	16	2.1 J	13 U	9.3 J	23	14 U
cis-1,2-Dichloroethene	13 U	12 U	14 U	7.5 J	13 U	14	13 U	14 U
cis-1,3-Dichloropropene	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
trans-1,2-Dichloroethene	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
trans-1,3-Dichloropropene	13 U	12 U	14 U	14 U	13 U	13 U	13 U	14 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2,2'-Oxybis(1-chloropropane)	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2,4,5-Trichlorophenol	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	1,100 U	1,100 U	1,200 U
2,4,6-Trichlorophenol	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2,4-Dichlorophenol	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2,4-Dimethylphenol	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2,4-Dinitrophenol	1,100 U	1,000 U	1,100 U	1,100 U	1,100 R	1,100 R	1,100 R	1,200 R
2-Chloronaphthalene	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2-Chlorophenol	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2-Methylnaphthalene	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2-Methylphenol	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
2-Nitroaniline	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	1,100 U	1,100 U	1,200 U
2-Nitrophenol	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U

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UL

Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO01		IS17SO02		IS17SO03		IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SB010203		IS17SB010203P		IS17SB020203		IS17SB030203		IS17SB040203		IS17SB050203		IS17SB060203		IS17SB070203	
Sample Date	08/03/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
3,3'-Dichlorobenzidine	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
3-Nitroaniline	1,100	U	1,000	U	1,100	U	1,100	U	1,100	U	1,100	U	1,100	U	1,200	U
4,6-Dinitro-2-methylphenol	1,100	U	1,000	U	1,100	U	1,100	U	1,100	U	1,100	U	1,100	U	1,200	U
4-Bromophenyl-phenylether	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
4-Chloro-3-methylphenol	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
4-Chloroaniline	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
4-Chlorophenyl-phenylether	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
4-Methylphenol	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
4-Nitroaniline	1,100	U	1,000	U	1,100	U	1,100	U	1,100	U	1,100	U	1,100	U	1,200	U
4-Nitrophenol	1,100	U	1,000	U	1,100	U	1,100	U	1,100	U	1,100	U	1,100	U	1,200	U
4-Nitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
Acenaphthene	430	U	400	U	450	U	76	J	420	U	420	U	420	U	460	U
Acenaphthylene	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Acetophenone	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Anthracene	430	U	400	U	75	J	63	J	420	U	420	U	420	U	460	U
Atrazine	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Benzaldehyde	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Benzo(a)anthracene	430	U	49	J	730		310	J	420	U	420	U	420	U	460	U
Benzo(a)pyrene	430	U	55	J	270	J	83	J	420	U	420	U	420	U	460	U
Benzo(b)fluoranthene	430	U	120	J	1,500		390	J	420	U	420	U	420	U	460	U
Benzo(g,h,i)perylene	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Benzo(k)fluoranthene	430	U	400	U	630		190	J	420	U	420	U	420	U	460	U
Butylbenzylphthalate	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Caprolactam	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Carbazole	430	U	400	U	47	J	49	J	420	U	420	U	420	U	460	U
Chrysene	430	U	58	J	880		350	J	420	U	420	U	420	U	460	U
Di-n-butylphthalate	430	U	400	U	63	J	450	U	420	U	420	U	420	U	460	U
Di-n-octylphthalate	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Dibenz(a,h)anthracene	430	U	400	U	190	J	450	U	420	U	420	U	420	U	460	U
Dibenzofuran	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Diethylphthalate	430	U	400	U	450	U	450	U	420	U	420	U	110	B	420	B
Dimethyl phthalate	430	U	400	U	450	U	450	U	420	U	420	U	420	U	460	U
Fluoranthene	430	U	48	J	1,100		680		420	U	420	U	420	U	460	U

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Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02	IS17SO03	IS17SO04	IS17SO05	IS17SO06	IS17SO07
Sample ID	IS17SB010203	IS17SB010203P	IS17SB020203	IS17SB030203	IS17SB040203	IS17SB050203	IS17SB060203	IS17SB070203
Sample Date	08/03/00	08/03/00	08/03/00	08/03/00	07/27/00	07/27/00	07/26/00	07/26/00
Chemical Name								
Fluorene	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Hexachlorobenzene	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Hexachlorobutadiene	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Hexachlorocyclopentadiene	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Hexachloroethane	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Indeno(1,2,3-cd)pyrene	430 U	74 J	360 J	92 J	420 U	420 U	420 U	460 U
Isophorone	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Naphthalene	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	420 U	460 U
Pentachlorophenol	1,000 U	980 U	1,100 U	1,100 U	1,000 U	1,000 U	1,000 U	1,100 U
Phenanthrene	430 U	400 U	370 J	390 J	420 U	420 U	420 U	460 U
Phenol	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Pyrene	430 U	65 J	590	350 J	420 U	420 U	420 U	460 U
bis(2-Chloroethoxy)methane	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
bis(2-Chloroethyl)ether	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
bis(2-Ethylhexyl)phthalate	430 U	400 U	450 U	79 J	420 U	420 U	420 U	460 U
n-Nitroso-di-n-propylamine	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
n-Nitrosodiphenylamine	430 U	400 U	450 U	450 U	420 U	420 U	420 U	460 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
1,3-Dinitrobenzene	250 U	250 U	250 U	250 U	35 J	250 U	250 U	250 U
2,4,6-Trinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2,4-Dinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2,6-Dinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2-Amino-4,6-dinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
2-Nitrotoluene	170 J	250 U	250 U	170 J	250 U	250 U	250 U	250 U
3-Nitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
4-Amino-2,6-dinitrotoluene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
4-Nitrotoluene	250 U	250 U	250 U	250 U	250 U	230 J	250 U	250 U
Ammonium perchlorate	100 U	100 U	110 U	110 U	110 U	110 U	57 J	110 U
HMX	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Nitrobenzene	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U

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Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02	IS17SO03	IS17SO04	IS17SO05	IS17SO06	IS17SO07
Sample ID	IS17SB010203	IS17SB010203P	IS17SB020203	IS17SB030203	IS17SB040203	IS17SB050203	IS17SB060203	IS17SB070203
Sample Date	08/03/00	08/03/00	08/03/00	08/03/00	07/27/00	07/27/00	07/26/00	07/26/00
Chemical Name								
Nitroglycerin	1,300 U	1,200 U	1,400 U	1,400 U	1,300 U	1,300 U	1,200 U	1,300 U
Nitroguanidine	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
PETN	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U
RDX	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Tetryl	650 U	650 U	650 U	650 U	650 U	650 U	650 U	650 U
Total Metals (MG/KG)								
Aluminum	7,250 J	3,770 J	7,660 J	7,510 J	8,600	6,240	8,060	9,320
Antimony	1.1 UL	1.1 UL	1.2 UL	1.2 UL	1.1 UL	1.1 UL	1.1 U	1.2 U
Arsenic	4.6 L	1.5 L	6.9 L	7.6 L	3.6	2.5 J	6.8	3.1
Barium	50.5 J	51.1	75.7	64.8	64.4	61.5	59.9	79.6
Beryllium	0.68 J	0.75 J	0.41 B	0.4 B	0.38 B	0.27 B	0.41 J	0.66 J
Cadmium	0.24 J	0.37 J	1.5	0.53 J	0.55 J	0.29 J	0.95 J	0.16 J
Calcium	2,060	2,350	1,640	1,250 J	828 J	567 J	1,090 J	817 J
Chromium	14.1	9.7	14.1	13.5	13.7	11.1	15.8	15
Cobalt	7.4 J	2.9 J	7 J	7.4 J	6.5 J	7.6 J	7.9 J	17.3
Copper	15.3	12.4	25.1	27.6	13.1	14.5	29.2	7.2
Cyanide	0.66	0.059 J	0.15 J	0.44 J	2.5 U	2.6 U	0.26 B	0.12 B
Iron	24,100	17,100	17,300	17,400	16,100 J	10,500 J	37,700	10,400
Lead	17.1	5.2	76	99.4	26.6 K	24.2 K	46.2	17.7
Magnesium	1,050 J	875 J	849 J	806 J	1,170 J	576 J	790 J	806 J
Manganese	128	133	197	151	85.8 J	186 J	222	132
Mercury	0.066 UL	0.061 UL	0.18 L	1.1 L	0.064 UL	0.064 UL	0.68	0.089 J
Nickel	7.5 J	3.2 J	11	10.7 J	11.5	6 J	10.1 J	10.2 J
Potassium	496 J	205 J	484 J	548 J	682 UL	346 J	676 J	501 J
Selenium	1.1 U	1.1	1.4	1.2 U	1.1 UL	1.1 UL	1.1 U	1.2 U
Silver	0.81	0.76	0.85	0.84	0.79 U	0.8 U	0.79 U	0.87 U
Sodium	115	108	120	119	420 B	450 B	452 J	464 J
Thallium	1.4 U	1.3	1.5	1.4	1.4 U	1.4 U	1.4 U	1.5 U
Vanadium	32.3	18.9	28.3	25.5	23.2	20.7	22.2	24.9
Zinc	45.9 J	11.1 J	111 J	91.5 J	46.8 J	27.5 J	73.6 E	52.8 E
Wet Chemistry (MG/KG)								

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UL

Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02	IS17SO03	IS17SO04	IS17SO05	IS17SO06	IS17SO07
Sample ID	IS17SB010203	IS17SB010203P	IS17SB020203	IS17SB030203	IS17SB040203	IS17SB050203	IS17SB060203	IS17SB070203
Sample Date	08/03/00	08/03/00	08/03/00	08/03/00	07/27/00	07/27/00	07/26/00	07/26/00
Chemical Name								
% Moisture	23.8	18.5	27.1	26.4	21.3	22.2	21.5	28.4

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Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15	
Sample ID	IS17SB080203		IS17SB090203		IS17SB100203		IS17SB110203		IS17SB120203		IS17SB130203		IS17SB140203		IS17SB150203	
Sample Date	07/26/00		07/26/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1,2,2-Tetrachloroethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1,2-Trichloro-1,2,2- trifluoroethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1,2-Trichloroethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1-Dichloroethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1-Dichloroethene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2,4-Trichlorobenzene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dibromo-3-chloropropane	60	U	14	R	12	R	12	U	12	U	12	U	12	U	12	U
1,2-Dibromoethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dichlorobenzene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dichloroethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dichloroethene (total)	430		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,3-Dichlorobenzene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
1,4-Dichlorobenzene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
2-Butanone	60	U	4.6	J	12	U	12	U	12	U	12	U	12	U	12	U
2-Hexanone	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
4-Methyl-2-pentanone	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Acetone	60	U	20		12	U	2.6	B	3.2	B	2.9	B	2.2	B	3.6	B
Benzene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Bromodichloromethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Bromoform	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Bromomethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Carbon disulfide	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Carbon tetrachloride	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Chlorobenzene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Chloroethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Chloroform	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Chloromethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Cumene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Cyclohexane	60	U	14	U	6	J	12	U	12	U	12	U	12	U	12	U

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UL

Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15	
Sample ID	IS17SB080203		IS17SB090203		IS17SB100203		IS17SB110203		IS17SB120203		IS17SB130203		IS17SB140203		IS17SB150203	
Sample Date	07/26/00		07/26/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																
Dibromochloromethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Dichlorodifluoromethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Ethylbenzene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Methyl acetate	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Methyl-tert-butyl ether (MTBE)	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Methylcyclohexane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Methylene chloride	60	U	14	U	12	U	2.6	B	3.6	B	3	B	1.7	B	2.9	B
Styrene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Tetrachloroethene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Toluene	60	U	2.9	J	12	U	12	U	12	U	12	U	12	U	12	U
Trichloroethene	680		14	U	12	U	12	U	12	U	12	U	12	U	12	U
Trichlorofluoromethane	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Vinyl chloride	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Xylene, total	14	J	7.5	J	12	U	12	U	12	U	12	U	12	U	12	U
cis-1,2-Dichloroethene	390		7.6	J	12	U	12	U	12	U	12	U	12	U	12	U
cis-1,3-Dichloropropene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
trans-1,2-Dichloroethene	18	J	14	U	12	U	12	U	12	U	12	U	12	U	12	U
trans-1,3-Dichloropropene	60	U	14	U	12	U	12	U	12	U	12	U	12	U	12	U
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2,2'-Oxybis(1-chloropropane)	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2,4,5-Trichlorophenol	1,000	U	1,100	U	970	U	1,000	U	1,000	U	1,000	U	970	U	960	U
2,4,6-Trichlorophenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2,4-Dichlorophenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2,4-Dimethylphenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2,4-Dinitrophenol	1,000	R	1,100	R	970	R	1,000	U	1,000	U	1,000	U	970	U	960	U
2-Chloronaphthalene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2-Chlorophenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2-Methylnaphthalene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2-Methylphenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
2-Nitroaniline	1,000	U	1,100	U	970	U	1,000	U	1,000	U	1,000	U	970	U	960	U
2-Nitrophenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U

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Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15	
Sample ID	IS17SB080203		IS17SB090203		IS17SB100203		IS17SB110203		IS17SB120203		IS17SB130203		IS17SB140203		IS17SB150203	
Sample Date	07/26/00		07/26/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																
3,3'-Dichlorobenzidine	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
3-Nitroaniline	1,000	U	1,100	U	970	U	1,000	U	1,000	U	1,000	U	970	U	960	U
4,6-Dinitro-2-methylphenol	1,000	U	1,100	U	970	U	1,000	U	1,000	U	1,000	U	970	U	960	U
4-Bromophenyl-phenylether	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
4-Chloro-3-methylphenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
4-Chloroaniline	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
4-Chlorophenyl-phenylether	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
4-Methylphenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
4-Nitroaniline	1,000	U	1,100	U	970	U	1,000	U	1,000	U	1,000	U	970	U	960	U
4-Nitrophenol	1,000	U	1,100	U	970	U	1,000	U	1,000	U	1,000	U	970	U	960	U
4-Nitrotoluene	NA		NA		NA		250	U	250	U	250	U	250	U	250	U
Acenaphthene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Acenaphthylene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Acetophenone	400	U	460	U	380	U	400	U	400	U	410	U	46	B	66	B
Anthracene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Atrazine	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Benzaldehyde	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Benzo(a)anthracene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Benzo(a)pyrene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Benzo(b)fluoranthene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Benzo(g,h,i)perylene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Benzo(k)fluoranthene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Butylbenzylphthalate	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Caprolactam	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Carbazole	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Chrysene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Di-n-butylphthalate	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Di-n-octylphthalate	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Dibenz(a,h)anthracene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Dibenzofuran	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Diethylphthalate	680	B	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Dimethyl phthalate	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Fluoranthene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U

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Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15	
Sample ID	IS17SB080203		IS17SB090203		IS17SB100203		IS17SB110203		IS17SB120203		IS17SB130203		IS17SB140203		IS17SB150203	
Sample Date	07/26/00		07/26/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																
Fluorene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Hexachlorobenzene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Hexachlorobutadiene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Hexachlorocyclopentadiene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Hexachloroethane	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Indeno(1,2,3-cd)pyrene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Isophorone	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Naphthalene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Nitrobenzene	400	U	NA		NA		NA		NA		NA		NA		NA	
Pentachlorophenol	970	U	1,100	U	930	U	960	U	970	U	990	U	930	U	920	U
Phenanthrene	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Phenol	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Pyrene	400	U	110	J	380	U	400	U	400	U	410	U	390	U	59	J
bis(2-Chloroethoxy)methane	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
bis(2-Chloroethyl)ether	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
bis(2-Ethylhexyl)phthalate	400	U	280	J	380	U	400	U	400	U	410	U	390	U	380	U
n-Nitroso-di-n-propylamine	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
n-Nitrosodiphenylamine	400	U	460	U	380	U	400	U	400	U	410	U	390	U	380	U
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	250	U	250	U	250	U	NA		NA		NA		NA		NA	
Ammonium perchlorate	96	U	100	U	95	U	100	U	98	U	99	U	94	U	92	U
HMX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U

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IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15	
Sample ID	IS17SB080203		IS17SB090203		IS17SB100203		IS17SB110203		IS17SB120203		IS17SB130203		IS17SB140203		IS17SB150203	
Sample Date	07/26/00		07/26/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																
Nitroglycerin	1,200	U	1,400	U	1,300	U	1,400	U	1,300	U	1,400	U	1,500	U	1,100	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)																
Aluminum	6,720		5,540		4,880		9,560		9,510		8,840		9,760		7,850	
Antimony	1	U	1.2	UL	1	UL	0.75	U	0.76	U	0.76	U	0.72	U	0.72	U
Arsenic	6.6		2.5	J	2	J	3.6		2.5		2.1	J	2.4		5.8	
Barium	60.4		78.6		34.4	J	51.6		61.3		59.2		29	J	105	
Beryllium	0.38	J	0.31	B	0.35	B	0.51	B	0.46	B	0.49	B	0.22	B	1.2	B
Cadmium	0.5	J	0.38	J	0.28	J	0.06	U	0.061	U	0.062	U	0.058	U	0.058	U
Calcium	903	J	745	J	883	J	435	J	419	J	288	B	90.7	B	245	J
Chromium	12.4		10.9		8.9		15.9		15.8		14.9		15		15.4	
Cobalt	7.1	J	7.1	J	10.8	J	6.3	J	7.8	J	6.6	J	5.5	J	9.6	J
Copper	519		13.6		7.1		12.5		12.2		13.9		11.4		16.2	
Cyanide	0.22	B	2.8	U	0.16	B	0.6	U	0.61	U	0.62	U	0.58	U	0.58	U
Iron	18,600		17,900	J	10,300	J	22,600		12,300		12,300		14,800		27,700	
Lead	40.3		14.1	K	10.2	K	10.5		14.5		10.9		12.4		12.4	
Magnesium	717	J	939	J	785	J	995	J	1,580		1,440		1,260		1,490	
Manganese	140		98.1	J	171	J	39.5		77		58		73.4		160	
Mercury	0.96		0.069	UL	0.058	UL	0.06	U	0.061	U	0.062	U	0.058	U	0.058	U
Nickel	10.2		10.2	J	6.7	J	10.1		13.6		11.7		9.9		13.8	
Potassium	562	J	515	J	512	J	679	J	830	J	786	J	803	J	774	J
Selenium	1	U	1.2	UL	1	UL	0.96	UL	0.97	UL	0.99	UL	0.93	UL	0.92	UL
Silver	0.75	U	0.86	U	0.72	U	0.26	U	0.27	U	0.27	U	0.26	U	0.25	U
Sodium	421	B	539	B	373	B	58.7	U	59.4	U	60.2	U	56.9	U	56.4	U
Thallium	1.3	U	1.5	U	1.2	U	1.6	U	1.7	U	1.7	U	1.6	U	1.6	U
Vanadium	20.7		16		17		26.7		27.3		19.9		25.2		29	
Zinc	114	J	56.5	J	33	J	32.9		48.1		39.4		36.2		46.6	
Wet Chemistry (MG/KG)																

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UL

Table 3-3
Raw Compounds and Analytes for Site 17 Subsurface Soil Samples
IHDIV-NSWC
Site 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08	IS17SO09	IS17SO10	IS17SO11	IS17SO12	IS17SO13	IS17SO14	IS17SO15
Sample ID	IS17SB080203	IS17SB090203	IS17SB100203	IS17SB110203	IS17SB120203	IS17SB130203	IS17SB140203	IS17SB150203
Sample Date	07/26/00	07/26/00	07/25/00	10/12/00	10/12/00	10/12/00	10/12/00	10/12/00
Chemical Name								
% Moisture	17.3	27.7	14.1	16.8	17.9	18.9	14.3	13.4

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UL

Table 3-4
Raw Compounds and Analytes for Site 17 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02		IS17SO03		IS17SO03		IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SS010001		IS17SS020001		IS17SS030001		IS17SS030001P		IS17SS040001		IS17SS050001		IS17SS060001		IS17SS070001	
Sample Date	08/04/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
1,1,2,2-Tetrachloroethane	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
1,1,2-Trichloro-1,2,2- trifluoroethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
1,1,2-Trichloroethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
1,1-Dichloroethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
1,1-Dichloroethene	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
1,2,4-Trichlorobenzene	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
1,2-Dibromo-3-chloropropane	13	UJ	13	U	13	U	13	U	13	R	14	R	18	UJ	160	U
1,2-Dibromoethane	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
1,2-Dichlorobenzene	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	U	160	U
1,2-Dichloroethane	13	UJ	13	U	13	U	13	U	13	U	14	U	18	U	160	U
1,2-Dichloroethene (total)	NA		NA		13	U	NA		13	U	NA		NA		NA	
1,2-Dichloropropane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
1,3-Dichlorobenzene	13	U	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
1,4-Dichlorobenzene	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
2-Butanone	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
2-Hexanone	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
4-Methyl-2-pentanone	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
Acetone	4.3	B	3.1	B	13	U	13	U	2.3	B	14	U	5.4	J	160	U
Benzene	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Bromodichloromethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Bromoform	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Bromomethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Carbon disulfide	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Carbon tetrachloride	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Chlorobenzene	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
Chloroethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Chloroform	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Chloromethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Cumene	13	U	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
Cyclohexane	13	U	13	U	13	U	13	U	1.8	J	1.7	J	11	J	160	U

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Table 3-4
Raw Compounds and Analytes for Site 17 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02		IS17SO03				IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SS010001		IS17SS020001		IS17SS030001		IS17SS030001P		IS17SS040001		IS17SS050001		IS17SS060001		IS17SS070001	
Sample Date	08/04/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
Dibromochloromethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Dichlorodifluoromethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Ethylbenzene	13	UJ	1.9	J	13	U	13	U	13	U	14	UJ	2.9	J	160	U
Methyl acetate	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Methyl-tert-butyl ether (MTBE)	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Methylcyclohexane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Methylene chloride	1.9	B	13	U	13	U	1.6	B	13	U	14	U	2	B	160	U
Styrene	13	UJ	13	U	13	U	13	U	13	U	3.9	J	18	UJ	160	U
Tetrachloroethene	13	UJ	13	U	13	U	13	U	13	U	14	UJ	18	UJ	160	U
Toluene	13	UJ	250		13	U	13	U	13	U	14	UJ	18	UJ	160	U
Trichloroethene	13	U	13	U	13	U	13	U	13	U	8.3	J	18	U	25	J
Trichlorofluoromethane	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Vinyl chloride	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Xylene, total	2.3	J	5.4	J	13	U	13	U	8.4	J	1.5	J	20	J	160	U
cis-1,2-Dichloroethene	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
cis-1,3-Dichloropropene	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
trans-1,2-Dichloroethene	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
trans-1,3-Dichloropropene	13	U	13	U	13	U	13	U	13	U	14	U	18	U	160	U
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2,2'-Oxybis(1-chloropropane)	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2,4,5-Trichlorophenol	1,100	U	1,100	U	1,100	U	1,100	U	1,000	U	1,200	U	1,500	U	1,300	U
2,4,6-Trichlorophenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2,4-Dichlorophenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2,4-Dimethylphenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2,4-Dinitrophenol	1,100	U	1,100	U	1,100	U	1,100	U	1,000	R	1,200	R	1,500	R	1,300	R
2-Chloronaphthalene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2-Chlorophenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2-Methylnaphthalene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2-Methylphenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
2-Nitroaniline	1,100	U	1,100	U	1,100	U	1,100	U	1,000	U	1,200	U	1,500	U	1,300	U
2-Nitrophenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U

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IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02		IS17SO03		IS17SO03		IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SS010001		IS17SS020001		IS17SS030001		IS17SS030001P		IS17SS040001		IS17SS050001		IS17SS060001		IS17SS070001	
Sample Date	08/04/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
3,3'-Dichlorobenzidine	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
3-Nitroaniline	1,100	U	1,100	U	1,100	U	1,100	U	1,000	U	1,200	U	1,500	U	1,300	U
4,6-Dinitro-2-methylphenol	1,100	U	1,100	U	1,100	U	1,100	U	1,000	U	1,200	U	1,500	U	1,300	U
4-Bromophenyl-phenylether	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
4-Chloro-3-methylphenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
4-Chloroaniline	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
4-Chlorophenyl-phenylether	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
4-Methylphenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
4-Nitroaniline	1,100	U	1,100	U	1,100	U	1,100	U	1,000	U	1,200	U	1,500	U	1,300	U
4-Nitrophenol	1,100	U	1,100	U	1,100	U	1,100	U	1,000	U	1,200	U	1,500	U	1,300	U
4-Nitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
Acenaphthene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Acenaphthylene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Acetophenone	420	U	420	U	420	U	430	U	420	U	470	U	72	J	520	U
Anthracene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Atrazine	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Benzaldehyde	1,100		420	U	420	U	430	U	47	J	81	J	71	J	520	U
Benzo(a)anthracene	520		420	U	420	U	430	U	420	U	51	J	600	U	520	U
Benzo(a)pyrene	130	J	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Benzo(b)fluoranthene	970		420	U	420	U	430	U	420	U	260	J	100	J	520	U
Benzo(g,h,i)perylene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Benzo(k)fluoranthene	380	J	420	U	420	U	430	U	420	U	99	J	600	U	520	U
Butylbenzylphthalate	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Caprolactam	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Carbazole	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Chrysene	590		420	U	420	U	430	U	420	U	180	J	87	J	520	U
Di-n-butylphthalate	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Di-n-octylphthalate	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Dibenz(a,h)anthracene	69	J	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Dibenzofuran	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Diethylphthalate	420	U	420	U	420	U	430	U	420	U	470	U	530	B	110	B
Dimethyl phthalate	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Fluoranthene	280	J	420	U	420	U	430	U	420	U	72	J	150	J	520	U

