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APPENDIX R

HUMAN HEALTH RISK SECTION

APPENDIX R-1

RISK ASSESSMENT METHODOLOGY FOR THE HUMAN HEALTH BASELINE RISK ASSESSMENT

R-1.0 HUMAN HEALTH RISK ASSESSMENT METHODOLOGY. This Human Health Risk Assessment (HHRA) is conducted in accordance with the USEPA's *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)* (USEPA, 1989a), Guidance for Data Useability in Risk Assessment (Part A), Final (USEPA, 1992a), Region IV Risk Assessment Guidance (USEPA, 1991a) and will consider Florida Department of Environmental Protection (FDEP) guidance, particularly, Cleanup Goals for the Military Sites in Florida (FDEP, 1994a) and numerous other USEPA guidance documents and directives(USEPA, 1986, 1989b, 1991c, 1991b, 1992b, 1992c, 1992d, 1992e). The HHRA is conducted to determine if contamination at PSCs 26 and 27 (known collectively as Operable Unit Number 1 or OU 1) pose potential health risks of concern to individuals under current and/or