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Table 3-4
Raw Compounds and Analytes for Site 17 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01		IS17SO02		IS17SO03		IS17SO03		IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SS010001		IS17SS020001		IS17SS030001		IS17SS030001P		IS17SS040001		IS17SS050001		IS17SS060001		IS17SS070001	
Sample Date	08/04/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
Fluorene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Hexachlorobenzene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Hexachlorobutadiene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Hexachlorocyclopentadiene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Hexachloroethane	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Indeno(1,2,3-cd)pyrene	130	J	420	U	420	U	430	U	420	U	60	J	600	U	520	U
Isophorone	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Naphthalene	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Nitrobenzene	NA		NA		NA		NA		NA		NA		600	U	520	U
Pentachlorophenol	1,000	U	1,000	U	1,000	U	1,000	U	1,000	U	1,100	U	1,400	U	1,300	U
Phenanthrene	420	U	420	U	420	U	430	U	420	U	470	U	60	J	520	U
Phenol	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Pyrene	430		420	U	420	U	120	J	420	U	57	J	72	J	520	U
bis(2-Chloroethoxy)methane	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
bis(2-Chloroethyl)ether	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
bis(2-Ethylhexyl)phthalate	420	U	420	U	51	J	44	J	420	U	470	U	600	U	520	U
n-Nitroso-di-n-propylamine	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
n-Nitrosodiphenylamine	420	U	420	U	420	U	430	U	420	U	470	U	600	U	520	U
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	46	J	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	240	J
Ammonium perchlorate	110	U	110	U	100	U	110	U	110	U	110	U	110	U	120	U
HMX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U

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IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
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Station ID	IS17SO01		IS17SO02		IS17SO03		IS17SO03		IS17SO04		IS17SO05		IS17SO06		IS17SO07	
Sample ID	IS17SS010001		IS17SS020001		IS17SS030001		IS17SS030001P		IS17SS040001		IS17SS050001		IS17SS060001		IS17SS070001	
Sample Date	08/04/00		08/03/00		08/03/00		08/03/00		07/27/00		07/27/00		07/26/00		07/26/00	
Chemical Name																
Nitroglycerin	1,300	U	1,400	U	2,500	U	1,500	U	1,300	U	1,500	U	1,200	U	1,400	U
Nitroguanidine	100	U	100	U	100	U	100	U	40	J	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)																
Aluminum	6,360	J	7,980	J	6,840	J	5,390	J	7,320		7,690		4,260		7,350	
Antimony	1.5	L	1.1	UL	1.1	UL	1.1	UL	1.1	UL	1.2	UL	3.1	U	1.4	U
Arsenic	11.3	L	4.7	L	3.2	L	3.1	L	2.9		4.6		13.6		3.9	
Barium	51.1		40.3	J	42.6	J	59.5		42.1	J	77.8		46.2	J	62	J
Beryllium	0.23	B	0.38	B	0.22	B	0.25	B	0.3	B	0.36	B	0.17	J	0.33	J
Cadmium	1.5		0.26	J	0.18	J	0.36	J	0.25	B	1.2	J	2.6	J	0.82	J
Calcium	1,120	J	525	J	1,170	J	2,210		445	J	2,510		2,120	E	2,640	E
Chromium	32.9		13.3		11.5		9.4		12.4		16.1		25.2		13.9	
Cobalt	11.4	J	6.5	J	4.2	J	4.8	J	6.1	J	8.4	J	29		7.9	J
Copper	90.7		14.5		8.4		9.6		9.4		19.6		82.5		15.3	
Cyanide	0.26	B	0.64		0.64		0.069	J	2.5	U	0.17	B	0.54	B	0.37	B
Iron	47,400		13,600		14,900		13,500		15,500	J	22,900	J	224,000		16,000	
Lead	602		34.4		10.5		13.6		13	K	37.2	K	111		33.4	
Magnesium	656	J	726	J	851	J	819	J	826	J	1,540		519	J	1,100	J
Manganese	536		135		145		188		75.4	J	492	J	752		264	
Mercury	0.15	L	0.064	UL	0.064	UL	0.065	UL	0.063	UL	0.12	J	0.41		0.34	
Nickel	32.8		9.2	J	7.5	J	9.5	J	8.5	J	20.1		32.7		13.2	
Potassium	606	J	614	J	489	J	407	J	623	J	727	J	545	J	652	J
Selenium	1.1	U	1.1	U	1.1		1.1	U	1.1	UL	1.6	L	3.1	U	1.4	U
Silver	0.79		0.79		0.79		0.81		0.78	U	0.88	U	1.1	U	0.97	U
Sodium	112		112		113	U	114		279	B	517	B	388	J	583	J
Thallium	1.4	U	1.4		1.4		1.4		1.3	U	1.5	U	3.8	U	1.7	U
Vanadium	21.4		20.8		19.9		17.1		20.8		23.8		14.8	J	22	
Zinc	162	J	39	J	29.4	J	60.4	J	35	J	101	J	82.1	E	345	E
Wet Chemistry (MG/KG)																

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IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO01	IS17SO02	IS17SO03		IS17SO04	IS17SO05	IS17SO06	IS17SO07
Sample ID	IS17SS010001	IS17SS020001	IS17SS030001	IS17SS030001P	IS17SS040001	IS17SS050001	IS17SS060001	IS17SS070001
Sample Date	08/04/00	08/03/00	08/03/00	08/03/00	07/27/00	07/27/00	07/26/00	07/26/00
Chemical Name								
% Moisture	21.5	21.5	21.9	23.1	20.8	29.6	44.8	36.3
% Solids	72.3	64.6	69.7	65.9	79.2	64.9	44.6	75.5
Total organic carbon (TOC)	29,200	36,700	45,500	59,300	21,600	60,100	152,000	23,400
pH	5.8	5.3	5.6	5.6	5.2	6	5.8	6.1

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Table 3-4
Raw Compounds and Analytes for Site 17 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15			
Sample ID	IS17SS080001		IS17SS090001		IS17SS100001		IS17SS110001		IS17SS120001		IS17SS130001		IS17SS140001		IS17SS150001		IS17SS150001P	
Sample Date	07/26/00		07/25/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																		
Volatile Organic Compounds (UG/KG)																		
1,1,1-Trichloroethane	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,1,2,2-Tetrachloroethane	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,1,2-Trichloro-1,2,2- trifluoroethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,1,2-Trichloroethane	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,1-Dichloroethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,1-Dichloroethene	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,2,4-Trichlorobenzene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,2-Dibromo-3-chloropropane	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,2-Dibromoethane	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,2-Dichlorobenzene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,2-Dichloroethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		12	U	NA		NA		NA		NA	
1,2-Dichloropropane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,3-Dichlorobenzene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
1,4-Dichlorobenzene	14	UJ	14	U	17	U	11	U	12	U	1.4	J	12	U	1.5	J	1.7	J
2-Butanone	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
2-Hexanone	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
4-Methyl-2-pentanone	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Acetone	14	U	14	U	17	U	2.6	B	2.6	B	3.8	B	2.3	B	2.6	B	3.3	B
Benzene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Bromodichloromethane	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Bromoform	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Bromomethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Carbon disulfide	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Carbon tetrachloride	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Chlorobenzene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Chloroethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Chloroform	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Chloromethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Cumene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Cyclohexane	5.3	J	7.9	J	26		11	U	12	U	12	U	12	U	12	U	13	U

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IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15			
Sample ID	IS17SS080001		IS17SS090001		IS17SS100001		IS17SS110001		IS17SS120001		IS17SS130001		IS17SS140001		IS17SS150001		IS17SS150001P	
Sample Date	07/26/00		07/25/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																		
Dibromochloromethane	14	UJ	14	J	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Dichlorodifluoromethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Ethylbenzene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Methyl acetate	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Methyl-tert-butyl ether (MTBE)	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Methylcyclohexane	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Methylene chloride	14	U	14	U	17	U	3.1	B	6.4	B	4.2	B	2.6	B	3.9	B	3.1	B
Styrene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Tetrachloroethene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Toluene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Trichloroethene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Trichlorofluoromethane	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Vinyl chloride	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Xylene, total	2.9	J	1.5	J	20		11	U	12	U	12	U	12	U	12	U	13	U
cis-1,2-Dichloroethene	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
cis-1,3-Dichloropropene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
trans-1,2-Dichloroethene	14	U	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
trans-1,3-Dichloropropene	14	UJ	14	U	17	U	11	U	12	U	12	U	12	U	12	U	13	U
Semi-volatile Organic Compounds (UG/KG)																		
1,1-Biphenyl	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2,2'-Oxybis(1-chloropropane)	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2,4,5-Trichlorophenol	1,200	U	1,200	U	1,400	U	920	U	1,000	U	1,000	U	970	U	990	U	1,100	U
2,4,6-Trichlorophenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2,4-Dichlorophenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2,4-Dimethylphenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2,4-Dinitrophenol	1,200	R	1,200	R	1,400	R	920	U	1,000	U	1,000	U	970	U	990	U	1,100	U
2-Chloronaphthalene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2-Chlorophenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2-Methylnaphthalene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2-Methylphenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
2-Nitroaniline	1,200	U	1,200	U	1,400	U	920	U	1,000	U	1,000	U	970	U	990	U	1,100	U
2-Nitrophenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U

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IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15			
Sample ID	IS17SS080001		IS17SS090001		IS17SS100001		IS17SS110001		IS17SS120001		IS17SS130001		IS17SS140001		IS17SS150001		IS17SS150001P	
Sample Date	07/26/00		07/25/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																		
3,3'-Dichlorobenzidine	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
3-Nitroaniline	1,200	U	1,200	U	1,400	U	920	U	1,000	U	1,000	U	970	U	990	U	1,100	U
4,6-Dinitro-2-methylphenol	1,200	U	1,200	U	1,400	U	920	U	1,000	U	1,000	U	970	U	990	U	1,100	U
4-Bromophenyl-phenylether	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
4-Chloro-3-methylphenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
4-Chloroaniline	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
4-Chlorophenyl-phenylether	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
4-Methylphenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
4-Nitroaniline	1,200	U	1,200	U	1,400	U	920	U	1,000	U	1,000	U	970	U	990	U	1,100	U
4-Nitrophenol	1,200	U	1,200	U	1,400	U	920	U	1,000	U	1,000	U	970	U	990	U	1,100	U
4-Nitrotoluene	NA		NA		NA		250	U	250	U	250	U	250	U	250	U	250	U
Acenaphthene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Acenaphthylene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Acetophenone	49	J	470	U	550	U	370	U	55	B	46	B	390	U	390	U	44	B
Anthracene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Atrazine	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Benzaldehyde	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Benzo(a)anthracene	280	J	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Benzo(a)pyrene	78	J	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Benzo(b)fluoranthene	880		470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Benzo(g,h,i)perylene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Benzo(k)fluoranthene	310	J	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Butylbenzylphthalate	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Caprolactam	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Carbazole	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Chrysene	710		470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Di-n-butylphthalate	470	U	470	U	550	U	41	J	410	U	410	U	390	U	390	U	420	U
Di-n-octylphthalate	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Dibenz(a,h)anthracene	54	J	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Dibenzofuran	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Diethylphthalate	210	B	140	B	200	B	370	U	410	U	410	U	390	U	390	U	420	U
Dimethyl phthalate	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Fluoranthene	1,400		470	U	57	J	370	U	410	U	410	U	390	U	390	U	420	U

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IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15			
Sample ID	IS17SS080001		IS17SS090001		IS17SS100001		IS17SS110001		IS17SS120001		IS17SS130001		IS17SS140001		IS17SS150001		IS17SS150001P	
Sample Date	07/26/00		07/25/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																		
Fluorene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Hexachlorobenzene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Hexachlorobutadiene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Hexachlorocyclopentadiene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Hexachloroethane	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Indeno(1,2,3-cd)pyrene	110	J	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Isophorone	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Naphthalene	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Nitrobenzene	470	U	470	U	550	U	NA		NA		NA		NA		NA		NA	
Pentachlorophenol	1,100	U	1,200	U	1,300	U	890	U	990	U	990	U	940	U	950	U	1,000	U
Phenanthrene	440	J	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Phenol	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Pyrene	740		72	J	550	U	47	J	410	U	160	J	390	U	390	U	420	U
bis(2-Chloroethoxy)methane	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
bis(2-Chloroethyl)ether	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
bis(2-Ethylhexyl)phthalate	470	U	470	U	550	U	370	U	45	J	410	U	390	U	390	U	420	U
n-Nitroso-di-n-propylamine	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
n-Nitrosodiphenylamine	470	U	470	U	550	U	370	U	410	U	410	U	390	U	390	U	420	U
Explosives (UG/KG)																		
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	210	J
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	30	J	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	250	U	630	U	250	U	NA		NA		NA		NA		NA		NA	
Ammonium perchlorate	130	U	110	U	120	J	89	U	100	U	89	U	92	U	96	U	95	U
HMX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U

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IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08		IS17SO09		IS17SO10		IS17SO11		IS17SO12		IS17SO13		IS17SO14		IS17SO15			
Sample ID	IS17SS080001		IS17SS090001		IS17SS100001		IS17SS110001		IS17SS120001		IS17SS130001		IS17SS140001		IS17SS150001		IS17SS150001P	
Sample Date	07/26/00		07/25/00		07/25/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00		10/12/00	
Chemical Name																		
Nitroglycerin	1,500	U	1,500	U	1,500	U	1,200	U	1,500	U	1,300	U	2,000	U	1,200	U	1,200	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)																		
Aluminum	7,640		5,440		9,110		7,700		3,780		9,850		7,300		10,200		10,500	
Antimony	1.2	U	1.3	J	1.4	U	0.69	U	0.77	U	0.77	U	0.73	U	0.74	U	0.79	U
Arsenic	6.5		3.9		4.1		3.7		1.6	B	1.4	J	2.5		2.8		3.8	
Barium	82.4		33.9	J	116		52.5		28.8	J	45.5	J	47.8		43	J	41.3	J
Beryllium	0.38	J	0.23	J	0.5	J	0.44	B	0.19	B	0.35	B	0.4	B	0.45	B	0.48	B
Cadmium	6.9		0.81	J	1.7		0.056	U	0.18	B	0.062	U	0.2	B	0.06	U	0.063	U
Calcium	4,150	E	1,920	E	4,490	E	837	J	1,110	J	602	J	1,100	J	482	J	376	J
Chromium	13.6		18		16.6		13.7		7.5		15.8		12.8		15		16.4	
Cobalt	9.2	J	5.5	J	11.5	J	5.5	J	2.6	J	5.8	J	6.4	J	6.1	J	5.6	J
Copper	42.6		17.2		40.9		13.3		5.6	J	11.3		11.6		10.4		11.4	
Cyanide	0.65	B	0.11	B	0.63	B	0.56	U	0.62	U	0.62	U	0.59	U	0.077	J	0.63	U
Iron	20,600		23,000		20,100		17,000		8,950		11,200		13,900		20,600		23,400	
Lead	94.1		20.7		78.1		11.8		7.4		11.6		14.4		13.3		12.6	
Magnesium	1,260	J	965	J	1,690		1,110	J	469	J	1,300		1,170		733	J	733	J
Manganese	529		150		539		72.4		79.3		42.7		83.6		149		123	
Mercury	0.3		0.072	U	0.16	J	0.056	U	0.062	U	0.062	U	0.059	U	0.06	U	0.063	U
Nickel	21.4		13		24.6		10.6		5.7	J	11		10.4		7.8	J	8	J
Potassium	799	J	347	J	1,200	J	688	J	315	J	840	J	654	J	866	J	884	J
Selenium	1.2	U	1.2	U	1.4	U	0.89	UL	0.99	UL	0.99	UL	0.94	UL	0.95	UL	1	UL
Silver	0.88	U	0.89	U	1	U	0.25	U	0.27	U	0.27	U	0.26	U	0.26	U	0.28	U
Sodium	516	J	600	J	551	J	54.3	U	60.5	U	60.6	U	57.1	U	58	U	61.9	U
Thallium	1.5	U	1.5	U	1.8	U	1.5	U	1.7	U	1.7	U	1.6	U	1.6	U	1.7	U
Vanadium	23.7		19.5		29.4		22.2		12.2	J	22.7		23.3		26.8		28.3	
Zinc	1,140	E	653	E	227	E	34.7		68.3		41.4		151		31.1		29.5	
Wet Chemistry (MG/KG)																		

NA - Not analyzed
B - Analyte not detected above associated blank
E
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
R - Unreliable result
U - Analyte not detected
UJ
UL

Table 3-4
Raw Compounds and Analytes for Site 17 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21 and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SO08	IS17SO09	IS17SO10	IS17SO11	IS17SO12	IS17SO13	IS17SO14	IS17SO15	
Sample ID	IS17SS080001	IS17SS090001	IS17SS100001	IS17SS110001	IS17SS120001	IS17SS130001	IS17SS140001	IS17SS150001	IS17SS150001P
Sample Date	07/26/00	07/25/00	07/25/00	10/12/00	10/12/00	10/12/00	10/12/00	10/12/00	10/12/00
Chemical Name									
% Moisture	29.3	30.5	40.4	10.2	19.3	19.5	14.5	15.9	21.1
% Solids	68.1	74	61.9	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	76,600	17,000	65,800	NA	NA	NA	NA	NA	NA
pH	6.5	7.2	6.4	NA	NA	NA	NA	NA	NA

NA - Not analyzed
B - Analyte not detected above associated blank
E
J - Reported value is estimated
K - Reported value may be biased high

L - Reported value may be biased low
R - Unreliable result
U - Analyte not detected
UJ
UL

Table 3-5
Raw Compounds and Analytes for Site 17 Surface Water Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SW01		IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample ID	IS17SW01	IS17SW01P	IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample Date	07/21/00	07/21/00	07/20/00	07/21/00	07/24/00	07/24/00	07/24/00
Chemical Name							
Explosives (UG/L)							
1,3,5-Trinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,6-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Amino-4,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Nitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
3-Nitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
4-Amino-2,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
4-Nitrotoluene	0.2 U	0.2 U	0.11 J	0.2 U	0.2 U	0.2 U	0.2 U
Ammonium perchlorate	4 U	4 U	4 U	4 U	4 U	4 U	4 U
HMX	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nitroglycerin	30 U	30 U	30 U	30 U	30 U	30 U	30 U
Nitroguanidine	20 U	20 U	20 U	20 U	20 U	20 U	20 U
PETN	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
RDX	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetryl	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Total Metals (UG/L)							
Aluminum	25.1 B	161 B	664	553 J	258	171 B	124 B
Antimony	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U
Arsenic	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Barium	19 J	23.4 J	24.7 J	25.8 J	24 J	25.2 J	24.4 J
Beryllium	0.2 U	0.42 B	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Cadmium	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Calcium	10,600	10,200	10,000	10,100	9,750	10,800	11,800
Chromium	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cobalt	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Copper	1.9 U	1.9 U	3.9 J	2.4 J	4.5 J	5 J	5.4 J
Cyanide	6.2 B N	2.2 L	10 L	1.1 L	2.7 B	0.98 B	2.7 B

NA - Not analyzed
B - Analyte not detected above associated blank
B N
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
U - Analyte not detected

Table 3-5
Raw Compounds and Analytes for Site 17 Surface Water Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SW01		IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample ID	IS17SW01	IS17SW01P	IS17SW02	IS17SW03	IS17SW04	IS17SW05	IS17SW06
Sample Date	07/21/00	07/21/00	07/20/00	07/21/00	07/24/00	07/24/00	07/24/00
Chemical Name							
Iron	32.3 B	453	725	981	576	362	227
Lead	1.3 U	1.3 U	1.3 U	1.3 K	1.3 U	1.9 J	7.3
Magnesium	5,690	5,500	5,300	5,310	5,140	5,600	5,900
Manganese	1.6 B	93.9	87.4	106	105	105	95.9
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	1.9 U	2.5 K	2 B	2.7 J	3.5 J	2.8 J	2.8 J
Potassium	2,770 J	2,790 J	2,670 J	2,700 J	2,650 J	2,920 J	3,030 J
Selenium	860 U	4.3 U	860 U	4.3 U	4.3 U	5.8	4.3 U
Silver	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
Sodium	13,400	12,200	12,200	12,100	15,000	15,800	15,900
Thallium	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U
Vanadium	1.4 U	1.4 U	2.1 J	2.1 J	1.7 J	1.5 J	1.4 U
Zinc	7.4 B	15.2 B	9.4 B	32.8 B	24.2	26	32.7
Dissolved Metals (UG/L)							
Aluminum	199 B	18.8 U	38.4 B	55.4 B	44.3 B	43.7 B	52.2 B
Antimony	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U
Arsenic	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Barium	21.8 J	18.4 J	17 J	17.8 J	20.4 J	20.7 J	21 J
Beryllium	0.31 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Cadmium	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Calcium	9,120	10,400	10,100	10,200	10,000	10,700	12,200
Chromium	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cobalt	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Copper	4.8 J	1.9 U	1.9 U	1.9 U	2.8 J	2.2 J	1.9 U
Iron	456	29.4 B	27.3 U	28.2 J	59.2 J	47.6 B	37.5 J
Lead	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Magnesium	4,840 J	5,660	5,320	5,470	5,230	5,630	6,180
Manganese	86.7	1.7 J	1.6 B	2.2 B	5.1 B	4.4 B	4.2 B
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	17.9 J	1.9 U	1.9 U	1.9 U	3.1 J	3.7 J	3.3 J
Potassium	2,400 J	2,800 J	2,550 J	2,710 J	2,640 J	2,840 J	3,090 J
Selenium	4.3 U	4.3 U	4.3 U	4.3 U	4.9 J	4.3 U	4.3 U

NA - Not analyzed
B - Analyte not detected above associated blank
B N
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low
U - Analyte not detected

Table 3-5
Raw Compounds and Analytes for Site 17 Surface Water Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS17SW01		IS17SW01		IS17SW02		IS17SW03		IS17SW04		IS17SW05		IS17SW06	
Sample ID	IS17SW01		IS17SW01P		IS17SW02		IS17SW03		IS17SW04		IS17SW05		IS17SW06	
Sample Date	07/21/00		07/21/00		07/20/00		07/21/00		07/24/00		07/24/00		07/24/00	
Chemical Name														
Silver	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U
Sodium	11,300		12,800		12,300		12,900		14,900		13,700		14,200	
Thallium	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U	5.3	U
Vanadium	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U
Zinc	15.7	B	6.2	B	7.2	B	8	B	29.9		19.8	B	19.2	B
Wet Chemistry (MG/L)														
Hardness	42		48		44		46		40		36		42	

NA - Not analyzed
B - Analyte not detected above associated blank
B N
J - Reported value is estimated
K - Reported value may be biased high

L - Reported value may be biased low
U - Analyte not detected

Table 4-1
Raw Compounds and Analytes for Site 21 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03		IS21MW03		IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2- trifluoroethane	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	R	10	U	10	U	10	U
1,2-Dibromoethane	10	U	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	10	U	10	U	NA		NA		NA	
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	1.3	J	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U
Acetone	2.7	J	7.8	B	2.4	B	2.7	B	2.8	B
Benzene	10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U	10	U	10	U
Carbon tetrachloride	10	U	10	U	10	U	10	U	10	U
Chlorobenzene	10	U	2.2	J	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U	10	U
Cumene	10	U	10	U	10	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

U - Analyte not detected
UL

Table 4-1
Raw Compounds and Analytes for Site 21 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03				IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
Cyclohexane	10	U	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane	10	U	10	U	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U	10	U	10	U
Methyl acetate	10	U	10	U	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U	10	U	10	U
Methylene chloride	2.5	B	10	U	1.8	B	2.6	B	2.5	B
Styrene	10	U	10	U	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U	10	U	10	U
Toluene	10	U	1.4	J	10	U	10	U	10	U
Trichloroethene	10	U	10	U	10	U	10	U	10	U
Trichlorofluoromethane	10	U	10	U	10	U	10	U	10	U
Vinyl chloride	10	U	10	U	10	U	10	U	10	U
Xylene, total	10	U	10	U	10	U	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U
Semi-volatile Organic Compounds (UG/L)										
1,1-Biphenyl	10	U	10	U	10	U	10	U	10	U
2,2'-Oxybis(1-chloropropane)	10	U	10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U	25	U	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U	10	U	10	U	10	U
2,4-Dichlorophenol	10	U	10	U	10	U	10	U	10	U
2,4-Dimethylphenol	10	U	10	U	10	U	10	U	10	U
2,4-Dinitrophenol	25	U	25	U	25	U	25	U	25	U
2-Chloronaphthalene	10	U	10	U	10	U	10	U	10	U
2-Chlorophenol	10	U	10	U	10	U	10	U	10	U
2-Methylnaphthalene	10	U	10	U	10	U	10	U	10	U
2-Methylphenol	10	U	10	U	10	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

U - Analyte not detected
UL

Table 4-1
Raw Compounds and Analytes for Site 21 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03		IS21MW03		IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
2-Nitroaniline	25	U	25	U	25	U	25	U	25	U
2-Nitrophenol	10	U	10	U	10	U	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U	10	U	10	U	10	U
3-Nitroaniline	25	U	25	U	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U	25	U	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U	10	U	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U	10	U	10	U	10	U
4-Chloroaniline	10	U	10	U	10	U	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U	10	U	10	U	10	U
4-Methylphenol	10	U	10	U	10	U	10	U	10	U
4-Nitroaniline	25	U	25	U	25	U	25	U	25	U
4-Nitrophenol	25	U	25	U	25	U	25	U	25	U
Acenaphthene	10	U	10	U	10	U	10	U	10	U
Acenaphthylene	10	U	10	U	10	U	10	U	10	U
Acetophenone	10	U	10	U	10	U	10	U	10	U
Anthracene	10	U	10	U	10	U	10	U	10	U
Atrazine	10	U	10	U	10	U	10	U	10	U
Benzaldehyde	10	U	10	U	10	U	10	U	10	U
Benzo(a)anthracene	10	U	10	U	10	U	10	U	10	U
Benzo(a)pyrene	10	U	10	U	10	U	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U	10	U	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U	10	U	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U	10	U	10	U	10	U
Butylbenzylphthalate	10	U	10	U	10	U	10	U	10	U
Caprolactam	10	U	10	U	10	U	10	U	10	U
Carbazole	10	U	10	U	10	U	10	U	10	U
Chrysene	10	U	10	U	10	U	10	U	10	U
Di-n-butylphthalate	10	U	10	U	10	U	10	U	10	U
Di-n-octylphthalate	10	U	10	U	10	U	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U	10	U	10	U	10	U
Dibenzofuran	10	U	10	U	10	U	10	U	10	U
Diethylphthalate	10	U	10	U	10	U	10	U	10	U

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UL

Table 4-1
Raw Compounds and Analytes for Site 21 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03				IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
Dimethyl phthalate	10	U	10	U	10	U	10	U	10	U
Fluoranthene	10	U	10	U	10	U	10	U	10	U
Fluorene	10	U	10	U	10	U	10	U	10	U
Hexachlorobenzene	10	U	10	U	10	U	10	U	10	U
Hexachlorobutadiene	10	U	10	U	10	U	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U	10	U	10	U	10	U
Hexachloroethane	10	U	10	U	10	U	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U	10	U	10	U
Isophorone	10	U	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U	10	U
Pentachlorophenol	25	U	25	U	25	U	25	U	25	U
Phenanthrene	10	U	10	U	10	U	10	U	10	U
Phenol	10	U	10	U	10	U	10	U	10	U
Pyrene	10	U	10	U	10	U	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	2	B	8	B	1	B	10	U	1	B
n-Nitroso-di-n-propylamine	10	U	10	U	10	U	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U	10	U	10	U	10	U
Explosives (UG/L)										
1,3,5-Trinitrobenzene	0.2	U	0.19	J	0.2	U	0.2	U	0.2	U
1,3-Dinitrobenzene	0.053	J	0.2	U	0.2	U	0.2	U	0.049	J
2,4,6-Trinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2,4-Dinitrotoluene	0.2	U	0.13	J	0.2	U	0.098	J	0.2	U
2,6-Dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Amino-4,6-dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Nitrotoluene	0.2	U	0.45	U	0.2	U	0.2	U	0.2	U
3-Nitrotoluene	0.2	U	0.37	U	0.2	U	0.2	U	0.2	U
4-Amino-2,6-dinitrotoluene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Nitrotoluene	0.2	U	0.22	U	0.2	U	0.2	U	0.2	U
Ammonium perchlorate	2	J	4	U	4	U	4	U	2,000	

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Table 4-1
Raw Compounds and Analytes for Site 21 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03		IS21MW03		IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
HMX	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Nitrobenzene	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nitroglycerin	2.5	U	30	U	30	U	30	U	30	U
Nitroguanidine	20	U	20	U	20	U	20	U	20	U
PETN	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
RDX	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Tetryl	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Total Metals (UG/L)										
Aluminum	190	J	2,060		2,100		5,180		729	
Antimony	4.3	U	3.1	U	4.3	U	4.3	U	4.3	U
Arsenic	3.6	U	3.2	U	3.6	U	3.6	J	3.6	U
Barium	35.2	J	108	J	41	J	50.9	J	32.4	J
Beryllium	0.2	U	0.13	B	0.99	B	1.5	B	0.2	U
Cadmium	0.4	U	0.25	U	0.57	J	0.76	J	0.47	J
Calcium	1,720	J	29,700		22,100	J	23,200	J	3,380	J
Chromium	2	U	103		58.4		83.2		3.9	J
Cobalt	9.5	J	161		25.7	J	27.5	J	42.9	J
Copper	5.3	J	27.9		38.3		47.5		6.4	J
Cyanide	1.9	B	1.7	L	10	UL	1.7	L	1.6	B
Iron	97.3	J	24,200		2,820		6,820		1,790	
Lead	1.3	U	3.9		6.7		9		2.1	J
Magnesium	1,090	J	18,000		29,900		31,100		1,200	J
Manganese	66.5	J	23,100		682	J	709	J	601	J
Mercury	0.1	U	0.1		0.12	J	0.1	U	0.1	U
Nickel	6.8	J	85.7		71.5		84.4		10.1	B
Potassium	2,120	J	7,590		4,110	J	4,400	J	1,120	J
Selenium	4.3	U	4	U	4.3	U	4.3	U	4.3	U
Silver	3.1	U	1.3	J	3.1	U	3.1	U	3.1	U
Sodium	12,400		72,700		58,200		59,400		74,900	
Thallium	5.3	U	6.8	U	5.3	U	5.3	U	5.3	U
Vanadium	1.4	U	6.5	J	4.9	J	12.5	J	5.2	J

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Table 4-1
Raw Compounds and Analytes for Site 21 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21MW01		IS21MW02		IS21MW03		IS21MW03		IS21MW04	
Sample ID	IS21MW010900		IS21MW020900		IS21MW030900P		IS21MW030900		IS21MW040900	
Sample Date	09/07/00		09/11/00		09/08/00		09/08/00		09/08/00	
Chemical Name										
Zinc	30.7	J	164		77.3	J	87.1	J	19.9	J
Dissolved Metals (UG/L)										
Aluminum	48.8	B	19.9	U	705		667		41.7	B
Antimony	4.3	U	3.1	U	4.3	U	4.3	U	4.3	U
Arsenic	3.6	U	3.2	U	3.6	U	3.6	U	3.6	U
Barium	33.3	J	113	J	37.7	J	36.5	J	11.9	J
Beryllium	0.2	U	0.08	U	1.2	B	1.2	B	0.2	U
Cadmium	0.4	U	0.25	U	0.59	J	0.74	J	0.4	U
Calcium	1,890	J	34,400		25,700	J	24,800	J	2,930	J
Chromium	2	U	1.6	B	5.8	J	7	J	2	U
Cobalt	8.9	J	179		29.1	J	29.2	J	33.6	J
Copper	7.3	J	7.8	J	28.9		26.3		1.9	U
Iron	27.3	U	16,300		180		335		331	
Lead	1.3	U	1.9	U	4		3.7		1.3	U
Magnesium	1,050	J	20,900		34,600		33,000		1,050	J
Manganese	64.6	J	24,700		776	J	748	J	492	J
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	7.5	B	46.9		48.9		67.5		13.4	B
Potassium	2,080	J	8,460		4,190	J	3,970	J	1,140	J
Selenium	4.3	U	4	U	4.3	U	4.3	U	4.3	U
Silver	3.1	U	2.4	J	3.1	U	3.1	U	3.1	U
Sodium	12,100		82,600		65,900		62,300		87,800	
Thallium	6.2	J	6.8	U	5.3	U	5.3	U	5.5	J
Vanadium	1.4	U	0.76	U	1.4	U	1.4	U	1.4	U
Zinc	49.9	J	209		69.9	J	69.5	J	26.6	J

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Table 4-2
Raw Compounds and Analytes for Site 21 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO01		IS21SO02		IS21SO03		IS21SO04		IS21SO05		IS21SO06		IS21SO07		IS21SO08		IS21SO09
Sample ID	IS21SS010001		IS21SS020001		IS21SS030001		IS21SS040001		IS21SS050001		IS21SS060001		IS21SS070001		IS21SS080001		IS21SS0900
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00
Chemical Name																	
Volatile Organic Compounds (UG/KG)																	
1,1,1-Trichloroethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
1,1,2,2-Tetrachloroethane	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
1,1,2-Trichloro-1,2,2- trifluoroethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
1,1,2-Trichloroethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
1,1-Dichloroethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
1,1-Dichloroethene	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
1,2,4-Trichlorobenzene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
1,2-Dibromo-3-chloropropane	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
1,2-Dibromoethane	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
1,2-Dichlorobenzene	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
1,2-Dichloroethane	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA		NA
1,2-Dichloropropane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
1,3-Dichlorobenzene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
1,4-Dichlorobenzene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
2-Butanone	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
2-Hexanone	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
4-Methyl-2-pentanone	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
Acetone	1.8	B	11	U	1.4	B	1.7	B	11	U	1.8	B	13	U	2	B	2.7
Benzene	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Bromodichloromethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Bromoform	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Bromomethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Carbon disulfide	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Carbon tetrachloride	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Chlorobenzene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
Chloroethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Chloroform	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Chloromethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Cumene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12

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Table 4-2
Raw Compounds and Analytes for Site 21 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO01		IS21SO02		IS21SO03		IS21SO04		IS21SO05		IS21SO06		IS21SO07		IS21SO08		IS21SO09
Sample ID	IS21SS010001		IS21SS020001		IS21SS030001		IS21SS040001		IS21SS050001		IS21SS060001		IS21SS070001		IS21SS080001		IS21SS0900
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00
Chemical Name																	
Cyclohexane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Dibromochloromethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Dichlorodifluoromethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Ethylbenzene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
Methyl acetate	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Methyl-tert-butyl ether (MTBE)	18	U	11	U	12	U	13	U	11	U	11	U	13	J	12	U	12
Methylcyclohexane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Methylene chloride	18	U	11	U	12	U	13	U	1.2	B	11	U	13	U	12	U	12
Styrene	18	U	11	U	12	U	1.5	J	11	U	11	U	13	UJ	12	U	12
Tetrachloroethene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
Toluene	18	U	11	U	12	U	13	U	11	U	11	U	2.6	J	12	U	6.3
Trichloroethene	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	U	12
Trichlorofluoromethane	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Vinyl chloride	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Xylene, total	18	U	11	U	12	U	13	U	11	U	11	U	13	UJ	12	B	12
cis-1,2-Dichloroethene	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
cis-1,3-Dichloropropene	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
trans-1,2-Dichloroethene	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
trans-1,3-Dichloropropene	18	U	11	U	12	U	13	U	11	U	11	U	13	U	12	U	12
Semi-volatile Organic Compounds (UG/KG)																	
1,1-Biphenyl	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2,2'-Oxybis(1-chloropropane)	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2,4,5-Trichlorophenol	1,500	U	940	U	1,000	U	1,100	U	950	U	940	U	1,000	U	1,000	U	1,000
2,4,6-Trichlorophenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2,4-Dichlorophenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2,4-Dimethylphenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2,4-Dinitrophenol	1,500	U	940	U	1,000	U	1,100	U	950	U	940	U	1,000	U	1,000	U	1,000
2-Chloronaphthalene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2-Chlorophenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2-Methylnaphthalene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
2-Methylphenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO01		IS21SO02		IS21SO03		IS21SO04		IS21SO05		IS21SO06		IS21SO07		IS21SO08		IS21SO09
Sample ID	IS21SS010001		IS21SS020001		IS21SS030001		IS21SS040001		IS21SS050001		IS21SS060001		IS21SS070001		IS21SS080001		IS21SS0900
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00
Chemical Name																	
2-Nitroaniline	1,500	U	940	U	1,000	U	1,100	U	950	U	940	U	1,000	U	1,000	U	1,000
2-Nitrophenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
3,3'-Dichlorobenzidine	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
3-Nitroaniline	1,500	U	940	U	1,000	U	1,100	U	950	U	940	U	1,000	U	1,000	U	1,000
4,6-Dinitro-2-methylphenol	1,500	U	940	U	1,000	U	1,100	U	950	U	940	U	1,000	U	1,000	U	1,000
4-Bromophenyl-phenylether	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
4-Chloro-3-methylphenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
4-Chloroaniline	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
4-Chlorophenyl-phenylether	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
4-Methylphenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
4-Nitroaniline	1,500	U	940	U	1,000	U	1,100	U	950	U	940	U	1,000	U	1,000	U	1,000
4-Nitrophenol	1,500	U	940	U	1,000	U	1,100	U	950	U	940	U	1,000	U	1,000	U	1,000
Acenaphthene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Acenaphthylene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Acetophenone	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Anthracene	580	U	380	U	400	U	420	U	45	J	370	U	410	U	400	U	400
Atrazine	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Benzaldehyde	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Benzo(a)anthracene	81	J	83	J	400	U	170	J	260	J	370	U	120	J	190	J	72
Benzo(a)pyrene	580	U	380	U	400	U	46	J	81	J	61	J	45	J	49	J	400
Benzo(b)fluoranthene	130	J	130	J	400	U	250	J	350	J	370	U	200	J	270	J	110
Benzo(g,h,i)perylene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Benzo(k)fluoranthene	62	J	42	J	400	U	100	J	170	J	370	U	79	J	140	J	400
Butylbenzylphthalate	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Caprolactam	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Carbazole	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Chrysene	100	J	100	J	400	U	190	J	290	J	370	U	140	J	230	J	87
Di-n-butylphthalate	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Di-n-octylphthalate	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Dibenz(a,h)anthracene	580	U	380	U	400	U	420	U	41	J	370	U	410	U	400	U	400
Dibenzofuran	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Diethylphthalate	390	B	72	B	400	U	84	B	380	U	370	U	410	U	400	U	250

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Table 4-2
Raw Compounds and Analytes for Site 21 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO01		IS21SO02		IS21SO03		IS21SO04		IS21SO05		IS21SO06		IS21SO07		IS21SO08		IS21SO09
Sample ID	IS21SS010001		IS21SS020001		IS21SS030001		IS21SS040001		IS21SS050001		IS21SS060001		IS21SS070001		IS21SS080001		IS21SS0900
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00
Chemical Name																	
Dimethyl phthalate	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Fluoranthene	140	J	160	J	400	U	320	J	530		370	U	190	J	340	J	130
Fluorene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Hexachlorobenzene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Hexachlorobutadiene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Hexachlorocyclopentadiene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Hexachloroethane	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Indeno(1,2,3-cd)pyrene	580	U	380	U	400	U	61	J	77	J	52	J	410	U	57	J	400
Isophorone	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Naphthalene	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Pentachlorophenol	1,400	U	910	U	970	U	1,000	U	910	U	900	U	1,000	U	960	U	970
Phenanthrene	580	U	63	J	400	U	110	J	230	J	370	U	66	J	120	J	63
Phenol	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Pyrene	580	U	73	J	400	U	130	J	220	J	59	J	120	J	170	J	85
bis(2-Chloroethoxy)methane	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
bis(2-Chloroethyl)ether	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
bis(2-Ethylhexyl)phthalate	76	J	380	U	45	J	48	J	48	J	370	U	45	J	400	U	45
n-Nitroso-di-n-propylamine	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
n-Nitrosodiphenylamine	580	U	380	U	400	U	420	U	380	U	370	U	410	U	400	U	400
Explosives (UG/KG)																	
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
4-Nitrotoluene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
Ammonium perchlorate	97	U	92	U	97	U	100	U	98	U	89	U	89	U	98	U	99

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Table 4-2
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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO01		IS21SO02		IS21SO03		IS21SO04		IS21SO05		IS21SO06		IS21SO07		IS21SO08		IS21SO09
Sample ID	IS21SS010001		IS21SS020001		IS21SS030001		IS21SS040001		IS21SS050001		IS21SS060001		IS21SS070001		IS21SS080001		IS21SS0900
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00
Chemical Name																	
HMX	500	U	500	U	500	U	500	U	500	U	190	J	500	U	500	U	500
Nitrobenzene	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250
Nitroglycerin	1,700	U	1,200	U	1,300	U	1,300	U	1,100	U	1,100	U	1,100	U	1,100	U	1,100
Nitroguanidine	100	U	100	U	100	U	100	U	100	U	68	J	100	U	100	U	100
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500
RDX	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500
Tetryl	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650
Total Metals (MG/KG)																	
Aluminum	9,830		5,240		6,440		6,780		7,230		7,340		4,130		6,070		5,760
Antimony	1.5	UL	0.98	UL	1	UL	1.1	UL	0.98	UL	0.97	UL	1.1	UL	1	UL	1
Arsenic	15.1		9		18.5		33		7.2		4.8		3.6		17.8		9.7
Barium	67.6	J	35.9	J	28.5	J	51.1		41.5	J	34.2	J	24.8	J	38.5	J	39
Beryllium	0.42	B	0.15	B	0.059	B	0.051	U	0.3	B	0.12	B	0.078	B	0.068	B	0.094
Cadmium	0.92	J	1.5		0.097	U	0.1	U	0.091	U	0.09	U	0.52	J	0.096	U	0.097
Calcium	2,640		1,160		277	J	305	J	4,870		208	J	3,290		453	J	902
Chromium	18.8		16.5		36.6		15.3		16.3		11.9		13.8		12.2		12.7
Cobalt	7.9	J	4.5	J	2.3	J	2.2	J	4	J	3.7	J	3.1	J	2.5	J	4.5
Copper	22	K	14.9	K	26.4	K	13.4	K	9.4	K	9.8	K	7.2	K	10.2	K	7.8
Cyanide	0.18		0.075	B	0.61		0.64		0.57		0.12	B	0.12	B	0.6		0.6
Iron	25,300		13,400		13,200		29,500		16,300		17,200		9,310		18,800		15,100
Lead	57.1		35.9		18.5		31.4		16.2		16.8		22.7		21.6		25.6
Magnesium	1,370	J	936	J	534	J	559	J	1,630		560	J	1,260		592	J	560
Manganese	131		127		50.2		32.6		127		345		86.4		41.7		85.7
Mercury	0.19		0.085	J	0.082	J	0.29		0.06	J	1.5		0.063	U	0.34		0.14
Nickel	18.5		13.4		5.2	J	7.2	J	11		6.1	J	17.2		8.9	J	7.3
Potassium	650	J	393	J	352	J	720	J	441	J	491	J	473	J	528	J	357
Selenium	1.5	UL	0.98	UL	1.1	L	1.1	UL	0.98	UL	0.97	UL	1.1	UL	1	UL	1
Silver	1.1	U	0.71	U	0.75	U	0.79	U	0.71	U	0.7	U	0.78	U	0.75	U	0.75
Sodium	155	U	99.9	U	107	U	208	J	117	J	98.9	U	110	U	106	U	106
Thallium	1.9	U	1.2	U	1.3	U	1.4	U	1.2	U	1.2	U	1.3	U	1.3	U	1.3
Vanadium	45.3		22.1		21.9		33.5		21.6		29.2		32.2		36.5		20

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO01	IS21SO02	IS21SO03	IS21SO04	IS21SO05	IS21SO06	IS21SO07	IS21SO08	IS21SO09
Sample ID	IS21SS010001	IS21SS020001	IS21SS030001	IS21SS040001	IS21SS050001	IS21SS060001	IS21SS070001	IS21SS080001	IS21SS0900
Sample Date	08/01/00	08/01/00	08/01/00	08/01/00	08/01/00	08/01/00	08/01/00	08/01/00	08/01/00
Chemical Name									
Zinc	81.7 J	60.9 J	17.3 J	19.1 J	30.2 J	49.4 J	26.9 J	20.2 J	24.6
Wet Chemistry (MG/KG)									
% Moisture	43.2	12.1	17.7	21.4	12.5	11.3	20.1	17	17.2
% Solids	58.7	88.1	81.5	84.4	78.5	92.5	83	83.8	84.8
Total organic carbon (TOC)	16,400	10,600	12,700	3,460	3,460	5,150	31,700	15,500	7,750
pH	6.6	6.7	5.6	4.3	7.1	5.3	7.4	5.4	5.6

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15			
Sample ID	01	IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001		IS21SS150001P	
Sample Date		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																	
Volatile Organic Compounds (UG/KG)																	
1,1,1-Trichloroethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,1,2,2-Tetrachloroethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,1,2-Trichloro-1,2,2- trifluoroethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,1,2-Trichloroethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,1-Dichloroethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,1-Dichloroethene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,2,4-Trichlorobenzene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,2-Dibromo-3-chloropropane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,2-Dibromoethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,2-Dichlorobenzene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,2-Dichloroethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,2-Dichloroethene (total)		NA		NA		NA		12	U	NA		NA		NA		NA	
1,2-Dichloropropane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,3-Dichlorobenzene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
1,4-Dichlorobenzene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
2-Butanone	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
2-Hexanone	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
4-Methyl-2-pentanone	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Acetone	B	1.9	B	2.4	B	1.3	B	1.6	B	12	U	1.7	B	13	U	13	U
Benzene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Bromodichloromethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Bromoform	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Bromomethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Carbon disulfide	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Carbon tetrachloride	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Chlorobenzene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Chloroethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Chloroform	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Chloromethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Cumene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U

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IHDIV-NSWC
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Station ID		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15			
Sample ID	01	IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001		IS21SS150001P	
Sample Date		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																	
Cyclohexane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Dibromochloromethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Dichlorodifluoromethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Ethylbenzene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Methyl acetate	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Methyl-tert-butyl ether (MTBE)	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Methylcyclohexane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Methylene chloride	U	12	U	13	U	1.5	B	12	U	12	U	1.5	B	1.4	B	13	U
Styrene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Tetrachloroethene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Toluene	J	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Trichloroethene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Trichlorofluoromethane	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Vinyl chloride	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Xylene, total	B	12	U	1.8	J	12	U	12	U	12	U	11	U	13	U	13	U
cis-1,2-Dichloroethene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
cis-1,3-Dichloropropene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
trans-1,2-Dichloroethene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
trans-1,3-Dichloropropene	U	12	U	13	U	12	U	12	U	12	U	11	U	13	U	13	U
Semi-volatile Organic Compounds (UG/KG)																	
1,1-Biphenyl	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2,2'-Oxybis(1-chloropropane)	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2,4,5-Trichlorophenol	U	1,000	U	1,100	U	1,000	U	970	U	1,000	U	940	U	1,100	U	1,100	U
2,4,6-Trichlorophenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2,4-Dichlorophenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2,4-Dimethylphenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2,4-Dinitrophenol	U	1,000	U	1,100	U	1,000	U	970	U	1,000	U	940	U	1,100	U	1,100	U
2-Chloronaphthalene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2-Chlorophenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2-Methylnaphthalene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
2-Methylphenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U

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Station ID		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15			
Sample ID	01	IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001		IS21SS150001P	
Sample Date		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																	
2-Nitroaniline	U	1,000	U	1,100	U	1,000	U	970	U	1,000	U	940	U	1,100	U	1,100	U
2-Nitrophenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
3,3'-Dichlorobenzidine	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
3-Nitroaniline	U	1,000	U	1,100	U	1,000	U	970	U	1,000	U	940	U	1,100	U	1,100	U
4,6-Dinitro-2-methylphenol	U	1,000	U	1,100	U	1,000	U	970	U	1,000	U	940	U	1,100	U	1,100	U
4-Bromophenyl-phenylether	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
4-Chloro-3-methylphenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
4-Chloroaniline	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
4-Chlorophenyl-phenylether	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
4-Methylphenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
4-Nitroaniline	U	1,000	U	1,100	U	1,000	U	970	U	1,000	U	940	U	1,100	U	1,100	U
4-Nitrophenol	U	1,000	U	1,100	U	1,000	U	970	U	1,000	U	940	U	1,100	U	1,100	U
Acenaphthene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Acenaphthylene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Acetophenone	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Anthracene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Atrazine	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Benzaldehyde	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Benzo(a)anthracene	J	160	J	430	U	220	J	110	J	51	J	150	J	430	U	430	U
Benzo(a)pyrene	U	45	J	430	U	60	J	390	U	410	U	370	U	430	U	430	U
Benzo(b)fluoranthene	J	250	J	430	U	380	J	150	J	64	J	250	J	430	U	430	U
Benzo(g,h,i)perylene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Benzo(k)fluoranthene	U	120	J	430	U	130	J	84	J	410	U	99	J	430	U	430	U
Butylbenzylphthalate	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Caprolactam	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Carbazole	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Chrysene	J	180	J	430	U	330	J	140	J	55	J	190	J	430	U	430	U
Di-n-butylphthalate	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Di-n-octylphthalate	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Dibenz(a,h)anthracene	U	400	U	430	U	48	J	390	U	410	U	370	U	430	U	430	U
Dibenzofuran	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Diethylphthalate	B	220	B	430	U	1,200		260	B	410	U	310	B	110	B	76	J

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Table 4-2
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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15			
Sample ID	01	IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001		IS21SS150001P	
Sample Date		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																	
Dimethyl phthalate	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Fluoranthene	J	190	J	430	U	490		300	J	100	J	350	J	430	U	430	U
Fluorene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Hexachlorobenzene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Hexachlorobutadiene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Hexachlorocyclopentadiene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Hexachloroethane	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Indeno(1,2,3-cd)pyrene	U	47	J	430	U	81	J	390	U	410	U	370	U	430	U	430	U
Isophorone	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Naphthalene	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Pentachlorophenol	U	970	U	1,000	U	980	U	930	U	990	U	910	U	1,100	U	1,000	U
Phenanthrene	J	63	J	430	U	340	J	200	J	50	J	220	J	430	U	430	U
Phenol	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Pyrene	J	110	J	430	U	280	J	150	B	45	B	220	J	430	U	430	U
bis(2-Chloroethoxy)methane	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
bis(2-Chloroethyl)ether	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
bis(2-Ethylhexyl)phthalate	J	51	J	430	U	49	J	43	J	43	B	67	J	64	B	59	J B
n-Nitroso-di-n-propylamine	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
n-Nitrosodiphenylamine	U	400	U	430	U	400	U	390	U	410	U	370	U	430	U	430	U
Explosives (UG/KG)																	
1,3,5-Trinitrobenzene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Ammonium perchlorate	U	92	U	97	U	100	U	91	U	81	J	88	U	94	U	130	U

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Table 4-2
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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15			
Sample ID	01	IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001		IS21SS150001P	
Sample Date		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																	
HMX	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U	250	U
Nitroglycerin	U	1,300	U	1,200	U	1,300	U	1,100	U	1,300	U	1,100	U	1,200	U	NA	
Nitroguanidine	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
PETN	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Tetryl	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)																	
Aluminum		5,680		5,320		5,070		7,100		7,270		5,260		3,820		3,120	
Antimony	UL	1	UL	1.1	UL	1.1	UL	1	UL	1.1	UL	0.97	UL	1.1	UL	1.1	UL
Arsenic		15.5		6.2		20.6		11.5		11.7	L	51.8		4.1		3.4	L
Barium	J	28.3	J	32.2	J	34.1	J	36.7	J	39.7	J	45.5		41.5	J	22.6	J
Beryllium	B	0.23	B	0.052	U	0.12	B	0.076	B	0.066	J	0.045	U	0.053	U	0.052	U
Cadmium	U	0.097	U	0.15	J	0.6	J	0.093	U	0.15	J	0.37	J	0.54	J	0.22	J
Calcium	J	1,490		614	J	2,280		1,420		1,770		3,220		722	J	868	J
Chromium		11.2		11.6		12.5		12.3		12.6		13.8		10.7		9.2	
Cobalt	J	4.2	J	2.5	J	4.7	J	4.2	J	4.3	J	3	J	5.8	J	3.8	J
Copper	K	24.6	K	10.7	K	14.4	K	48.1	K	48	K	32.7	K	8.5	K	8.2	K
Cyanide		0.61		0.65		0.11	B	0.58		0.62		0.57		0.66		0.64	
Iron		13,600		13,900		14,200		17,100		15,000		26,600		11,200		9,120	
Lead		32.3		13.2		29.9	L	41.6		37.2		49.1		15.5		15.3	
Magnesium	J	1,050	J	535	J	747	J	811	J	884	J	1,000	J	943	J	1,070	J
Manganese		90		41		212		94.7		105		45.5		398		103	
Mercury		0.061	U	0.067	J	0.14		0.13		0.073	J	0.56		0.066	U	0.12	J
Nickel	J	12		5.2	J	12.6		9	J	8.6	J	19.2		13.1		13.3	
Potassium	J	357	J	403	J	500	J	495	J	450	J	520	J	317	J	262	J
Selenium	UL	1	UL	1.1	UL	1.6	L	1	UL	1.1	UL	2.7	L	1.1	UL	1.1	UL
Silver	U	0.75	U	0.81	U	0.76	U	0.72	U	0.77	U	16.5		0.81	U	0.8	U
Sodium	U	107	J	115	U	108	U	103	U	109	U	166	J	115	U	113	U
Thallium	U	1.3	U	1.4	U	1.3	U	1.2	U	1.3	U	1.2	U	1.4	U	1.4	U
Vanadium		20.7		26.4		29.4		21.3		21.8		65.1		25.1		21.6	

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Table 4-2
Raw Compounds and Analytes for Site 21 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID		IS21SO10		IS21SO11		IS21SO12		IS21SO13				IS21SO14		IS21SO15			
Sample ID	01	IS21SS100001		IS21SS110001		IS21SS120001		IS21SS130001		IS21SS130001P		IS21SS140001		IS21SS150001		IS21SS150001P	
Sample Date		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name																	
Zinc	J	134	J	15.5	J	40.7	J	64.2	J	61.2	J	26.3	J	23.5	J	24.6	J
Wet Chemistry (MG/KG)																	
% Moisture		17.4		23.6		18.4		14.3		19.3		11.7		23.8		22.4	
% Solids		89		77.6		78.2		86.2		87.1		90.3		80.9		78.6	
Total organic carbon (TOC)		5,970		10,400		43,800		7,010		4,970		23,100		10,900		12,800	
pH		7.7		4.7		7.6		7.2		7.6		3.7		6.6		6.5	

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Table 4-2
Raw Compounds and Analytes for Site 21 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,1,1-Trichloroethane	12	U	13	U	12	UJ	15	U	13	U
1,1,2,2-Tetrachloroethane	12	U	13	U	12	UJ	15	U	13	U
1,1,2-Trichloro-1,2,2- trifluoroethane	12	U	13	U	12	UJ	15	U	13	U
1,1,2-Trichloroethane	12	U	13	U	12	UJ	15	U	13	U
1,1-Dichloroethane	12	U	13	U	12	UJ	15	U	13	U
1,1-Dichloroethene	12	U	13	U	12	UJ	15	U	13	U
1,2,4-Trichlorobenzene	12	U	13	U	12	UJ	15	U	13	U
1,2-Dibromo-3-chloropropane	12	U	13	U	12	UJ	15	U	13	U
1,2-Dibromoethane	12	U	13	U	12	UJ	15	U	13	U
1,2-Dichlorobenzene	12	U	13	U	12	UJ	15	U	13	U
1,2-Dichloroethane	12	U	13	U	12	UJ	15	U	13	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA	
1,2-Dichloropropane	12	U	13	U	12	UJ	15	U	13	U
1,3-Dichlorobenzene	12	U	13	U	12	UJ	15	U	13	U
1,4-Dichlorobenzene	12	U	13	U	12	UJ	15	U	13	U
2-Butanone	12	U	13	U	12	UJ	15	U	13	U
2-Hexanone	12	U	13	U	12	UJ	15	U	13	U
4-Methyl-2-pentanone	12	U	13	U	12	UJ	15	U	13	U
Acetone	12	U	13	U	2.6	B	3	B	2	B
Benzene	12	U	13	U	12	UJ	15	U	13	U
Bromodichloromethane	12	U	13	U	12	UJ	15	U	13	U
Bromoform	12	U	13	U	12	UJ	15	U	13	U
Bromomethane	12	U	13	U	12	UJ	15	U	13	U
Carbon disulfide	12	U	13	U	12	UJ	15	U	13	U
Carbon tetrachloride	12	U	13	U	12	UJ	15	U	13	U
Chlorobenzene	12	U	13	U	12	UJ	15	U	13	U
Chloroethane	12	U	13	U	12	UJ	15	U	13	U
Chloroform	12	U	13	U	12	UJ	15	U	13	U
Chloromethane	12	U	13	U	12	UJ	15	U	13	U
Cumene	12	U	13	U	12	U	15	U	13	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name										
Cyclohexane	12	U	13	U	12	UJ	15	U	13	U
Dibromochloromethane	12	U	13	U	12	UJ	15	U	13	U
Dichlorodifluoromethane	12	U	13	U	12	UJ	15	U	13	U
Ethylbenzene	12	U	13	U	12	UJ	15	U	13	U
Methyl acetate	12	U	13	U	12	UJ	15	U	13	U
Methyl-tert-butyl ether (MTBE)	12	U	13	U	12	UJ	15	U	13	U
Methylcyclohexane	12	U	13	U	12	UJ	15	U	13	U
Methylene chloride	12	U	13	U	12	UJ	1.6	B	1.6	B
Styrene	12	U	13	U	12	UJ	15	U	13	U
Tetrachloroethene	12	U	13	U	12	UJ	15	U	13	U
Toluene	12	U	13	U	12	UJ	15	U	13	U
Trichloroethene	12	U	13	U	12	UJ	15	U	13	U
Trichlorofluoromethane	12	U	13	U	12	UJ	15	U	13	U
Vinyl chloride	12	U	13	U	12	UJ	15	U	13	U
Xylene, total	12	U	13	U	12	UJ	15	U	13	U
cis-1,2-Dichloroethene	12	U	13	U	12	UJ	15	U	13	U
cis-1,3-Dichloropropene	12	U	13	U	12	UJ	15	U	13	U
trans-1,2-Dichloroethene	12	U	13	U	12	UJ	15	U	13	U
trans-1,3-Dichloropropene	12	U	13	U	12	UJ	15	U	13	U
Semi-volatile Organic Compounds (UG/KG)										
1,1-Biphenyl	390	U	430	U	390	U	480	U	430	UL
2,2'-Oxybis(1-chloropropane)	390	U	430	U	390	U	480	U	430	UL
2,4,5-Trichlorophenol	980	U	1,100	U	970	U	1,200	U	1,100	UL
2,4,6-Trichlorophenol	390	U	430	U	390	U	480	U	430	UL
2,4-Dichlorophenol	390	U	430	U	390	U	480	U	430	U
2,4-Dimethylphenol	390	U	430	U	390	U	480	U	430	UL
2,4-Dinitrophenol	980	U	1,100	U	970	U	1,200	U	1,100	UL
2-Chloronaphthalene	390	U	430	U	390	U	480	U	430	UL
2-Chlorophenol	390	U	430	U	390	U	480	U	430	UL
2-Methylnaphthalene	390	U	430	U	390	U	480	U	73	L
2-Methylphenol	390	U	430	U	390	U	480	U	430	UL

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name										
2-Nitroaniline	980	U	1,100	U	970	U	1,200	U	1,100	UL
2-Nitrophenol	390	U	430	U	390	U	480	U	430	UL
3,3'-Dichlorobenzidine	390	U	430	U	390	U	480	U	430	UL
3-Nitroaniline	980	U	1,100	U	970	U	1,200	U	1,100	UL
4,6-Dinitro-2-methylphenol	980	U	1,100	U	970	U	1,200	U	1,100	UL
4-Bromophenyl-phenylether	390	U	430	U	390	U	480	U	430	UL
4-Chloro-3-methylphenol	390	U	430	U	390	U	480	U	430	UL
4-Chloroaniline	390	U	430	U	390	U	480	U	430	UL
4-Chlorophenyl-phenylether	390	U	430	U	390	U	480	U	430	UL
4-Methylphenol	390	U	430	U	390	U	480	U	430	UL
4-Nitroaniline	980	U	1,100	U	970	U	1,200	U	1,100	UL
4-Nitrophenol	980	U	1,100	U	970	U	1,200	U	1,100	UL
Acenaphthene	390	U	430	U	390	U	480	U	430	UL
Acenaphthylene	390	U	430	U	390	U	480	U	430	UL
Acetophenone	390	U	430	U	390	U	63	J	430	UL
Anthracene	390	U	430	U	390	U	480	U	430	UL
Atrazine	390	U	430	U	390	U	480	U	430	UL
Benzaldehyde	390	U	430	U	390	U	480	U	430	UL
Benzo(a)anthracene	390	U	430	U	390	U	480	U	430	UL
Benzo(a)pyrene	390	U	430	U	390	U	480	U	430	UL
Benzo(b)fluoranthene	49	J	430	U	390	U	480	U	430	UL
Benzo(g,h,i)perylene	390	U	430	U	390	U	480	U	430	UL
Benzo(k)fluoranthene	390	U	430	U	390	U	480	U	430	UL
Butylbenzylphthalate	390	U	430	U	390	U	480	U	430	R
Caprolactam	390	U	430	U	390	U	480	U	430	UL
Carbazole	390	U	430	U	390	U	480	U	430	UL
Chrysene	390	U	430	U	390	U	480	U	430	UL
Di-n-butylphthalate	390	U	430	U	390	U	480	U	430	UL
Di-n-octylphthalate	390	U	430	U	390	U	480	U	430	UL
Dibenz(a,h)anthracene	390	U	430	U	390	U	480	U	430	UL
Dibenzofuran	390	U	430	U	390	U	480	U	430	UL
Diethylphthalate	320	B	310	B	490	B	480	U	430	UL

NA - Not analyzed
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UJ
UL

Table 4-2
Raw Compounds and Analytes for Site 21 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name										
Dimethyl phthalate	390	U	430	U	390	U	480	U	430	UL
Fluoranthene	63	J	46	J	390	U	480	U	430	UL
Fluorene	390	U	430	U	390	U	480	U	430	UL
Hexachlorobenzene	390	U	430	U	390	U	480	U	430	UL
Hexachlorobutadiene	390	U	430	U	390	U	480	U	430	UL
Hexachlorocyclopentadiene	390	U	430	U	390	U	480	U	430	UL
Hexachloroethane	390	U	430	U	390	U	480	U	430	UL
Indeno(1,2,3-cd)pyrene	390	U	430	U	390	U	480	U	430	UL
Isophorone	390	U	430	U	390	U	480	U	430	UL
Naphthalene	390	U	430	U	390	U	480	U	110	L
Pentachlorophenol	940	U	1,000	U	940	U	1,200	U	1,000	UL
Phenanthrene	390	U	430	U	390	U	480	U	430	UL
Phenol	390	U	430	U	390	U	480	U	430	UL
Pyrene	65	J	430	U	390	U	480	U	430	UL
bis(2-Chloroethoxy)methane	390	U	430	U	390	U	480	U	430	UL
bis(2-Chloroethyl)ether	390	U	430	U	390	U	480	U	430	UL
bis(2-Ethylhexyl)phthalate	43	J	430	U	390	U	67	B	430	UL
n-Nitroso-di-n-propylamine	390	U	430	U	390	U	480	U	430	UL
n-Nitrosodiphenylamine	390	U	430	U	390	U	480	U	430	UL
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	250	U	250	U	250	U	250	U	250	U
1,3-Dinitrobenzene	250	U	250	U	250	U	250	U	250	U
2,4,6-Trinitrotoluene	250	U	250	U	250	U	250	U	250	U
2,4-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U
2,6-Dinitrotoluene	250	U	250	U	250	U	250	U	250	U
2-Amino-4,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U
2-Nitrotoluene	250	U	250	U	250	U	250	U	250	U
3-Nitrotoluene	250	U	250	U	250	U	250	U	250	U
4-Amino-2,6-dinitrotoluene	250	U	250	U	250	U	250	U	250	U
4-Nitrotoluene	250	U	250	U	250	U	250	U	250	U
Ammonium perchlorate	97	U	110	U	100	U	110	U	100	U

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Table 4-2
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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name										
HMX	500	U	500	U	500	U	500	U	500	U
Nitrobenzene	250	U	250	U	250	U	250	U	250	U
Nitroglycerin	1,200	U	1,400	U	1,200	U	1,300	U	1,300	U
Nitroguanidine	100	U	100	U	100	U	100	U	100	U
PETN	2,500	U	2,500	U	2,500	U	2,500	U	2,500	U
RDX	500	U	500	U	500	U	500	U	500	U
Tetryl	650	U	650	U	650	U	650	U	650	U
Total Metals (MG/KG)										
Aluminum	5,620		8,850		4,510		5,940		10,100	
Antimony	1	UL	1.1	UL	1	UL	1.3	UL	1.1	UL
Arsenic	4.9		14		3.3		5.9		7.7	
Barium	31.2	J	58.4		17.4	J	45.3	J	42.2	J
Beryllium	0.047	U	0.17	B	0.047	U	0.058	U	0.052	U
Cadmium	0.2	J	0.21	J	0.094	U	0.12	U	0.16	J
Calcium	651	J	1,460		83.9	J	235	J	609	J
Chromium	10.4		13		8.9		16.1		19.6	
Cobalt	5.2	J	4.6	J	1.8	J	4.7	J	3.9	J
Copper	7.1	K	9.9	K	3.8	K	4.9	K	9.7	K
Cyanide	0.4	B	0.65		0.59		0.73		0.65	
Iron	12,100		12,700		8,280		12,200		22,200	
Lead	10.5		27.5		17.1		25.7		16.8	
Magnesium	591	J	1,040	J	353	J	582	J	390	J
Manganese	260		175		66.1		279		397	
Mercury	0.059	U	0.11	J	0.076	J	0.073	U	0.12	J
Nickel	6.2	J	10.7		3.2	J	7	J	4.5	J
Potassium	499	J	394	J	236	J	324	J	636	J
Selenium	1	UL	1.1	UL	1	UL	1.3	UL	1.1	UL
Silver	0.73	U	0.8	U	0.73	U	0.9	U	0.81	U
Sodium	103	U	271	J	103	U	128	U	115	U
Thallium	1.3	U	1.4	U	1.2	U	1.6	U	1.4	U
Vanadium	18.7		28.3		18.3		29		36.4	

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Table 4-2
Raw Compounds and Analytes for Site 21 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS21SO16		IS21SO17		IS21SO18		IS21SO19		IS21SO20	
Sample ID	IS21SS160001		IS21SS170001		IS21SS180001		IS21SS190001		IS21SS200001	
Sample Date	08/01/00		08/01/00		08/01/00		08/01/00		08/01/00	
Chemical Name										
Zinc	18.8	J	25.9	J	8.8	J	19	J	22.9	J
Wet Chemistry (MG/KG)										
% Moisture	14.9		22.6		14.6		31.4		23.4	
% Solids	81.8		82.1		78		77.9		73.1	
Total organic carbon (TOC)	16,400		10,700		26,000		31,000		37,600	
pH	6.2		7.4		5.2		4.5		5.4	

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U - Analyte not detected
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Table 5-1
Raw Compounds and Analytes for Site 25 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25MW01		IS25MW02	
Sample ID	IS25MW011000		IS25MW021000	
Sample Date	10/24/00		10/24/00	
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U
1,1,2-Trichloro-1,2,2- trifluoroethane	10	U	3.6	J
1,1,2-Trichloroethane	10	U	10	U
1,1-Dichloroethane	10	U	10	U
1,1-Dichloroethene	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	U
1,2-Dibromoethane	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U
1,2-Dichloroethane	10	U	10	U
1,2-Dichloroethene (total)	10	U	10	U
1,2-Dichloropropane	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U
2-Butanone	10	U	10	U
2-Hexanone	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U
Acetone	3.5	B	8.7	B
Benzene	10	U	10	U
Bromodichloromethane	10	U	10	U
Bromoform	10	U	10	U
Bromomethane	10	U	10	U
Carbon disulfide	10	U	10	U
Carbon tetrachloride	10	U	10	U
Chlorobenzene	10	U	10	U
Chloroethane	10	U	10	U
Chloroform	10	U	10	U
Chloromethane	10	U	10	U
Cumene	10	U	10	U

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Table 5-1
Raw Compounds and Analytes for Site 25 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25MW01		IS25MW02	
Sample ID	IS25MW011000		IS25MW021000	
Sample Date	10/24/00		10/24/00	
Chemical Name				
Cyclohexane	10	U	10	U
Dibromochloromethane	10	U	10	U
Dichlorodifluoromethane	10	U	10	U
Ethylbenzene	10	U	10	U
Methyl acetate	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U
Methylcyclohexane	10	U	10	U
Methylene chloride	10	U	27	B
Styrene	10	U	10	U
Tetrachloroethene	10	U	10	U
Toluene	10	U	10	U
Trichloroethene	10	U	10	U
Trichlorofluoromethane	10	U	10	U
Vinyl chloride	10	U	10	U
Xylene, total	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U
Semi-volatile Organic Compounds (UG/L)				
1,1-Biphenyl	10	U	10	U
2,2'-Oxybis(1-chloropropane)	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U
2,4-Dichlorophenol	10	U	10	U
2,4-Dimethylphenol	10	U	10	U
2,4-Dinitrophenol	25	U	25	U
2,4-Dinitrotoluene	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U
2-Chloronaphthalene	10	U	10	U
2-Chlorophenol	10	U	10	U

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Table 5-1
Raw Compounds and Analytes for Site 25 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25MW01		IS25MW02	
Sample ID	IS25MW011000		IS25MW021000	
Sample Date	10/24/00		10/24/00	
Chemical Name				
2-Methylnaphthalene	10	U	10	U
2-Methylphenol	10	U	10	U
2-Nitroaniline	25	U	25	U
2-Nitrophenol	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U
3-Nitroaniline	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U
4-Chloroaniline	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U
4-Methylphenol	10	U	10	U
4-Nitroaniline	25	U	25	U
4-Nitrophenol	25	U	25	U
Acenaphthene	10	U	10	U
Acenaphthylene	10	U	10	U
Acetophenone	10	U	10	U
Anthracene	10	U	10	U
Atrazine	10	U	10	U
Benzaldehyde	10	U	10	U
Benzo(a)anthracene	10	U	10	U
Benzo(a)pyrene	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U
Butylbenzylphthalate	10	U	10	U
Caprolactam	10	U	10	U
Carbazole	10	U	10	U
Chrysene	10	U	10	U
Di-n-butylphthalate	10	U	10	U
Di-n-octylphthalate	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U

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Table 5-1
Raw Compounds and Analytes for Site 25 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25MW01		IS25MW02	
Sample ID	IS25MW011000		IS25MW021000	
Sample Date	10/24/00		10/24/00	
Chemical Name				
Dibenzofuran	10	U	10	U
Diethylphthalate	10	U	10	U
Dimethyl phthalate	10	U	10	U
Fluoranthene	10	U	10	U
Fluorene	10	U	10	U
Hexachlorobenzene	10	U	10	U
Hexachlorobutadiene	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U
Hexachloroethane	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U
Isophorone	10	U	10	U
Naphthalene	10	U	10	U
Nitrobenzene	10	U	10	U
Pentachlorophenol	25	U	25	U
Phenanthrene	10	U	10	U
Phenol	10	U	10	U
Pyrene	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U
Explosives (UG/L)				
Nitroglycerin	30	U	30	U
Total Metals (UG/L)				
Aluminum	292		81.7	B
Antimony	3.1	U	3.1	U
Arsenic	3.2	U	3.2	U
Barium	352		98.8	J
Beryllium	2.4	J	0.091	B

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Table 5-1
Raw Compounds and Analytes for Site 25 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25MW01		IS25MW02	
Sample ID	IS25MW011000		IS25MW021000	
Sample Date	10/24/00		10/24/00	
Chemical Name				
Cadmium	0.61	B	0.25	U
Calcium	11,300		9,460	
Chromium	1.1	U	1.1	U
Cobalt	64.7		28.5	J
Copper	4	J	1.3	U
Cyanide	10	U	10	U
Iron	111		1,160	
Lead	1.9	U	1.9	U
Magnesium	11,400		5,380	
Manganese	2,040		343	
Mercury	0.1	U	0.1	U
Nickel	28.8	J	5	J
Potassium	3,160	J	5,540	
Selenium	4	U	4	U
Silver	1.1	U	1.1	U
Sodium	120,000		23,100	
Thallium	6.8	U	6.8	B
Vanadium	0.76	U	0.94	J
Zinc	77.7		5.5	B
Dissolved Metals (UG/L)				
Aluminum	301		104	B
Antimony	3.1	U	3.1	U
Arsenic	3.2	U	3.2	U
Barium	369		95.3	J
Beryllium	2.5	J	0.24	B
Cadmium	0.57	B	0.28	B
Calcium	11,700		9,200	
Chromium	1.1	U	1.1	U
Cobalt	68.2		40.5	J
Copper	4.4	J	1.3	U
Iron	136	B	1,120	

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Table 5-1
Raw Compounds and Analytes for Site 25 Monitoring Well Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25MW01		IS25MW02	
Sample ID	IS25MW011000		IS25MW021000	
Sample Date	10/24/00		10/24/00	
Chemical Name				
Lead	1.9	U	1.9	U
Magnesium	11,900		5,220	
Manganese	2,110		332	
Mercury	0.1	U	0.1	U
Nickel	29	J	5.8	J
Potassium	3,290	J	5,350	
Selenium	4	U	4	U
Silver	1.1	U	1.1	U
Sodium	125,000		22,200	
Thallium	6.8	U	6.8	U
Vanadium	0.76	U	0.97	J
Zinc	81.5		6.8	B

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1902–2002
Citizens in Support of the Sea Services

August 2, 2002

Mr. Paul C. Tseng
Director, Facility Services, NE Region
CH2M HILL, INC.
1392 Park Center Road, Suite 600
Herndon, VA 20171

Re: Notice to Proceed

Dear Mr. Tseng:

CH2M HILL, INC. is hereby authorized to proceed with your attached scope of services. Please initiate the first steps of this contract as discussed with Bill Keech and provide for us a written schedule of services and the corresponding portion of the owner cost of your contract.

The following items appear to be of highest priority. Please advise if you find any difference.

1. Focus Review of the Design Development Plans and Specifications.
2. Second/Final review and issue reconciliation.
3. Commissioning Specifications development and coordination with the bid documents.
4. Develop construction phase Commissioning Plan.

There items are required to be completed as soon as possible as indicated in the schedule provided to you at our meeting June 5, 2002.

I will address the Facility Security Scope of Services by separate correspondence. We do not want to include that item within the scope of the current agreement.

Thank you for your interest in our project and I look forward to working with you and our development team. If you should have any questions please contact me.

Sincerely,

C. L. Robinson

Charles L. Robinson
Authorized Manager

CLR/fah

NAVY LEAGUE *of the* United States
2300 Wilson Boulevard • Arlington, VA 22201 • 703-528-1775 • 703-528-2333 Fax • www.navyleague.org
Navy • Marine Corps • Coast Guard • U.S.-Flag Merchant Marine

Attachment A

Scope of Services for LEED Commissioning

3.0 The Scope of Services

Project Intent: The Navy League project team intends to achieve the **silver** rating under the LEED Green Building Rating System. CH2M HILL proposes to provide the Commissioning Services as prescribed by the U.S. Green Building Council and in conformance to the LEED commissioning requirements described above.

3.1 Additional Value-Added Scope Included in the Commissioning Proposal

The project team has identified a list of probable points targeted for LEED certification as shown below. Additional efforts by CH2M HILL are required to facilitate the attainment of these probable credits.

The CH2M HILL's Value Added Commissioning Services. We offer strategies especially during the crucial design process and monitor the implementation of the selected measures in the Construction Documents. Specifically, our efforts go beyond the conventional commissioning to include the review of the energy analysis and examination of design engineer's modeling effort as well as in the review of pertinent design details in the Construction Documents that affect energy performance. Therefore, CH2M HILL proposes to provide technical review and design phase assistance to the design/build team on the following LEED efforts as part of our core services:

A. *Energy and Atmosphere Prerequisite 2: Minimum Energy Performance*—Evaluate and review the project team's baseline building performance by assessing the energy baseline modeling results and assumptions. Examine the appropriateness and the rigor of energy modeling software utilized to establish the ASHRAE energy baseline.

   Review architect's thermal envelope design elements for appropriateness of thermal insulation, placement of air and moisture barriers, window performance include edge materials, and foundation insulation placement.

B. *Energy and Atmosphere Credit 1: Optimize Energy Performance to the Target Level*—Evaluate the energy modeling results for correctness of input, appropriateness of modeling assumptions, accurate use of baseline and parametric modeling data.

   Review the energy efficiency ratings of selected equipment, the efficacy of light fixtures selected, the effectiveness of air handling and air distribution equipment selected by the designer.

C. *Sustainable Sites Credit 7: Reduce Heat Islands*—Review the design of the proposed Energy Star-compliant roof for thermal and functional performance, and maintainability.

D. *Sustainable Sites Credit 8: Light Pollution Reduction*—Review the selection of the exterior lighting fixture for technical compliance to IESNA requirements, functional performance and maintainability.

   Review the cut sheet of proposed interior light fixtures and lamp configuration for compliance with IESNA illumination level by examine the lumens and footcandle performance data.

E. *Indoor Environmental Quality Prerequisite 1: Minimum IAQ Performance*—Review project designer's compliance documentation of ASHRAE 62-1999. Examine outdoor air calculations for building ventilation systems and design engineer's system outdoor air balance tabulation. Review filtration performance.

F. *Indoor Environmental Quality Credit 1 on CO2 Monitoring*—Review the selection and technical compliance of the monitoring system and its performance.

G. *Indoor Environmental Quality Credit 2 on Ventilation Effectiveness*—Review designer's air balance tabulations and air distribution effectiveness for compliance with ASHRAE 129-1997. Evaluate the selection of air distribution devices and air change paths.

H. *Indoor Environmental Quality Credit 3.2 on IAQ management per SMACNA*—Review the IAQ compliance plan for efficacy and impact on the commissionability of the HVAC system. Evaluate the performance and effectiveness of filtration media to be used during construction.

I. *Indoor Environmental Quality Credit 7. On Thermal Comfort Compliance*—Review designer's conformance to ASHARE 55-1992 and design criteria for relative humidity level.

J. *Indoor Environmental Quality Credit 8.2 on Daylight and Views*—Review design team selection of window for visual transmittance performance, thermal property and optimal emittance.

3.2 Systems To Be Commissioned

In accordance with the prescribed framework for commissioning in the LEED Green Building Rating System, the following fundamental building elements and dynamic systems will be commissioned utilizing the traditional construction phase commissioning process that includes (a) submittal review, (b) onsite observation and (c) witnessing of functional testing.

A. **HVAC and Electrical Systems and all integral equipment controls.** HVAC systems shall be commissioned:

- ❑ Chiller system (chillers, cooling towers, piping, pumps and variable speed drives)
- ❑ Boiler system (including controls, boilers, piping, pumps and variable speed drives), if applicable
- ❑ Pumps (other pumps serving mechanical and plumbing systems other than HVAC)
- ❑ Air handling units
- ❑ Heat recovery wheels or run-around glycol heat recovery pipes
- ❑ Heat exchangers, air and water economizers
- ❑ Ductwork system, static pressure and ventilation air volume
- ❑ VAV Terminal units (with reheat coils)
- ❑ Testing, Adjusting and Balancing work
- ❑ Exhaust and return fans
- ❑ Variable speed drives (VFD) operation
- ❑ Computer room units
- ❑ Commercial tenant air conditioning equipment
- ❑ Building automation system (controlled devices, control loops and system architecture)
- ❑ Lighting system and scheduled lighting controls
- ❑ Lighting occupancy sensors
- ❑ Daylight Dimming system

B. **Thermal Envelope System**

- ❑ Glazing and fenestration systems (limited review efforts involving submittal review and some visual observation without functional testing)
- ❑ Air/Moisture barrier with thermal insulation (limited review effort involving submittal review and some visual observation without functional testing)
- ❑ Bulk water controls of walls and glazing (optional, recommended but not included in basic scope)
- ❑ Building pressure testing and mock-up testing (optional, recommended but not included in basic scope)

- ❑ Precast wall panel system (optional, recommended but not included in basic scope)
- ❑ Roof system (optional, recommended but not included in basic scope)

C. **Static Elements and Features**

The following static elements and features will be commissioned utilizing documented submittal reviews and limited observations, without functional testing. Functional testing of these static elements can be provided as Additional Services.

1. Static LEED water and wastewater efficiency features
2. Static LEED sustainable sites feature: exterior lighting
3. Static LEED energy features:
    a. Exterior windows and doors
    b. Envelope and pipe insulation
4. Static LEED indoor environmental quality (IEQ) features:
    a. Ventilation effectiveness
    b. IEQ measures
    c. Daylighting and views

3.3 Commissioning Meetings

We have included twelve (12) meetings for the project: (1) a review of Owner's Requirements and Basis of Design, (2) a coordination meeting with project team on commissioning specification, (3) a pre-bid meeting with contractor on commissioning requirements, (4) a commissioning kick-off meeting with contractor and design team, (5) a review of Contractor's O&M manuals submission, (6) a review of Contractor's training material, (7) a Focused Review prior to construction document, (8) an issues resolution meeting of review comments, (9) a final review of the design documents, (10) an issues resolution of final review comments, (11)a briefing and review of Measurement & Verification requirements with contractor, (12) a Post-Occupancy/Warranty meeting. The coordination and site observation meetings necessary for commissioning tasks, during the 21 months construction period, as defined in the Commissioning Plan is also included.

Attendance at other project team meetings, review sessions, progress meetings, RFI response discussions, and other project activities will be on a time & material basis.

3.4 Design Phase

During design, the CH2M HILL shall execute commissioning as Commissioning Authority (Commissioning Authority) according to the following process and plan.

A. The Commissioning Authority develops a Design Phase Commissioning Plan that provides the process, structure, schedule and coordination planning for the commissioning process during design.

B. The Commissioning Authority provides suggestions to the designer and owner on the format and a written list of desired content for the Owner's Requirements (Design Intent) and Basis of Design. Both documents are developed by them. The Commissioning Authority reviews their submissions for clarity and completeness. The designer will revise and resubmit for owner's approval. One initial review and one review of resubmission is anticipated. Repeated reviews are additional services.

C. The Commissioning Authority conducts a Focused Design Review (design drawings and specifications) prior to the construction documents phase (design development set) and evaluates commissioned systems and assemblies for functionality, system performance, energy and water efficiency, maintainability, sustainability, cost, IEQ, local environmental impacts and commissioning facilitation. Compare to the owner's project requirements and previous design decisions. Participate in resolving issues related to the review comments. The designer will provide prompt response to comments electronically in an report for faster resolution of issues. The Commissioning Authority will prepare the format of the electronic report

for use by the designer. Repeated participation at design issues resolution meetings will be additional services.

D. The Commissioning Authority develops a draft Construction Phase Commissioning Plan to guide the development of the commissioning specifications and updates this plan after the specifications are written. The Commissioning Plan will include components prescribed in the LEED reference guide.

E. The Commissioning Authority develops the Commissioning Requirements (Specifications) for mechanical and electrical systems along with relevant related general provision sections and see that they are incorporated into the construction documents. A delineation of roles and responsibilities for the contractor and design team in the implementation of the commissioning process. In particular, the respective duties in performing the functions of the Testing Engineer and the creation of the Operations and Maintenance Manuals.

F. The Commissioning Authority conducts a second Focused Review of the Construction Document and delivers a Design Review Document which compile review comments of the design documents at the 65% (permit submission set), if available, and at the 90% construction documents phases, if project schedule allows it. Two separate reviews are expected. ***(Note: only one review of the Construction Documents is required by LEED, CH2M HILL's approach is more complete by providing two (2) separate and discrete reviews)***

   Evaluate commissioned systems and assemblies for functionality, system performance, energy and water efficiency, maintainability, sustainability, cost, IEQ, local environmental impacts and commissioning facilitation. Compare to the owner's project requirements and previous design decisions. Participate in resolving issues related to the review comments. (limited to one meeting) The designer will provide prompt response to comments prepared by the Commissioning Authority within two weeks of receipt of Commissioning Authority's comments. The designer's response will be presented in an electronic report for faster resolution of issues. The Commissioning Authority will prepare the format of the electronic report for use by the design team. Repeated participation at design issues resolution meetings will be additional services.

G. The Commissioning Authority, if requested by the owner, attends the pre-bid conference to describe commissioning provisions and answer any questions on commissioning requirements.

H. CH2M HILL as the Commissioning Authority is not responsible for design concepts, design criteria, compliance with codes, interdisciplinary coordination or contractor coordination, design or general construction scheduling, cost estimating, means and methods related to construction management or supervision. We may assist with problem-solving or resolving non-conformance or deficiencies, but ultimately that responsibility resides with the contractors and the design professionals on the project.

3.5 Construction Phase

During construction and warranty phases, the Commissioning Authority shall execute their tasks as given in the following process and plan.

A. A Pre-bid and Commissioning Planning Meeting is planned and conducted by the Commissioning Authority prior to final bid by the contractor. The meeting will be with the commissioning authority, contractor and the prime subcontractors, construction manager, owner's project manager and architect. The commissioning process is discussed (including communication, documentation and reporting protocols, submittals, etc.) and updates are made to the Commissioning Requirements. One planning meeting with the entire project delivery team is planned. Repeat of the planning meeting is additional service.

B. Within 60 days from the receipt of the Commissioning Plan, a Kick-Off Meeting (Chartering Session) is held with all designated commissioning team members (Commissioning Authority, Contractor, mechanical, electrical, controls, TAB sub-contractors, Construction Manager, Project Manager and Architect). The commissioning process and schedule is discussed and questions raised about the commissioning plan, specifications and process addressed. Roles and responsibilities of each team member is described.

Commissioning sequences are presented. Documentation requirement of commissioning tasks completion is provided.

C. Focused Review of selected Submittals of commissioned equipment, features and assemblies are commented on by the Commissioning Authority, or by the Project Manager for some static elements. Reviews are conducted parallel to and within the normal submittal cycle to document the feature being provided meets the specifications and owner requirements. One review of selected submittals is planned. Repeated review of submittals due to incompleteness or omission of required information will be additional costs.

D. The Commissioning Authority coordinates a **Controls System Integration Meeting** prior to the Contractor developing the controls submittal. ***(Note: the LEED does not specifically require this step, CH2M HILL's commissioning method includes this crucial step of integration activity)*** At this meeting the control system database, point naming, graphic details and layout, access levels, methods for implementing performance type specifications or strategies, interlocks between systems, priority of control between packaged controls and the central control system, etc. are discussed and resolved. Contractor is to provide an integrated Controls System Submittal within 15 days for review by the Commissioning Authority and coordination by other subcontractors. One integration meeting is planned. Repeated review of submittal due to errors, incompleteness or omissions of required data will be additional services. Owner may charge back to the Contractor for costs incurred.

E. The Commissioning Authority provides the Contractor with Construction Installation Checkout/ Pre-Functional Checklists for the mechanical equipment and selected electrical equipment to enhance the installation and checkout process. The checklists, after completed by the Contractor, will be reviewed and verified through sampling. Prompt submission of the prescribed Checklists by the Contractor is required to facilitate verification of equipment installation. Delayed submission by the Contractor which necessitated remedial on-site activities by the Commissioning Authority will be additional services. Owner may charge back to the Contractor for costs incurred for this remedial activities.

F. The Contractor conducts the Start-Up Testing in compliance with manufacturer's prescribed testing and other vendor-specific installation tests. The Contractor completes the starts up of equipment and performs normal initial checkout. The results and startup completion documentation are submitted by the Contractor to the Commissioning Authority for review.

G. The Commissioning Authority performs Installation Observations by making documented site visits to observe installation prior to functional testing to verify the installation of the equipment, systems and assemblies being commissioned, to spot check selected items in the Checklists and verify that installations won't negatively impact functional testing and access for operations and maintenance.

H. The Commissioning Authority develops Functional Performance Testing Procedures for use by the Contractor. The Commissioning Authority writes step-by-step functional test procedures and documentation formats for all commissioned equipment and assemblies, except regulated tests such as fire alarm, fire suppression, elevators and NETA electrical tests where detailed test and documentation requirements already exist, and common contractor tests such as duct and piping tests and the contractors' initial equipment checkout tests which will be written by the Contractor.

   Functional testing will include manual functional testing, energy management control system trending and may include stand-alone data-logger monitoring. The test forms are provided to the contractor for use.

I. On the HVAC control system, the contractor also need to provide results of a complete point-to-point checkout of the control system and trend data of systems. The Commissioning Authority will review the results to verify that each control point is commanding, reporting, and controlling according to the intended purpose.

   The timely submission for Commissioning Authority review of the control system results is critical to successful completion of the project. Undue delays by the contractor may necessitate remobilization of

project staff for which such costs will be additional services. The owner may charge back the costs to the contractor.

J. Periodic meetings are held to assess commissioning progress and to resolve issues. the commissioning authority takes and distributes minutes at these meetings. A total of 20 periodic meetings is planned. Additional meetings requested by the contractor, the designer or the owner will be additional services.

K. The Commissioning Authority submits periodic commissioning progress reports.

L. When the equipment is fully installed and all controls operable, checked out, and the construction checklists completed, the equipment is ready for functional testing. The Commissioning Authority assists the Contractor in scheduling the testing prior to substantial completion by assessing the readiness of the equipment for functional testing. The Contractor will prepare a Testing Schedule and integrate the duration of the tests in the project schedule.

   Note: The Commissioning Authority will assist and advice the owner in the evaluation of the qualification and the competence of contractor's personnel serving as the testing engineer. If the contractor is unable to provide a qualified testing engineer capable to perform the Functional Performance Tests, the Commissioning Authority may perform the needed tests at owner's discretion as additional services

M. At appropriate times during construction, the commissioning authority makes site observations to ensure that the static elements and assemblies such as insulation, daylighting, IEQ-related procedures and materials, etc. comply with the contract documents and their intended purpose.

N. The Contractor executes the manual Functional Tests. The Commissioning Authority witness and documents the tests. The Commissioning Authority will assist the Contractor to schedule the testing of the heating equipment during the winter and the air conditioning equipment during the summer to demonstrate system performance under near-design conditions. For selected equipment of simpler systems, the Commissioning Authority may have the Contractor document their own testing.

   Functional tests are expected to be performed by the Contractor in efficient and planned manner. Lack of readiness on the part of the Contractor constitute test failures. Repeated failure of tests for equipment to be commissioned which affects verification of functional performance and training will require additional efforts by the Commissioning Authority. An allowance of 40 hours for retest for the Commissioning Authority is included. Witness of additional re-tests by the Commissioning Authority will be additional services and owner may charge back the costs incurred to the Contractor.

O. For systems testing specified to be tested as part of the Contractor's responsibility following NETA (National Electrical Testing Association) standards using a NETA certified testing firm for some tests and the electrical contractor for other tests, testing is coordinated by the Contractor with only a review of test form blanks and completed reports, and some very limited spot field witnessing by the Commissioning Authority.

P. After manual testing and initial troubleshooting is complete, selected points are trended by the Contractor in the building HVAC control system from a specific request from the Commissioning Authority. The Commissioning Authority analyzes the BAS trends and issues a report. Prompt trending by the control system vendor to measure system operation and verify energy performance is expected. The trending of selected HVAC control points needs to be completed and submitted for review by Commissioning Authority prior to substantial completion.

   Portable stand-alone data logging monitoring by the Commissioning Authority may be made necessary by the failure or lack of progress on the prescribed trending by the control system vendor. Costs of portable data logging monitoring incurred by the Commissioning Authority will be additional services and owner may charge back the costs to the control system vendor.

Q. Issues and deficiencies are jointly developed in the course of commissioning activities by all members of the construction commissioning team including the subcontractors. These items are documented by the

Commissioning Authority, resolved, corrected and retested by the Contractor as needed, all being documented in the issues log maintained by the Commissioning Authority.

R. The Commissioning Authority reviews O&M manuals, which are prepared by the Contractor in accordance by the contract provisions and LEED prescribed content, for completeness, organization, clarity and ease of use in accordance with the format and content prescribed for compliance with the specifications. One initial review and one resubmission review by the Commissioning Authority is planned. Additional reviews made necessary by the poor quality, incompleteness or omitted information will be additional services and owner may charge costs incurred to the Contractor.

   If the O&M manual is submitted more than three months after substantial completion date of the project, additional costs will be accrued by the Commissioning Authority in re-mobilize the review efforts. These costs will be additional costs which the owner may charge back to the Contractor.

S. The Commissioning Authority facilitates Training by providing training agendas to the Contractor for commissioned features, systems and equipment. The Commissioning Authority verifies that specified training is completed under the auspices of the Contractor promptly in accordance to contract provisions and the prescribed LEED issues. The Commissioning Authority will review the qualifications of Contractor's proposed training staff and recommends acceptability of training material. Training rescheduled with less than 5 day notice will be considered as additional services.

T. The Commissioning Authority compiles and submits the Commissioning Record which constitutes the final Commissioning Report.

U. After testing is complete by the Contractor, the Commissioning Authority will compile a Re-Commissioning & Energy Management Manual, separate from the O&M manuals.

V. The Commissioning Authority and Contractor return to the project site in the opposite season from beneficial occupancy and Contractor will conduct needed functional tests near design conditions of the season (winter or summer) on HVAC equipment according to the details in the specification.

W. As part of the Near-Warranty End and Post Occupancy Review, a stipulated requirement of LEED, the Commissioning Authority returns to the site with the Contractor and the owner approximately 10 months into the 12 month warranty period and reviews with facility staff how the systems are working and assists the facility staff in dealing with any outstanding issues or problems identified prior to expiration of warranty. The Commissioning Authority may provide suggestions for improvements to building operations and remedy outstanding problems. The owner's facility staff will facilitate and schedule this site visit.

X. The Commissioning Authority develops a **Measurement & Verification (M&V) Plan** with requirements prescribed by LEED. The project-specific M&V Plan is instituted by the Contractor as part of the controls system installation. The plan will list all measures to be monitored, a baseline defined and the projected savings. The Commissioning Authority reviews the energy analyses and projections prepared by the design engineer, verifies installation of energy efficient strategies, determines savings under actual post-installation conditions from metered data from the Contractor or engineered calculation/energy simulation by the design engineer. Verify that the Contractor provided an ongoing M&V system maintenance and operating plan.

3.6 Commissioning of Static, Non-Dynamic LEED Features

The commissioning process and verification details for static, non-dynamic LEED features are shown below. Document reviews and observations in the tasks below shall be documented by the Commissioning Authority.

The project LEED consultant shall provide information and documentation of the LEED features. The performance of these applicable LEED features are to be documented by the Contractor and review by the Commissioning Authority.

A. Water Efficiency

1. The LEED efficient water and wastewater credit (Credits 1, 2; 3) dynamic elements (composting toilets and IR lav controls) are commissioned utilizing formal functional testing by the Contractor as specified .

2. Water efficient landscaping (Credit 1) will be commissioned by verifying that the design flow of the system is being achieved and demonstrated by the Contractor that water coverage meets design.

3. Innovative wastewater (Credit 2) static elements and features will have submittals reviewed by the Commissioning Authority, Owner's Project Manager or General Contractor/ Construction Manager to verify that they meet the specified LEED standards and by site observation to ensure that submitted products were installed. Contractor to verify installation checkouts as documented by the installation specialty sub-contractor.

4. Water use reduction (Credit 3) static features (shower and faucet aerators) will have submittals reviewed by the Commissioning Authority, Owner's Project Manager or General Contractor/Construction Manager to verify that they meet the specified LEED standards and by site observation to ensure that submitted products were installed.

B. Sustainable Sites

1. The LEED credit 8 for light pollution reduction will include review of exterior light fixture for compliance with LEED criteria by the project LEED consultant. Submittal reviews of light fixtures, interior and exterior by the Commissioning Authority will be conducted and Contractor will provide the necessary lumen and footcandle performance data.

C. Energy and Atmosphere

1. Energy performance prerequisite and Credit 1 will be verified through commissioning the dynamic energy consuming systems, equipment and assemblies as specified.

2. The static energy features for the energy Credit 1 will be commissioned by the Commissioning Authority, Owner's Project Manager or General Contractor/Construction Manager by reviewing submittals and installations of the wall, roof and pipe insulation for compliance with the specifications and good thermal practice and the envelope assembly, including window, skylight and door installation for air leakage potential. Physically testing envelope components for air and water tightness will not be conducted.

D. Indoor Environmental Quality (IEQ).

1. Minimum IAQ performance (Prerequisite 1) will be verified by:

   a. The Commissioning Authority reviewing the design criteria and ASHRAE 62-1999 compliance logic, calculations and control schemes, reviewing submittals and making site observations to ensure that specified filtration media and installation meets the specifications, that there are no problematic HVAC materials that will support microbial contamination, outdoor air intakes are not in locations where they could draw in contaminated air, ducts are clean (during storage and after installation), condensate drains, traps and pans and humidifiers, mist eliminators and cooling towers are not harboring standing water, microbials or algae and that there is adequate access for cleaning drain pans and coils. See also dynamic IAQ verifications.

   b. Functionally testing to be witnessed by the Commissioning Authority of the minimum outside air system and differential interstitial, room and building pressure controls as specified.

   c. The Commissioning Authority reviewing design details and making construction observation of exterior doors, fenestrations, window-walls, exterior wall finished, miscellaneous flashings and wall-to-floor joints for water-tightness, weep and drainage control and ob-

serving ground and slab slope and irrigation immediately around the structure to ensure that bulk water will not penetrate the interior and potentially contribute to mold and mildew. A full roofing inspection and commissioning is not part of this task and can be provided as additional services.

d. The Commissioning Authority ensuring that vapor and unwanted moisture will not be drawn into the facility by differential pressure, by reviewing design criteria and details and TAB report, and by making construction observations of materials that act as the vapor retarders used in the exterior and interior wall and roof systems and the interactions and impacts they have with the design, set-up and sequences of control of the HVAC systems. **(Note: the LEED does not specifically require this level of review, CH2M HILL's commissioning method include this review to enhance construction quality)**

2. CO2 monitoring (Credit 1) will be verified through functional testing as specified.

3. Ventilation effectiveness (Credit 2) will be commissioned by the Commissioning Authority reviewing associated submittals and shop drawings, reviewing the design and its assumptions and through site observation ensuring that all components have been incorporated into the building, as designed.

4. IAQ management plan (Credit 3.1 and 3.2) features (IAQ management plan and building flushout) will be commissioned by the Commissioning Authority reviewing the Contractor's submittal of means and methods of the plan and through monitoring the implementation of the plan during construction.

5. Low emitting materials features (Credit 4.1-4.4) will be commissioned by the Construction Manager reviewing the submittals for adhesives, paints and coatings, carpets and composite wood and agrifiber products to verify that they meet the specified LEED standards and by site observation to ensure that submitted products were installed. The Commissioning Authority will file the review in their Commissioning Record.

6. Indoor chemical and pollutant source control (Credit 5) features.

   a. Entry-way systems, isolation and ventilation of house-keeping rooms, copy rooms and other chemical containing spaces and plumbing systems serving chemical mixing shall have their submittals and shop drawings reviewed by the Construction Manager and on-site observations made to verify that specified and submitted features are installed and operating properly. The Commissioning Authority will file the review in their Commissioning Record. The isolation rooms will be verified through functional testing.

7. Controllability of systems (Credits 6.1; 6.2) will be commissioned by the Commissioning Authority reviewing submittals of the lighting and HVAC controls, by site observation verifying that installations meet the LEED requirements for operable windows, and lighting and HVAC control and by functionally testing the lighting and HVAC controls.

8. Thermal comfort-ASHRAE 55 and temperature and relative humidity monitoring (Credits 7.1; 7.2) will be commissioned through trend logging performance over time as specified in this section.

9. Daylight and views (Credits 8.1; 8.2) will be commissioned by the Commissioning Authority reviewing the submittals of compliance by the Designer and through site observation ensuring that the installed systems meet the LEED requirements and by functionally testing the daylighting controls (as specified in this section).

3.7 Written Deliverables

The Commissioning Authority will provide the following written deliverables. as part of the basic services.

1. Review Report of Owner's Requirements (Design Intent). The architect to provide the content of the design intent in accordance with the format provided by the CA.
2. Review Report of the Basis of Design. The design team to furnish the content for the document in accordance with the format provided by the CA.
3. Develop a Commissioning Plan for the project.
4. Develop a Commissioning Requirements (Specifications) for the bid documents.
5. Develop equipment-specific Installation Checklists, Start-up Checklists, Checkout Forms, Functional Test Procedures, Trend Log format for use by the Contractor.
6. Report on Training by the Contractor.
7. Report on Focused Design Review of Design Development Documents.
8. Report on Focused Design Review of Construction Documents
9. Report on Focused Review of Equipment Submittals
10. Report on Contractor's O&M Manuals Submission
11. Develop a Recommissioning Management Manual.
12. Complete a Commissioning Report.

Descriptions of the deliverables are as follows:

A. *Recommissioning & Energy Management Manual*—The Commissioning Authority shall compile and submit a manual for the owner. The contractor provides some components of the manual, mostly the standard O&M manuals. The following components of the manual are organized and indexed by system into one compilation. The responsibility of the contractor and other parties in the Manual development are given in brackets. LEED refers to the Manual as the Recommissioning Management Manual.

   1. Design Record. The Design Record for each system or assembly included in the Systems Manual, consists of:

      a. Owner Requirements and Objectives (Design Intent) [by Owner]

      b. Basis of Design [by Architect]

      c. Design Narrative [by Architect]

      d. Performance Metrics/Criteria, if developed [by Commissioning Authority, if in scope]

   2. Fire and life safety and emergency power criteria including a general strategy narrative, detailed sequences and an HVAC fire and emergency power response matrix describing the actions, responses, interlocks, restart routines, etc. during fire and power outage. [format by Commissioning Authority and content by Contractor and Architect]

   3. Single-Line Drawings. When specified elsewhere, include professionally drawn single-line ladder type system flow diagrams for commissioned mechanical equipment, lighting controls and other systems specified elsewhere in the specifications. [by Contractor]

   4. Seasonal start-up and shutdown, manual and restart operation procedures. [by Contractor]

   5. Complete As-Built control drawings with points list, valve schedules, schematics, control system architecture and full sequences of operation. [by Contractor]

   6. A description of and rationale for all energy saving features and strategies with operating instructions and caveats about their function and maintenance relative to energy use. [by Commissioning Authority]

7. Recommendations for re-calibration frequency of sensors and actuators by type and use and recommendations for frequency of re-testing of equipment with reference to original test forms. [format by Commissioning Authority, content by controls subcontractor]

8. Description of the primary recommended standard trend logs in the control system (when one exists) that will assist in maintaining comfort, energy efficiency and system control. This will include sample plots with explanations of what to look for in the graphs. [format by Commissioning Authority, content by controls sub]

9. Specific recommendations regarding seasonal operational issues that affect energy use. [by Commissioning Authority]

10. A list of all user adjustable setpoints and reset schedules with a discussion of the purpose of each and the range of reasonable adjustments with energy implications and a schedule for their re-evaluation. [format by Commissioning Authority, content by controls sub]

11. Guidelines for establishing and tracking benchmarks for whole building energy use and primary plant equipment efficiencies. [format by Commissioning Authority, content by controls subcontractor]

12. Guidelines for ensuring that future renovations and additions will not result in decreased energy efficiency. [by Commissioning Authority]

13. A list of diagnostic tools with use descriptions to assist facility staff. [format by Commissioning Authority, content by controls sub]

14. A copy of the Commissioning Summary Report. [by Commissioning Authority]

B. *Design Review Reports*—The Commissioning Authority will provide higher level peer reviews of design documents for compliance with owner's requirements. Review reports will be provided at each Focused Review during the design phase.

C. *Commissioning Record*—The Commissioning Authority shall compile and submit the Commissioning Record which consists of the record of the salient documentation of the commissioning process: Final Commissioning Report, the Issues Log, Commissioning Plan, progress reports, submittal and O&M manual reviews, training record, test schedules, construction checklists, start-up reports, functional tests, and trend log analysis, grouped by equipment in tabbed binders.

D. *Commissioning Report*—The Commissioning Authority shall write and submit a Final Commissioning Report. For each piece of commissioned equipment or assembly, the Final Commissioning Report shall contain the disposition of the Commissioning Authority regarding the adequacy of the equipment or assemblies meeting the contract documents in the following areas: 1) Installation, including equipment meeting the equipment specifications, 2) Functional performance and efficiency, 3) O&M manual documentation , and 4) Operator training. All outstanding non-compliance items shall be specifically listed. Include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

E. *Other Submissions*—The Commissioning Authority will submit, for contractor use, sample construction checklists and training agendas. Additional submissions include submittal review comments, construction observation reports, progress reports, issue logs, commissioning meeting minutes, functional test form blanks, O&M manual review comments and trend log analysis reports.

Functional test forms are used to verify that specific components, assemblies, systems, and interfaces among systems function and perform in accordance with the owner's objectives and the contract documents. Functional testing may include manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of specific and interacting equipment and systems in full operation. Functional tests are performed after construction checklists and start-up are complete. Written functional test procedures for a given piece of equipment contain a list of integral equipment and components being

tested, associated construction checklists, functions and modes to be tested, required conditions of the test for each mode, specific step-by-step repeatable procedures, the expected or required response and acceptance criteria, a place to record the results and notes, required monitoring and any sampling strategies used.

F. *Measurement and Verification Plan*—As part of this scope of work CH2M HILL will develop during late design an Measurement & Verification (M&V) Plan to comply with the LEED M&V credit. The plan will provide guidance for design team to incorporate the M&V measures prescribed in the LEED certification requirement. Incorporation of M&V measures by the contractor is assumed. Required monitoring points necessary for long term continuous measurement will be included in the commissioning specification issued to the contractor prior to construction. Additional efforts in assisting the contractor in achieving a working M&V monitoring capability is additional services. owner may charge back to the contractor the costs incurred by the Commissioning Authority. Computer energy modeling and implementation of this plan after occupancy are not part of this scope of work.

3.8 Assumptions

A. The energy simulation will be performed by the owner's design engineer. The recommended energy software used for modeling needs to be a simulation program such as DOE2. Use of energy software using modified bin temperature method will not meet certain LEED criteria on daylight and view. The weather data used should include measured solar data such as the TMY weather data to better reflect solar contribution. Assistance to the design engineer in refining energy modeling is additional services.

B. The design engineer's energy modeling results are sufficient for LEED submission and valid as the project's energy baseline for M&V credit. Assistance to the design engineer in refining the energy modeling or correct modeling results is additional services.

C. Owner's design team of architects and engineers will provide Basis of Design and Design Intent on thermal envelope, mechanical and electrical systems for review by the Commissioning Authority. The design team will make revisions to comply with LEED submission requirements. Developing these two documents (Basis of Design and Design Intent) or extended revision to these documents is additional services.

D. O&M manual compilation will be performed by others. Our scope is limited to review and comment for conformance, content and usability only. Contractor to revise and incorporate comments.

E. Functional Performance Testing is to be done by the Contractor. Contractor is assumed to be able to performed FPT prescribed in the specification. Testing support and performance of tests can be provided as added services.

F. Measurement and Verification efforts in this proposal assume the temperature controls contractor conducts the instrumentation monitoring. Contractor will be required to demonstrate full functionality and performance of LEED prescribed M&V features including trending and calibration.

Facility Security Scope Definition Services

We offer to review the current facility design to define the scope for facility security at the Navy League Building. CH2M HILL will provide the services of an expert in infrastructure security and force protection to meet directly with the Navy League staff, to review the project design, examine the overall method of intended operation of the building and to define the needs and scope for building security.

We are intimately familiar with the interim DOD guidelines and fully capable to address all aspects of building security from access control, structural hardening, personal and infrastructure risks, biological and chemical threats as well as emergency management and response. We will also examine the security requirements of possible future tenants, especially if the tenants are defense-related or with agencies with high degree of security or force protection requirements. We will develop a brief written report of his observations and recommendations on security needs for the Navy League Building including a scope for further detailed assessments by CH2M HILL and, if requested, develop a proposed budget for further assessments.

Not to be implemented at this time.

Attachment B
Compensation

Compensation will be on a ~~lump sum~~ fixed fee for services rendered basis for the scope of services described in Attachment A:

- Basic Services – ~~lump sum of~~ $118,500 total cost of services
- Measurement and verification plan – ~~lump sum of $17,500~~
- ~~Facility security scope definition – lump sum of $7,900~~ Not to be implemented at this time

Additional services will be performed on a time and materials basis after written agreement on scope of work and total price according to the following rate schedule.

Project Director	$175
Project Commissioning Manager	$125
Sr. Mechanical Commissioning Engineer	$155
Architectural Commissioning Lead	$150
Electrical Commissioning Engineer	$140
On-Site Commissioning Engineer	$110
Junior Engineer	$80
Contracts Administrator	$115
Administrative Assistant	$60

Notes:

- Hourly bill rates are those hourly rates charged for work performed on the PROJECT by CH2M HILL's employees. These rates are subject to annual calendar year adjustments; include all allowances for salary, overheads and fees; but do not include allowances for Direct Expenses subcontracts and outside services. Labor for administrative and contracts staff would be billed as needed for the project.
- Direct Expenses are those necessary costs and charges incurred for the PROJECT including, but not limited to: (1) the direct costs of transportation, meals and lodging, mail, special Consultant approved PROJECT specific insurance, letters of credit, bonds, and equipment and supplies; (2) CH2M HILL's current rate charges for direct use of CH2M HILL's vehicles, laboratory test and analysis, printing and reproduction services, and certain field equipment; and (3) CH2M HILL's project charges for computing systems, special health and safety requirements of OSHA, and telecommunications service.
- For Services rendered, all direct expenses including subcontractor costs are applicable to services rendered and subject to a service fee.

STANDARD AGREEMENT FOR PROFESSIONAL SERVICES

This AGREEMENT is between CH2M HILL INC., ("ENGINEER"), and

The Navy League Building, LLC ("OWNER")

for a PROJECT generally described as:

Commissioning Services for the Navy League Building.

ARTICLE 1. SCOPE OF SERVICES

ENGINEER will perform the Scope of Services set forth in Attachment A.

ARTICLE 2. COMPENSATION

OWNER will compensate ENGINEER as set forth in Attachment B. Work performed under this AGREEMENT may be performed using labor from affiliated companies of ENGINEER. Such labor will be billed to OWNER under the same billing terms applicable to ENGINEER's employees.

ARTICLE 3. TERMS OF PAYMENT

OWNER will pay ENGINEER as follows:

3.1 Invoices and Time of Payment

ENGINEER will issue monthly invoices pursuant to Attachment B. Invoices are due and payable within 30 days of receipt.

3.2 Interest

3.2.1 OWNER will be charged interest at the rate of 1-1/2% per month, or that permitted by law if lesser, on all past-due amounts starting 30 days after receipt of invoice. Payments will first be credited to interest and then to principal.

3.2.2 In the event of a disputed billing, only the disputed portion will be withheld from payment, and OWNER shall pay the undisputed portion. OWNER will exercise reasonableness in disputing any bill or portion thereof. No interest will accrue on any disputed portion of the billing until mutually resolved.

3.2.3 If OWNER fails to make payment in full within 30 days of the date due for any undisputed billing, ENGINEER may, after giving 7 days' written notice to OWNER, suspend services under this AGREEMENT until paid in full, including interest. In the event of suspension of services, ENGINEER will have no liability to OWNER for delays or damages caused by OWNER because of such suspension.

ARTICLE 4. OBLIGATIONS OF ENGINEER

4.1 Standard of Care

The standard of care applicable to ENGINEER's Services will be the degree of skill and diligence normally employed by professional engineers or consultants performing the same or similar Services at the time said services are performed. ENGINEER will reperform any services not meeting this standard without additional compensation.

4.2 Subsurface Investigations

In soils, foundation, groundwater, and other subsurface investigations, the actual characteristics may vary significantly between successive test points and sample intervals and at locations other than where observations, exploration, and investigations have been made. Because of the inherent uncertainties in subsurface evaluations, changed or unanticipated underground conditions may occur that could affect total PROJECT cost and/or execution. These conditions and cost/execution effects are not the responsibility of ENGINEER.

4.3 ENGINEER's Personnel at Construction Site

4.3.1 The presence or duties of ENGINEER's personnel at a construction site, whether as onsite representatives or otherwise, do not make ENGINEER or ENGINEER's personnel in any way responsible for those duties that belong to OWNER and/or the construction contractors or other entities, and do not relieve the construction contractors or any other entity of their obligations, duties, and responsibilities, including, but not limited to, all construction methods, means, techniques, sequences, and procedures necessary for coordinating and completing all portions of the construction work in accordance with the construction Contract Documents and any health or safety precautions required by such construction work.

4.3.2 ENGINEER and ENGINEER's personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions and have no duty for inspecting, noting, observing, correcting, or reporting on health or safety deficiencies of the construction contractor(s) or other entity or any other persons at the site except ENGINEER's own personnel.

4.3.3 The presence of ENGINEER's personnel at a construction site is for the purpose of providing to OWNER a greater degree of confidence that the completed construction work will conform generally to the construction documents and that the integrity of the design concept as reflected in the construction documents has been implemented and preserved by the construction contractor(s). ENGINEER neither guarantees the performance of the construction contractor(s) nor assumes responsibility for construction

Engineer does warrant that its design recommendations will, if properly followed, perform as promised

contractor's failure to perform work in accordance with the construction documents.

For this AGREEMENT only, construction sites include places of manufacture for materials incorporated into the construction work, and construction contractors include manufacturers of materials incorporated into the construction work.

4.4 Opinions of Cost, Financial Considerations, and Schedules

In providing opinions of cost, financial analyses, economic feasibility projections, and schedules for the PROJECT, ENGINEER has no control over cost or price of labor and materials; unknown or latent conditions of existing equipment or structures that may affect operation or maintenance costs; competitive bidding procedures and market conditions; time or quality of performance by operating personnel or third parties; and other economic and operational factors that may materially affect the ultimate PROJECT cost or schedule. Therefore, ENGINEER makes no warranty that OWNER's actual PROJECT costs, financial aspects, economic feasibility, or schedules will not vary from ENGINEER's opinions, analyses, projections, or estimates.

If OWNER wishes greater assurance as to any element of PROJECT cost, feasibility, or schedule, OWNER will employ an independent cost estimator, contractor, or other appropriate advisor.

4.5 Construction Progress Payments

Recommendations by ENGINEER to OWNER for periodic construction progress payments to the construction contractor(s) will be based on ENGINEER's knowledge, information, and belief from selective sampling that the work has progressed to the point indicated. Such recommendations do not represent that continuous or detailed examinations have been made by ENGINEER to ascertain that the construction contractor(s) have completed the work in exact accordance with the construction documents; that the final work will be acceptable in all respects; that ENGINEER has made an examination to ascertain how or for what purpose the construction contractor(s) have used the moneys paid; that title to any of the work, materials, or equipment has passed to OWNER free and clear of liens, claims, security interests, or encumbrances; or that there are not other matters at issue between OWNER and the construction contractors that affect the amount that should be paid.

4.6 Record Drawings

Record drawings, if required, will be prepared, in part, on the basis of information compiled and furnished by others, and may not always represent the exact location, type of various components, or exact manner in which the PROJECT was finally constructed. ENGINEER is not responsible for any errors or omissions in the information from others that is incorporated into the record drawings.

4.7 Access to ENGINEER's Accounting Records

ENGINEER will maintain accounting records, in accordance with generally accepted accounting principles. These records will be available to OWNER during ENGINEER's normal business hours for a period of 1 year after ENGINEER's final invoice for examination to the extent required to verify the direct costs (excluding established or standard allowances and rates) incurred hereunder. OWNER may only audit accounting records applicable to a cost-reimbursable type compensation.

4.8 ENGINEER's Insurance

ENGINEER will maintain throughout this AGREEMENT the following insurance:

(a) Worker's compensation and employer's liability insurance as required by the state where the work is performed.

(b) Comprehensive automobile and vehicle liability insurance covering claims for injuries to members of the public and/or damages to property of others arising from use of motor vehicles, including onsite and offsite operations, and owned, nonowned, or hired vehicles, with $1,000,000 combined single limits.

(c) Commercial general liability insurance covering claims for injuries to members of the public or damage to property of others arising out of any covered negligent act or omission of ENGINEER or of any of its employees, agents, or subcontractors, with $1,000,000 per occurrence and in the aggregate.

(d) Professional liability insurance of $1,000,000 per occurrence and in the aggregate.

(e) OWNER will be named as an additional insured with respect to ENGINEER's liabilities hereunder in insurance coverages identified in items (b) and (c) and ENGINEER waives subrogation against OWNER as to said policies.

ARTICLE 5. OBLIGATIONS OF OWNER

5.1 OWNER-Furnished Data

OWNER will provide to ENGINEER all data in OWNER's possession relating to ENGINEER's services on the PROJECT. ENGINEER will reasonably rely upon the accuracy, timeliness, and completeness of the information provided by OWNER.

5.2 Access to Facilities and Property

OWNER will make its facilities accessible to ENGINEER as required for ENGINEER's performance of its services and will provide labor and safety equipment as required by ENGINEER for such access. OWNER will perform, at no cost to ENGINEER, such tests of equipment, machinery, pipelines, and other components of OWNER's facilities as may be required in connection with ENGINEER's services.

5.3 Advertisements, Permits, and Access

Unless otherwise agreed to in the Scope of Services, OWNER will obtain, arrange, and pay for all advertisements for bids; permits and licenses required by local, state, or federal authorities; and land, easements, rights-of-way, and access necessary for ENGINEER's services or PROJECT construction.

5.4 Timely Review

OWNER will examine ENGINEER's studies, reports, sketches, drawings, specifications, proposals, and other documents; obtain advice of an attorney, insurance counselor, accountant, auditor, bond and financial advisors, and other consultants as OWNER deems appropriate; and render in writing decisions required by OWNER in a timely manner.

5.5 Prompt Notice
OWNER will give prompt written notice to ENGINEER whenever OWNER observes or becomes aware of any development that affects the scope or timing of ENGINEER's Services, or of any defect in the work of ENGINEER or construction contractors.

5.6 Asbestos or Hazardous Substances
5.6.1 If asbestos or hazardous substances in any form are encountered or suspected, ENGINEER will stop its own work in the affected portions of the PROJECT to permit testing and evaluation.

5.6.2 If asbestos is suspected, ENGINEER will, if requested, manage the asbestos remediation activities using a qualified subcontractor at an additional fee and contract terms to be negotiated.

5.6.3 If hazardous substances other than asbestos are suspected, ENGINEER will, if requested, conduct tests to determine the extent of the problem and will perform the necessary studies and recommend the necessary remedial measures at an additional fee and contract terms to be negotiated.

5.6.4 Client recognizes that CH2M HILL assumes no risk and/or liability for a waste or hazardous waste site originated by other than CH2M HILL.

5.7 Contractor Indemnification and Claims
5.7.1 OWNER agrees to include in all construction contracts the provisions of Article 4.3, ENGINEER's Personnel at Construction Site, and provisions providing contractor indemnification of OWNER and ENGINEER for contractor's negligence.

5.7.2 OWNER shall require construction contractor(s) to name OWNER and ENGINEER as additional insureds on the contractor's general liability insurance policy.

5.7.3 OWNER agrees to include the following clause in all contracts with construction contractors, and equipment or materials suppliers:

Contractors, subcontractors, and equipment and material suppliers on the PROJECT, or their sureties, shall maintain no direct action against ENGINEER, ENGINEER's officers, employees, affiliated corporations, and subcontractors for any claim arising out of, in connection with, or resulting from the engineering services performed. OWNER will be the only beneficiary of any undertaking by ENGINEER."

5.8 OWNER's Insurance
5.8.1 OWNER will maintain property insurance on all pre-existing physical facilities associated in any way with the PROJECT.

5.8.2 OWNER will provide for a waiver of subrogation as to all OWNER-carried property damage insurance, during construction and thereafter, in favor of ENGINEER, ENGINEER's officers, employees, affiliates, and subcontractors.

5.8.3 OWNER will provide (or have the construction contractor(s) provide) a Builders Risk All Risk insurance policy for the full replacement value of all PROJECT work including the value of all onsite OWNER-furnished equipment and/or materials associated with ENGINEER's services. Such policy will include coverage for loss due to defects in materials and workmanship and errors in design, and will provide a waiver of subrogation as to ENGINEER and the construction contractor(s) (or OWNER), and their respective officers, employees, agents, affiliates, and subcontractors. OWNER will provide ENGINEER a copy of such policy.

5.9 Litigation Assistance
The Scope of Services does not include costs of ENGINEER for required or requested assistance to support, prepare, document, bring, defend, or assist in litigation undertaken or defended by OWNER. All such Services required or requested of ENGINEER by OWNER, except for suits or claims between the parties to this AGREEMENT, will be reimbursed as mutually agreed.

5.10 Changes
OWNER may make or approve changes within the general Scope of Services in this AGREEMENT. If such changes affect ENGINEER's cost of or time required for performance of the services, an equitable adjustment will be made through an amendment to this AGREEMENT.

ARTICLE 6. GENERAL LEGAL PROVISIONS

6.1 Authorization to Proceed
Execution of this AGREEMENT by OWNER will be authorization for ENGINEER to proceed with the work, unless otherwise provided for in this AGREEMENT.

6.2 Reuse of PROJECT Documents
All reports, drawings, specifications, documents, and other deliverables of ENGINEER, whether in hard copy or in electronic form, are instruments of service for this PROJECT, whether the PROJECT is completed or not. OWNER agrees to indemnify ENGINEER and ENGINEER's officers, employees, subcontractors, and affiliated corporations from all claims, damages, losses, and costs, including, but not limited to, litigation expenses and attorney's fees arising out of or related to the unauthorized reuse, change or alteration of these PROJECT documents.

6.3 Force Majeure
ENGINEER is not responsible for damages or delay in performance caused by acts of God, strikes, lockouts, accidents, or other events beyond the control of ENGINEER. In any such event, ENGINEER'S contract price and schedule shall be equitably adjusted.

6.4 Limitation of Liability
6.4.1 To the maximum extent permitted by law, ENGINEER's liability for OWNER's damages will not, in the aggregate, exceed $1,000,000.

6.4.2 This article takes precedence over any conflicting article of this AGREEMENT or any document incorporated into it or referenced by it.

6.4.3 This limitation of liability will apply whether ENGINEER's liability arises under breach of contract or warranty; tort; including negligence; strict liability; statutory liability; or any other cause of action, and shall include ENGINEER's officers, affiliated corporations, employees, and subcontractors.

6.5 Termination
6.5.1 This AGREEMENT may be terminated for convenience on 30 days' written notice, or for cause if either party fails substantially to perform through no fault

of the other and does not commence correction of such nonperformance within 5 days of written notice and diligently complete the correction thereafter.

6.5.2 On termination, ENGINEER will be paid for all authorized services performed up to the termination date plus termination expenses, such as, but not limited to, reassignment of personnel, subcontract termination costs, and related closeout costs.

6.6 Suspension, Delay, or Interruption of Work
OWNER may suspend, delay, or interrupt the Services of ENGINEER for the convenience of OWNER. In such event, ENGINEER's contract price and schedule shall be equitably adjusted.

6.7 No Third-Party Beneficiaries
This AGREEMENT gives no rights or benefits to anyone other than OWNER and ENGINEER and has no third-party beneficiaries.

6.8 Indemnification
6.8.1 ENGINEER agrees to indemnify OWNER for any claims, damages, losses, and costs, including, but not limited to, attorney's fees and litigation costs, arising out of claims by third parties for property damage or bodily injury, including death, to the proportionate extent caused by the negligence or willful misconduct of ENGINEER, ENGINEER's employees, affiliated corporations, and subcontractors in connection with the PROJECT.

6.8.2 OWNER agrees to indemnify ENGINEER from any claims, damages, losses, and costs, including, but not limited to, attorney's fees and litigation costs, arising out of claims by third parties for property damage or bodily injury, including death, to the proportionate extent caused by the negligence or willful misconduct of OWNER, or its employees or contractors in connection with the PROJECT.

6.9 Assignment
This is a bilateral personal Services AGREEMENT. Neither party shall have the power to or will assign any of the duties or rights or any claim arising out of or related to this AGREEMENT, whether arising in tort, contract or otherwise, without the written consent of the other party. Any unauthorized assignment is void and unenforceable. These conditions and the entire AGREEMENT are binding on the heirs, successors, and assigns of the parties hereto.

6.10 Consequential Damages
To the maximum extent permitted by law, ENGINEER and ENGINEER's affiliated corporations, officers, employees, and subcontractors shall not be liable for OWNER's special, indirect, or consequential damages, whether such damages arise out of breach of contract or warranty, tort including negligence, strict or statutory liability, or any other cause of action. In order to protect ENGINEER against indirect liability or third-party proceedings, OWNER will indemnify ENGINEER for any such damages.

6.11 Waiver
OWNER waives all claims against ENGINEER, including those for latent defects, that are not brought within 2 years of substantial completion of the facility designed or final payment to ENGINEER, whichever is earlier.

6.12 Jurisdiction
The substantive law of the state of the PROJECT site shall govern the validity of this AGREEMENT, its interpretation and performance, and any other claims related to it.

6.13 Severability and Survival
6.13.1 If any of the Provisions contained in this AGREEMENT are held for any reason to be invalid, illegal, or unenforceable, the enforceability of the remaining provisions shall not be impaired thereby.

6.13.2 Limitations of liability, indemnities, and other express representations shall survive termination of this AGREEMENT for any cause.

6.14 Materials and Samples
Any items, substances, materials, or samples removed from the PROJECT site for testing, analysis, or other evaluation will be returned to the PROJECT site within 60 days of PROJECT close-out unless agreed to otherwise. OWNER recognizes and agrees that ENGINEER is acting as a bailee and at no time assumes title to said items, substances, materials, or samples.

6.15 Engineer's Deliverables
Engineer's deliverables, including record drawings, are limited to the sealed and signed hard copies. Computer-generated drawing files furnished by ENGINEER are for OWNER or others' convenience. Any conclusions or information derived or obtained from these files will be at user's sole risk.

6.16 Dispute Resolution
The parties will use their best efforts to resolve amicably any dispute, including use of alternative dispute resolution options.

6.17 Ownership of Work Product and Inventions
All of the work product of the ENGINEER in executing this PROJECT shall remain the property of ENGINEER. OWNER shall receive a perpetual, royalty-free, non-transferable, non-exclusive license to use the deliverables for the purpose for which they were intended. Any inventions, patents, copyrights, computer programs, or other intellectual property developed during the course of, or as a result of, the PROJECT shall remain the property of the ENGINEER.

ARTICLE 7. ATTACHMENTS, SCHEDULES, AND SIGNATURES

This AGREEMENT, including its attachments and schedules, constitutes the entire AGREEMENT, supersedes all prior written or oral understandings, and may only be changed by a written amendment executed by both parties. The following attachments and schedules are hereby made a part of this AGREEMENT:
Attachment A--Scope of Services
Attachment B--Compensation

IN WITNESS WHEREOF, the parties execute below:

The Navy League Building, LLC
2300 Wilson Boulevard
Arlington, Virginia 22201-3308

For OWNER,

dated this 2nd day of August, 2002

Signature

Name (printed) Charles L. Robinson

Title ~~National Executive Director~~ Charles L. Robinson Authorized Manager

For ENGINEER, CH2M HILL INC.,

dated this 12th day of February, 2002

Signature

Name (printed) Courtney H. Brown, PE

Title Vice President

Table 5-2
Raw Compounds and Analytes for Site 25 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO04		IS25SO07		IS25SO20						IS25SO21	
Sample ID	IS25SB010203		IS25SB040203		IS25SB070203		IS25SB180203		IS25SB200203		IS25SB200203P		IS25SB190203	
Sample Date	10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
1,1,1-Trichloroethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1,2,2-Tetrachloroethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1,2-Trichloro-1,2,2- trifluoroethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1,2-Trichloroethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1-Dichloroethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,1-Dichloroethene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2,4-Trichlorobenzene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dibromo-3-chloropropane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dibromoethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dichlorobenzene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dichloroethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,2-Dichloroethene (total)	12	U	NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,3-Dichlorobenzene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
1,4-Dichlorobenzene	12	U	12	U	12	U	12	U	12	U	1.3	B	12	U
2-Butanone	12	U	12	U	12	U	12	U	12	U	12	U	12	U
2-Hexanone	12	U	12	U	12	U	12	U	12	U	12	U	12	U
4-Methyl-2-pentanone	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Acetone	3.4	B	3.1	B	2.5	B	12	U	3.3	B	3.8	B	2.4	B
Benzene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Bromodichloromethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Bromoform	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Bromomethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Carbon disulfide	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Carbon tetrachloride	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Chlorobenzene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Chloroethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Chloroform	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Chloromethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Cumene	12	U	12	U	12	U	12	U	12	U	12	U	12	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
U - Analyte not detected

Table 5-2
Raw Compounds and Analytes for Site 25 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO04		IS25SO07		IS25SO20						IS25SO21	
Sample ID	IS25SB010203		IS25SB040203		IS25SB070203		IS25SB180203		IS25SB200203		IS25SB200203P		IS25SB190203	
Sample Date	10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00	
Chemical Name														
Cyclohexane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Dibromochloromethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Dichlorodifluoromethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Ethylbenzene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Methyl acetate	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Methyl-tert-butyl ether (MTBE)	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Methylcyclohexane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Methylene chloride	3	B	3.2	B	2.3	B	2.3	B	2.8	B	2.5	B	2.2	B
Styrene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Tetrachloroethene	12	U	12	U	12	U	12	U	1.8	J	12	U	12	U
Toluene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Trichloroethene	12	U	12	U	12	U	12	U	3.1	J	12	U	12	U
Trichlorofluoromethane	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Vinyl chloride	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Xylene, total	12	U	12	U	12	U	12	U	12	U	12	U	12	U
cis-1,2-Dichloroethene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
cis-1,3-Dichloropropene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
trans-1,2-Dichloroethene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
trans-1,3-Dichloropropene	12	U	12	U	12	U	12	U	12	U	12	U	12	U
Semi-volatile Organic Compounds (UG/KG)														
1,1-Biphenyl	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2,2'-Oxybis(1-chloropropane)	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2,4,5-Trichlorophenol	990	U	1,000	U	990	U	990	U	1,000	U	1,000	U	990	U
2,4,6-Trichlorophenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2,4-Dichlorophenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2,4-Dimethylphenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2,4-Dinitrophenol	990	U	1,000	U	990	U	990	U	1,000	U	1,000	U	990	U
2,4-Dinitrotoluene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2,6-Dinitrotoluene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2-Chloronaphthalene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2-Chlorophenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
U - Analyte not detected

Table 5-2
Raw Compounds and Analytes for Site 25 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO04		IS25SO07		IS25SO20						IS25SO21	
Sample ID	IS25SB010203		IS25SB040203		IS25SB070203		IS25SB180203		IS25SB200203		IS25SB200203P		IS25SB190203	
Sample Date	10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00	
Chemical Name														
2-Methylnaphthalene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2-Methylphenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
2-Nitroaniline	990	U	1,000	U	990	U	990	U	1,000	U	1,000	U	990	U
2-Nitrophenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
3,3'-Dichlorobenzidine	390	U	400	U	400	U	390	U	400	U	400	U	390	U
3-Nitroaniline	990	U	1,000	U	990	U	990	U	1,000	U	1,000	U	990	U
4,6-Dinitro-2-methylphenol	990	U	1,000	U	990	U	990	U	1,000	U	1,000	U	990	U
4-Bromophenyl-phenylether	390	U	400	U	400	U	390	U	400	U	400	U	390	U
4-Chloro-3-methylphenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
4-Chloroaniline	390	U	400	U	400	U	390	U	400	U	400	U	390	U
4-Chlorophenyl-phenylether	390	U	400	U	400	U	390	U	400	U	400	U	390	U
4-Methylphenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
4-Nitroaniline	990	U	1,000	U	990	U	990	U	1,000	U	1,000	U	990	U
4-Nitrophenol	990	U	1,000	U	990	U	990	U	1,000	U	1,000	U	990	U
Acenaphthene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Acenaphthylene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Acetophenone	42	B	45	B	47	B	390	U	42	B	400	U	49	B
Anthracene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Atrazine	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Benzaldehyde	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Benzo(a)anthracene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Benzo(a)pyrene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Benzo(b)fluoranthene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Benzo(g,h,i)perylene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Benzo(k)fluoranthene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Butylbenzylphthalate	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Caprolactam	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Carbazole	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Chrysene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Di-n-butylphthalate	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Di-n-octylphthalate	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Dibenz(a,h)anthracene	390	U	400	U	400	U	390	U	400	U	400	U	390	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
U - Analyte not detected

Table 5-2
Raw Compounds and Analytes for Site 25 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO04		IS25SO07		IS25SO20						IS25SO21	
Sample ID	IS25SB010203		IS25SB040203		IS25SB070203		IS25SB180203		IS25SB200203		IS25SB200203P		IS25SB190203	
Sample Date	10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00		10/11/00	
Chemical Name														
Dibenzofuran	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Diethylphthalate	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Dimethyl phthalate	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Fluoranthene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Fluorene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Hexachlorobenzene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Hexachlorobutadiene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Hexachlorocyclopentadiene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Hexachloroethane	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Indeno(1,2,3-cd)pyrene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Isophorone	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Naphthalene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Nitrobenzene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Pentachlorophenol	950	U	970	U	960	U	950	U	960	U	960	U	950	U
Phenanthrene	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Phenol	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Pyrene	390	U	400	U	130	J	390	U	400	U	400	U	390	U
bis(2-Chloroethoxy)methane	390	U	400	U	400	U	390	U	400	U	400	U	390	U
bis(2-Chloroethyl)ether	390	U	400	U	400	U	390	U	400	U	400	U	390	U
bis(2-Ethylhexyl)phthalate	390	U	400	U	400	U	390	U	400	U	400	U	390	U
n-Nitroso-di-n-propylamine	390	U	400	U	400	U	390	U	400	U	400	U	390	U
n-Nitrosodiphenylamine	390	U	400	U	400	U	390	U	400	U	400	U	390	U
Explosives (UG/KG)														
Nitroglycerin	1,200	U	1,200	U	1,200	U	1,200	U	1,200	U	1,300	U	1,200	U
Total Metals (MG/KG)														
Aluminum	13,400		10,700		11,000		15,000		11,400		12,300		11,400	
Antimony	0.74	U	1.1	K	0.86	K	0.98	K	0.85	K	1.4	K	0.76	K
Arsenic	6.9		5.5		5.7		7.6		5.9		7.5		5.6	
Barium	34.8	J	23	J	24.5	J	37.2	J	24.8	J	26.8	J	35.6	J
Beryllium	0.23	B	0.29	B	0.32	B	0.38	B	0.26	B	0.31	B	0.27	B

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
U - Analyte not detected

Table 5-2
Raw Compounds and Analytes for Site 25 Subsurface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01	IS25SO04	IS25SO07	IS25SO20			IS25SO21
Sample ID	IS25SB010203	IS25SB040203	IS25SB070203	IS25SB180203	IS25SB200203	IS25SB200203P	IS25SB190203
Sample Date	10/11/00	10/11/00	10/11/00	10/11/00	10/11/00	10/11/00	10/11/00
Chemical Name							
Cadmium	0.18 J	0.092 J	0.12 J	0.17 J	0.14 J	0.075 J	0.32 J
Calcium	71.2 B	147 B	99.9 B	333 J	71.9 B	107 B	201 B
Chromium	22.6	13.7	13.4	17.5	17.2	19	18.2
Cobalt	2.8 J	2.7 J	3.2 J	3.1 J	2.7 J	2.9 J	3.1 J
Copper	13.6	10.8	12.5	11.7	11.5	12.7	9.1
Cyanide	0.6 U	0.61 U	0.6 U	0.6 U	0.6 U	0.6 U	0.59 U
Iron	30,100	21,100	22,800	22,100	25,100	27,000	19,400
Lead	11.1 K	10.3 K	10.4 K	10.7 K	10.3 K	10.7 K	11.9 K
Magnesium	380 J	349 J	434 J	531 J	354 J	405 J	496 J
Manganese	71.5	76	103	71.4	81.2	87.1	99.5
Mercury	0.06 U	0.061 U	0.06 U	0.1 J	0.075 J	0.064 J	0.059 U
Nickel	5.8 K	5.3 K	6.5 K	5.8 K	5.1 K	6.1 K	7.4 K
Potassium	592 J	677 J	677 B	638 B	529 J	551 J	399 J
Selenium	1.9 K	1.4 K	2.1	1.4 K	1.4 K	1.5 K	1.1 K
Silver	0.26 U	0.27 U	0.26 U	18.3	0.26 U	0.27 U	4.8
Sodium	58.2 U	59.2 U	58.4 U	58.2 U	58.7 U	58.8 U	58 U
Thallium	1.6 U	1.7 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
Vanadium	43.3	30.1	30.9	35.5	36.8	39.5	32.7
Zinc	26.6 J	23.2 J	26.9 J	34.4 J	23.8 J	26.5 J	27.4 J
Wet Chemistry (MG/KG)							
% Moisture	16.1	17.5	16.5	16.2	16.8	17	15.8

NA - Not analyzed
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J - Reported value is estimated
K - Reported value may be biased high
U - Analyte not detected

Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO02	IS25SO03	IS25SO04	IS25SO05	IS25SO06	IS25SO07
Sample ID	IS25SS010001	IS25SS010001P	IS25SS020001	IS25SS030001	IS25SS040001	IS25SS050001	IS25SS060001	IS25SS070001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,1,2,2-Tetrachloroethane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,1,2-Trichloro-1,2,2- trifluoroethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
1,1,2-Trichloroethane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,1-Dichloroethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
1,1-Dichloroethene	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
1,2,4-Trichlorobenzene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,2-Dibromo-3-chloropropane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,2-Dibromoethane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,2-Dichlorobenzene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,2-Dichloroethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,3-Dichlorobenzene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
1,4-Dichlorobenzene	16 UJ	17 UJ	15 UJ	14 U	13 U	13 U	13 U	15 U
2-Butanone	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
2-Hexanone	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
4-Methyl-2-pentanone	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Acetone	7.6 J	8.9 J	3.9 J	14 U	14 B	14 B	8 B	8.7 B
Benzene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Bromodichloromethane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Bromoform	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Bromomethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Carbon disulfide	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Carbon tetrachloride	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Chlorobenzene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Chloroethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Chloroform	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Chloromethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Cumene	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UJ
UL

Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO02	IS25SO03	IS25SO04	IS25SO05	IS25SO06	IS25SO07
Sample ID	IS25SS010001	IS25SS010001P	IS25SS020001	IS25SS030001	IS25SS040001	IS25SS050001	IS25SS060001	IS25SS070001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Cyclohexane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Dibromochloromethane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Dichlorodifluoromethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Ethylbenzene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Methyl acetate	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Methyl-tert-butyl ether (MTBE)	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Methylcyclohexane	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Methylene chloride	16 UJ	17 UJ	15 U	14 U	1.9 J	1.9 J	13 U	15 U
Styrene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Tetrachloroethene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Toluene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Trichloroethene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Trichlorofluoromethane	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Vinyl chloride	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
Xylene, total	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
cis-1,2-Dichloroethene	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
cis-1,3-Dichloropropene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
trans-1,2-Dichloroethene	16 UJ	17 UJ	15 U	14 U	13 U	13 U	13 U	15 U
trans-1,3-Dichloropropene	16 UJ	17 UJ	15 UJ	14 U	13 UJ	13 U	13 U	15 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2,2'-Oxybis(1-chloropropane)	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2,4,5-Trichlorophenol	4,000 U	4,200 U	1,300 U	2,300 U	1,100 U	1,100 U	1,100 U	1,200 U
2,4,6-Trichlorophenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2,4-Dichlorophenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2,4-Dimethylphenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2,4-Dinitrophenol	4,000 U	4,200 U	1,300 U	2,300 U	1,100 U	1,100 U	1,100 U	1,200 U
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2-Chlorophenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
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R - Unreliable result
U - Analyte not detected
UJ
UL

Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO02	IS25SO03	IS25SO04	IS25SO05	IS25SO06	IS25SO07
Sample ID	IS25SS010001	IS25SS010001P	IS25SS020001	IS25SS030001	IS25SS040001	IS25SS050001	IS25SS060001	IS25SS070001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
2-Methylnaphthalene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2-Methylphenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
2-Nitroaniline	4,000 U	4,200 U	1,300 U	2,300 U	1,100 U	1,100 U	1,100 U	1,200 U
2-Nitrophenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
3,3'-Dichlorobenzidine	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
3-Nitroaniline	4,000 U	4,200 U	1,300 U	2,300 U	1,100 U	1,100 U	1,100 U	1,200 U
4,6-Dinitro-2-methylphenol	4,000 U	4,200 U	1,300 U	2,300 U	1,100 U	1,100 U	1,100 U	1,200 U
4-Bromophenyl-phenylether	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
4-Chloro-3-methylphenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
4-Chloroaniline	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
4-Chlorophenyl-phenylether	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
4-Methylphenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
4-Nitroaniline	4,000 U	4,200 U	1,300 U	2,300 U	1,100 U	1,100 U	1,100 U	1,200 U
4-Nitrophenol	4,000 U	4,200 U	1,300 U	2,300 U	1,100 U	1,100 U	1,100 U	1,200 U
Acenaphthene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Acenaphthylene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Acetophenone	1,600 U	1,700 U	500 U	910 U	430 U	440 U	51 J	480 U
Anthracene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Atrazine	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Benzaldehyde	1,600 U	1,700 U	55 J	910 U	430 U	440 U	440 U	400 J
Benzo(a)anthracene	1,600 U	1,700 U	500 U	200 J	430 U	440 U	440 U	49 J
Benzo(a)pyrene	1,600 U	1,700 U	55 J	190 J	430 U	440 U	440 U	53 J
Benzo(b)fluoranthene	240 J	210 J	78 J	230 J	430 U	440 U	440 U	62 J
Benzo(g,h,i)perylene	1,600 U	1,700 U	500 U	130 J	430 U	440 U	440 U	480 U
Benzo(k)fluoranthene	200 J	220 J	64 J	220 J	430 U	440 U	440 U	60 J
Butylbenzylphthalate	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Caprolactam	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Carbazole	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Chrysene	190 J	200 J	97 J	280 J	430 U	440 U	54 J	95 J
Di-n-butylphthalate	1,600 U	1,700 U	500 U	540 J	430 U	440 U	440 U	480 U
Di-n-octylphthalate	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Dibenz(a,h)anthracene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U

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Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO02	IS25SO03	IS25SO04	IS25SO05	IS25SO06	IS25SO07
Sample ID	IS25SS010001	IS25SS010001P	IS25SS020001	IS25SS030001	IS25SS040001	IS25SS050001	IS25SS060001	IS25SS070001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Dibenzofuran	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Diethylphthalate	1,600 U	1,700 U	170 J	910 U	430 U	440 U	440 U	530
Dimethyl phthalate	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Fluoranthene	200 J	200 J	110 J	380 J	430 U	440 U	68 J	100 J
Fluorene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Hexachlorobenzene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Hexachlorobutadiene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Hexachlorocyclopentadiene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Hexachloroethane	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Indeno(1,2,3-cd)pyrene	1,600 U	1,700 U	51 J	150 J	430 U	440 U	440 U	49 J
Isophorone	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Naphthalene	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	3,800 U	4,000 U	1,200 U	2,200 U	1,000 U	1,100 U	1,100 U	1,200 U
Phenanthrene	1,600 U	1,700 U	71 J	220 J	430 U	440 U	440 U	65 J
Phenol	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Pyrene	160 J	170 J	84 J	230 J	430 U	440 U	61 J	90 J
bis(2-Chloroethoxy)methane	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
bis(2-Chloroethyl)ether	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
bis(2-Ethylhexyl)phthalate	380 B	300 B	180 B	17,000	430 U	45 B	110 B	56 B
n-Nitroso-di-n-propylamine	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
n-Nitrosodiphenylamine	1,600 U	1,700 U	500 U	910 U	430 U	440 U	440 U	480 U
Explosives (UG/KG)								
2,4-Dinitrotoluene	1,600 U	1,700 U	500 U	910 U	430 R	440 U	440 U	480 U
2,6-Dinitrotoluene	1,600 U	1,700 U	500 U	910 U	430 R	440 U	440 U	480 U
Nitrobenzene	1,600 U	1,700 U	500 U	910 U	430 R	440 U	440 U	480 U
Nitroglycerin	1,400 U	1,400 U	1,400 U	1,300 U	1,600 R	1,300 U	1,300 U	1,600 U
Total Metals (MG/KG)								
Aluminum	12,000	12,800	13,600	5,530	6,330	7,490	4,880	7,850
Antimony	2.1 L	1.5 L	1.3 UL	1.4 UL	1.1 UL	1.2 UL	1.2 UL	1.3 UL

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Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO01		IS25SO02	IS25SO03	IS25SO04	IS25SO05	IS25SO06	IS25SO07
Sample ID	IS25SS010001	IS25SS010001P	IS25SS020001	IS25SS030001	IS25SS040001	IS25SS050001	IS25SS060001	IS25SS070001
Sample Date	07/18/00	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Arsenic	7.3	8.7	9	4.6	4.5	4.5	4.5	10.2
Barium	65.8	62.8 J	57.5 J	73.4	40.4 J	30.3 J	38 J	111
Beryllium	0.08 B	0.18 B	0.091 B	0.055 U	0.064 B	0.054 B	0.054 U	0.3 B
Cadmium	5.3	4.4	2.6	47.2	0.29 J	0.37 J	1.2 J	0.82 J
Calcium	3,410 J	3,000 J	1,520 J	2,370 J	480 B	1,010 B	1,910	2,140
Chromium	28.5	28.9	30.1	124	10.3	16.1	9.4	18.5
Cobalt	8.1 J	7.7 J	4.1 J	8 J	3.4 J	2.6 J	3 J	9.6 J
Copper	49	49	52.6	108	6.3 B	15.2	58	31.6
Cyanide	0.41 B	0.11 B	0.51 B	0.79 B	0.23 B	0.36 B	0.3 B	0.57 B
Iron	20,100	22,200	24,400	20,000	9,340	16,500	12,500	15,600
Lead	73.9 K	74.2 K	75.9 K	174 K	19 K	18.5 K	35.2 K	60.2 K
Magnesium	2,090	1,760	793 J	830 J	506 B	477 J	549 J	608 J
Manganese	213	164	208	407	269	323	160	971
Mercury	0.31	0.35	0.39	0.34	0.084 J	0.087 J	0.12 J	0.27
Nickel	34	32.9	10.9 J	16.2	4.5 J	5.6 J	5.8 J	11.9
Potassium	748 J	735 J	730 J	358 J	294 J	677 J	508 J	639 J
Selenium	1.4 U	1.4 U	1.6	1.2 U	1.1 R	1.2 J	1.2 U	1.3 U
Silver	8.8	9.8	20.6	2.4 J	0.81 R	0.83 U	0.83 U	13.7
Sodium	323 B	417 B	332 B	340 B	290 B	284 B	300 B	366 B
Thallium	1.7 U	1.8 U	1.6 U	1.5 U	1.4 R	1.4 U	1.4 U	1.5 U
Vanadium	58.3	72.8	42	27.8	19.9	27.5	24.8	34.8
Zinc	117 J	108 J	101 J	529 J	24.3 B	29.6 B	59.1 B	101 J
Wet Chemistry (MG/KG)								
% Moisture	37.6	40.4	34	27.7	23.8	25	25.7	31.3
% Solids	58.3	69.3	70.7	80.4	75.6	73.1	75.9	70.4
Total organic carbon (TOC)	120,000	103,000	124,000	37,400	34,100	29,000	90,000	78,400
pH	6.2	6.3	5	6.6	4.6	6	4.9	5.8

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Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO08		IS25SO09		IS25SO10		IS25SO11		IS25SO12		IS25SO13		IS25SO14			
Sample ID	IS25SS080001		IS25SS090001		IS25SS100001		IS25SS110001		IS25SS120001		IS25SS130001		IS25SS140001		IS25SS140001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
1,1,2,2-Tetrachloroethane	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
1,1,2-Trichloro-1,2,2- trifluoroethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
1,1,2-Trichloroethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
1,1-Dichloroethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
1,1-Dichloroethene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
1,2,4-Trichlorobenzene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
1,2-Dibromo-3-chloropropane	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
1,2-Dibromoethane	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
1,2-Dichlorobenzene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
1,2-Dichloroethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
1,3-Dichlorobenzene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
1,4-Dichlorobenzene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
2-Butanone	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
2-Hexanone	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
4-Methyl-2-pentanone	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
Acetone	13	UJ	5.4	B	4.8	B	13	UJ	12	UJ	15	B	13	UJ	5.6	B
Benzene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Bromodichloromethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Bromoform	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Bromomethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Carbon disulfide	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Carbon tetrachloride	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Chlorobenzene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
Chloroethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Chloroform	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Chloromethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Cumene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO08		IS25SO09		IS25SO10		IS25SO11		IS25SO12		IS25SO13		IS25SO14			
Sample ID	IS25SS080001		IS25SS090001		IS25SS100001		IS25SS110001		IS25SS120001		IS25SS130001		IS25SS140001		IS25SS140001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Cyclohexane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Dibromochloromethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Dichlorodifluoromethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Ethylbenzene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
Methyl acetate	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Methyl-tert-butyl ether (MTBE)	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Methylcyclohexane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Methylene chloride	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Styrene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Tetrachloroethene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
Toluene	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
Trichloroethene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Trichlorofluoromethane	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Vinyl chloride	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Xylene, total	13	U	12	U	12	U	13	U	12	U	18	UJ	13	U	14	U
cis-1,2-Dichloroethene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
cis-1,3-Dichloropropene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
trans-1,2-Dichloroethene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
trans-1,3-Dichloropropene	13	U	12	U	12	U	13	U	12	U	18	U	13	U	14	U
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2,2'-Oxybis(1-chloropropane)	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2,4,5-Trichlorophenol	1,100	U	1,000	U	1,000	U	1,100	U	1,000	U	1,500	U	1,100	U	1,100	U
2,4,6-Trichlorophenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2,4-Dichlorophenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2,4-Dimethylphenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2,4-Dinitrophenol	1,100	U	1,000	U	1,000	U	1,100	U	1,000	U	1,500	U	1,100	U	1,100	U
2,4-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
2-Chloronaphthalene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2-Chlorophenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U

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Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO08		IS25SO09		IS25SO10		IS25SO11		IS25SO12		IS25SO13		IS25SO14			
Sample ID	IS25SS080001		IS25SS090001		IS25SS100001		IS25SS110001		IS25SS120001		IS25SS130001		IS25SS140001		IS25SS140001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
2-Methylnaphthalene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2-Methylphenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2-Nitroaniline	1,100	U	1,000	U	1,000	U	1,100	U	1,000	U	1,500	U	1,100	U	1,100	U
2-Nitrophenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
3,3'-Dichlorobenzidine	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
3-Nitroaniline	1,100	U	1,000	U	1,000	U	1,100	U	1,000	U	1,500	U	1,100	U	1,100	U
4,6-Dinitro-2-methylphenol	1,100	U	1,000	U	1,000	U	1,100	U	1,000	U	1,500	U	1,100	U	1,100	U
4-Bromophenyl-phenylether	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
4-Chloro-3-methylphenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
4-Chloroaniline	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
4-Chlorophenyl-phenylether	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
4-Methylphenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
4-Nitroaniline	1,100	U	1,000	U	1,000	U	1,100	U	1,000	U	1,500	U	1,100	U	1,100	U
4-Nitrophenol	1,100	U	1,000	U	1,000	U	1,100	U	1,000	U	1,500	U	1,100	U	1,100	U
Acenaphthene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Acenaphthylene	90	J	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Acetophenone	45	J	400	U	400	U	430	U	400	U	100	J	49	J	59	J
Anthracene	54	J	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Atrazine	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Benzaldehyde	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Benzo(a)anthracene	410	J	400	U	100	J	430	U	400	U	580	U	47	J	56	J
Benzo(a)pyrene	400	J	400	U	110	J	430	U	45	J	580	U	51	J	56	J
Benzo(b)fluoranthene	530		400	U	110	J	430	U	50	J	580	U	57	J	66	J
Benzo(g,h,i)perylene	210	J	400	U	120	J	430	U	51	J	580	U	69	J	79	J
Benzo(k)fluoranthene	380	J	400	U	120	J	430	U	47	J	580	U	60	J	72	J
Butylbenzylphthalate	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Caprolactam	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Carbazole	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Chrysene	580		400	U	160	J	430	U	65	J	580	U	79	J	93	J
Di-n-butylphthalate	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Di-n-octylphthalate	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Dibenz(a,h)anthracene	81	J	400	U	400	U	430	U	400	U	580	U	420	U	450	U

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IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO08		IS25SO09		IS25SO10		IS25SO11		IS25SO12		IS25SO13		IS25SO14			
Sample ID	IS25SS080001		IS25SS090001		IS25SS100001		IS25SS110001		IS25SS120001		IS25SS130001		IS25SS140001		IS25SS140001P	
Sample Date	07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00		07/19/00	
Chemical Name																
Dibenzofuran	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Diethylphthalate	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Dimethyl phthalate	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Fluoranthene	550		400	U	200	J	430	U	64	J	61	J	82	J	98	J
Fluorene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Hexachlorobenzene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Hexachlorobutadiene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Hexachlorocyclopentadiene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Hexachloroethane	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Indeno(1,2,3-cd)pyrene	260	J	400	U	120	J	430	U	46	J	580	U	65	J	77	J
Isophorone	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Naphthalene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Nitrobenzene	NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorophenol	1,000	U	960	U	980	U	1,000	U	970	U	1,400	U	1,000	U	1,100	U
Phenanthrene	210	J	400	U	130	J	430	U	400	U	580	U	46	J	53	J
Phenol	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Pyrene	470		400	U	210	J	430	U	88	J	67	J	110	J	120	J
bis(2-Chloroethoxy)methane	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
bis(2-Chloroethyl)ether	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
bis(2-Ethylhexyl)phthalate	610		46	B	570		120	B	98	B	83	B	170	B	240	B
n-Nitroso-di-n-propylamine	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
n-Nitrosodiphenylamine	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Explosives (UG/KG)																
2,4-Dinitrotoluene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
2,6-Dinitrotoluene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Nitrobenzene	430	U	400	U	400	U	430	U	400	U	580	U	420	U	450	U
Nitroglycerin	1,200	U	1,200	U	1,400	U	1,400	U	1,300	U	2,000	U	1,200	U	1,300	U
Total Metals (MG/KG)																
Aluminum	9,980		6,670		5,420		4,290		3,710		4,630		4,600		5,280	
Antimony	1.1	UL	1	UL	1.1	UL	1.1	UL	1.1	UL	1.5	UL	1.1	UL	1.2	UL

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Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO08	IS25SO09	IS25SO10	IS25SO11	IS25SO12	IS25SO13	IS25SO14	
Sample ID	IS25SS080001	IS25SS090001	IS25SS100001	IS25SS110001	IS25SS120001	IS25SS130001	IS25SS140001	IS25SS140001P
Sample Date	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00	07/19/00
Chemical Name								
Arsenic	8.8	6.5	6.8	4.6	4.4	4.3	5.7	6.1
Barium	70	42.3 J	37.2 J	43.5 J	27.4 J	92.7	46.7 J	49.9 J
Beryllium	0.18 B	0.2 B	0.1 B	0.11 B	0.11 B	0.11 B	0.14 B	0.17 B
Cadmium	1.2 J	0.5 J	0.94 J	0.49 J	0.31 J	0.36 J	0.95 J	0.82 J
Calcium	1,250 J	728 B	1,130 J	1,740	666 B	2,550	1,100	1,310 J
Chromium	23.4	14	20.3	10.4	9.9	8.5	12.5	15.2
Cobalt	4.1 J	4.8 J	3.4 J	3.1 J	3.3 J	5.1 J	4.7 J	4.9 J
Copper	20.6	7.6	19.6	9.6	6.1	8.1 J	11.1	14.8
Cyanide	0.46 B	0.16 B	0.24 B	0.19 B	0.12 B	0.32 B	0.15 B	0.31 B
Iron	21,200	17,200	12,600	9,260	9,470	8,880	12,400	13,100
Lead	23.1 K	15 K	24.2 K	14 K	10.5 K	17.5 K	19.9 K	20 K
Magnesium	988 J	531 J	640 J	585 J	438 B	654 J	537 J	601 J
Manganese	340	807	228	400	293	461	636 J	556
Mercury	0.1 J	0.06 U	0.064 J	0.081 J	0.061 U	0.12 J	0.073 J	0.091 J
Nickel	6.9 J	3.9 J	6.5 J	4.3 J	3.1 J	4.6 J	4.8 J	5.7 J
Potassium	474 J	442 J	414 J	318 J	247 J	376 J	303 J	387 J
Selenium	1.1 UL	1.1 L	1.1 UL	1.1 UL	1.1 UL	1.5 UL	1.1 UL	1.2 UL
Silver	0.81 U	0.75 U	2 J	0.81 U	0.76 U	1.1 U	0.8 U	1 J
Sodium	385 B	346 B	257 B	298 B	266 B	414 B	308 B	343 B
Thallium	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.9 U	1.4 U	1.5 U
Vanadium	31.7	24.3	20.2	15.1	13.7	17.9	17.6	19.8
Zinc	141 J	31 B	95.1 J	50.9 B	29.5 B	30.2 B	92.4 J	64 B
Wet Chemistry (MG/KG)								
% Moisture	23.6	16.8	18.1	23.7	17.9	43.2	22	27
% Solids	79.6	79.8	79.1	83.8	81.5	57.7	78.5	78.3
Total organic carbon (TOC)	23,400	6,180	23,200	7,840	13,900	78,200	16,800	24,300
pH	6.8	6	6.5	6.8	6.6	5	6.2	6.3

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Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO15		IS25SO16		IS25SO17		IS25SO18		IS25SO19		IS25SO20		IS25SO21		IS25SO22	
Sample ID	IS25SS150001		IS25SS160001		IS25SS170001		IS25SS180001		IS25SS190001		IS25SS200001		IS25SS1800012		IS25SS1900012	
Sample Date	07/19/00		07/19/00		07/19/00		07/31/00		07/31/00		10/11/00		10/11/00		10/11/00	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,1,2,2-Tetrachloroethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,1,2-Trichloro-1,2,2- trifluoroethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,1,2-Trichloroethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,1-Dichloroethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,1-Dichloroethene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,2,4-Trichlorobenzene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,2-Dibromo-3-chloropropane	15	U	18	U	13	U	12	R	13	R	11	U	12	U	14	U
1,2-Dibromoethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,2-Dichlorobenzene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,2-Dichloroethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,2-Dichloroethene (total)	NA		NA		13	U	NA		NA		NA		NA		NA	
1,2-Dichloropropane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,3-Dichlorobenzene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
1,4-Dichlorobenzene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
2-Butanone	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
2-Hexanone	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
4-Methyl-2-pentanone	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Acetone	21	B	18	UJ	2.6	J	1.9	B	3.4	B	3.5	B	3	B	14	U
Benzene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Bromodichloromethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Bromoform	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Bromomethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Carbon disulfide	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Carbon tetrachloride	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Chlorobenzene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Chloroethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Chloroform	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Chloromethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Cumene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U

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Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO15		IS25SO16		IS25SO17		IS25SO18		IS25SO19		IS25SO20		IS25SO21		IS25SO22	
Sample ID	IS25SS150001		IS25SS160001		IS25SS170001		IS25SS180001		IS25SS190001		IS25SS200001		IS25SS1800012		IS25SS1900012	
Sample Date	07/19/00		07/19/00		07/19/00		07/31/00		07/31/00		10/11/00		10/11/00		10/11/00	
Chemical Name																
Cyclohexane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Dibromochloromethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Dichlorodifluoromethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Ethylbenzene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Methyl acetate	15	U	18	U	2.1	J	12	U	13	U	11	U	12	U	14	U
Methyl-tert-butyl ether (MTBE)	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Methylcyclohexane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Methylene chloride	15	U	18	U	13	U	12	U	13	U	3.3	B	2.6	B	11	B
Styrene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Tetrachloroethene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Toluene	1.5	J	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Trichloroethene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Trichlorofluoromethane	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Vinyl chloride	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Xylene, total	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
cis-1,2-Dichloroethene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
cis-1,3-Dichloropropene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
trans-1,2-Dichloroethene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
trans-1,3-Dichloropropene	15	U	18	U	13	U	12	U	13	U	11	U	12	U	14	U
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
2,2'-Oxybis(1-chloropropane)	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
2,4,5-Trichlorophenol	1,300	U	1,500	U	1,100	U	1,000	U	1,100	U	930	U	1,000	U	1,100	U
2,4,6-Trichlorophenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
2,4-Dichlorophenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
2,4-Dimethylphenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
2,4-Dinitrophenol	1,300	U	1,500	U	1,100	U	1,000	R	1,100	R	930	U	1,000	U	1,100	U
2,4-Dinitrotoluene	NA		NA		NA		410	U	440	U	370	U	400	U	460	U
2,6-Dinitrotoluene	NA		NA		NA		410	U	440	U	370	U	400	U	460	U
2-Chloronaphthalene	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
2-Chlorophenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U

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Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO15		IS25SO16		IS25SO17		IS25SO18		IS25SO19		IS25SO20		IS25SO21		IS25SO22	
Sample ID	IS25SS150001		IS25SS160001		IS25SS170001		IS25SS180001		IS25SS190001		IS25SS200001		IS25SS1800012		IS25SS1900012	
Sample Date	07/19/00		07/19/00		07/19/00		07/31/00		07/31/00		10/11/00		10/11/00		10/11/00	
Chemical Name																
2-Methylnaphthalene	500	U	590	U	420	U	410	U	440	U	370	U	44	J	460	U
2-Methylphenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
2-Nitroaniline	1,300	U	1,500	U	1,100	U	1,000	U	1,100	U	930	U	1,000	U	1,100	U
2-Nitrophenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
3,3'-Dichlorobenzidine	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
3-Nitroaniline	1,300	U	1,500	U	1,100	U	1,000	U	1,100	U	930	U	1,000	U	1,100	U
4,6-Dinitro-2-methylphenol	1,300	U	1,500	U	1,100	U	1,000	U	1,100	U	930	U	1,000	U	1,100	U
4-Bromophenyl-phenylether	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
4-Chloro-3-methylphenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
4-Chloroaniline	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
4-Chlorophenyl-phenylether	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
4-Methylphenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
4-Nitroaniline	1,300	U	1,500	U	1,100	U	1,000	U	1,100	U	930	U	1,000	U	1,100	U
4-Nitrophenol	1,300	U	1,500	U	1,100	U	1,000	U	1,100	U	930	U	1,000	U	1,100	U
Acenaphthene	500	U	590	U	420	U	410	U	440	U	370	U	370	J	460	U
Acenaphthylene	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Acetophenone	68	J	590	U	68	J	410	U	46	J	130	B	86	B	460	U
Anthracene	500	U	590	U	420	U	410	U	440	U	370	U	440		460	U
Atrazine	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Benzaldehyde	500	U	590	U	420	U	410	U	59	J	2,400		400	U	460	U
Benzo(a)anthracene	500	U	590	U	52	J	410	U	440	U	370	U	1,300		460	U
Benzo(a)pyrene	500	U	590	U	54	J	410	U	440	U	370	U	160	J	460	U
Benzo(b)fluoranthene	500	U	590	U	60	J	410	U	440	U	370	U	1,200		81	J
Benzo(g,h,i)perylene	500	U	590	U	65	J	410	U	440	U	370	U	400	U	460	U
Benzo(k)fluoranthene	500	U	590	U	66	J	410	U	440	U	370	U	710		460	U
Butylbenzylphthalate	500	U	590	U	420	U	410	U	440	U	370	U	70	J	460	U
Caprolactam	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Carbazole	500	U	590	U	420	U	410	U	440	U	370	U	200	J	460	U
Chrysene	500	U	590	U	90	J	410	U	440	U	370	U	1,200		66	J
Di-n-butylphthalate	500	U	590	U	420	U	410	U	440	U	370	U	86	J	460	U
Di-n-octylphthalate	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Dibenz(a,h)anthracene	500	U	590	U	420	U	410	U	440	U	370	U	220	J	460	U

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Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO15		IS25SO16		IS25SO17		IS25SO18		IS25SO19		IS25SO20		IS25SO21		IS25SO22	
Sample ID	IS25SS150001		IS25SS160001		IS25SS170001		IS25SS180001		IS25SS190001		IS25SS200001		IS25SS1800012		IS25SS1900012	
Sample Date	07/19/00		07/19/00		07/19/00		07/31/00		07/31/00		10/11/00		10/11/00		10/11/00	
Chemical Name																
Dibenzofuran	500	U	590	U	420	U	410	U	440	U	370	U	180	J	460	U
Diethylphthalate	500	U	590	U	420	U	410	U	220	B	47	B	400	U	460	U
Dimethyl phthalate	500	U	590	U	420	U	410	U	440	U	370	U	96	J	460	U
Fluoranthene	51	J	590	U	95	J	410	U	440	U	39	J	2,300		87	J
Fluorene	500	U	590	U	420	U	410	U	440	U	370	U	290	J	460	U
Hexachlorobenzene	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Hexachlorobutadiene	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Hexachlorocyclopentadiene	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Hexachloroethane	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Indeno(1,2,3-cd)pyrene	500	U	590	U	68	J	410	U	440	U	370	U	210	J	460	U
Isophorone	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Naphthalene	500	U	590	U	420	U	410	U	440	U	370	U	92	J	460	U
Nitrobenzene	NA		NA		NA		410	U	440	U	370	U	400	U	460	U
Pentachlorophenol	1,200	U	1,400	U	1,000	U	1,000	U	1,100	U	900	U	980	U	1,100	U
Phenanthrene	500	U	590	U	45	J	410	U	440	U	370	U	2,300		59	J
Phenol	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Pyrene	65	J	590	U	120	J	410	U	440	U	370	U	990		95	J
bis(2-Chloroethoxy)methane	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
bis(2-Chloroethyl)ether	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
bis(2-Ethylhexyl)phthalate	130	B	73	B	150	B	51	J	440	U	450		340	J	460	U
n-Nitroso-di-n-propylamine	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
n-Nitrosodiphenylamine	500	U	590	U	420	U	410	U	440	U	370	U	400	U	460	U
Explosives (UG/KG)																
2,4-Dinitrotoluene	500	U	590	U	420	U	NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	500	U	590	U	420	U	NA		NA		NA		NA		NA	
Nitrobenzene	500	U	590	U	420	U	NA		NA		NA		NA		NA	
Nitroglycerin	1,400	U	1,400	U	1,600	U	1,300	U	1,400	U	1,100	U	1,200	U	1,400	U
Total Metals (MG/KG)																
Aluminum	4,150		5,350		5,270		9,030		4,920		8,290		6,910		5,020	
Antimony	1.3	UL	1.5	UL	1.1	UL	1.1	UL	1.2	UL	0.7	U	1.5	K	0.86	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UJ
UL

Table 5-3
Raw Compounds and Analytes for Site 25 Surface Soil Samples
IHDIV-NSWC
Sites 11,13,17,21, and 25 RI Report
Indian Head, Indian Head, Maryland

Station ID	IS25SO15	IS25SO16	IS25SO17	IS25SO18	IS25SO19	IS25SO20	IS25SO21	IS25SO22
Sample ID	IS25SS150001	IS25SS160001	IS25SS170001	IS25SS180001	IS25SS190001	IS25SS200001	IS25SS1800012	IS25SS1900012
Sample Date	07/19/00	07/19/00	07/19/00	07/31/00	07/31/00	10/11/00	10/11/00	10/11/00
Chemical Name								
Arsenic	7.2	3.7	5.1	6.5	4.4	21.4	23.8	5.9
Barium	43.7 J	84.1	25.8 J	42.2 J	36.2 J	27.9 J	46 J	45.7 J
Beryllium	0.15 B	0.5 B	0.17 B	0.05 U	0.054 U	0.3 B	0.35 B	0.3 B
Cadmium	0.46 J	0.48 J	0.21 J	0.18 B	2.5	0.092 J	3.7	1.6
Calcium	1,400 J	1,980 J	316 B	175 J	270 J	278 B	2,020	1,810
Chromium	13.6	9.6	9.9	17.4	9.3	15	31.9	34.9
Cobalt	4.2 J	10 J	4.6 J	5 J	5 J	3.6 J	6.8 J	13.2 J
Copper	8.4	10	6.1 J	6.8	5.4 J	10.2	53.7	11.6
Cyanide	0.18 B	0.39 B	0.29 B	NA	NA	0.56 U	0.22 J	0.69 U
Iron	10,600	10,600	10,400	15,900 J	9,610 J	12,900	13,100	9,850
Lead	12.9 K	16 K	15.9 K	28.2 K	35 K	25.9 K	90.2 K	29.8 K
Magnesium	487 J	698 J	339 B	634 J	529 J	678 J	2,560	6,680
Manganese	568 J	521	270	196 J	619 J	156	348	328
Mercury	0.075 U	0.089 U	0.084 J	0.063 UL	0.083	0.091 J	0.095 J	0.093 J
Nickel	4.2 J	8.8 J	3.8 J	5.1 J	5 J	9.5 K	39	120
Potassium	347 J	452 J	388 J	420 J	190 J	379 J	389 J	353 J
Selenium	1.3 UL	1.5 UL	1.1 UL	1.1 U	1.2 U	0.9 U	2.3	1.4 K
Silver	0.94 U	1.1 U	0.8 U	0.78 U	0.84 U	0.9 J	201	8.5
Sodium	391 B	502 B	346 B	407 B	350 B	54.9 U	59.9 U	67.4 U
Thallium	1.6 U	1.9 J	1.4 U	1.3 U	1.4 U	1.5 U	1.7 U	1.9 U
Vanadium	15.9	17.7 J	19.5	29.5	22.7	28.2	27.2	19.5
Zinc	46.7 B	48.1 B	20.5 B	26.8 J	21.3 J	44.2 J	196 J	56.4 J
Wet Chemistry (MG/KG)								
% Moisture	33.7	43.8	22	20	25.8	11.1	18.5	27.6
% Solids	70.1	70.6	76.1	79.2	77.4	NA	NA	NA
Total organic carbon (TOC)	21,100	33,300	20,200	15,700	23,900	NA	NA	NA
pH	6.6	6.3	4.2	4.7	4.7	NA	NA	NA

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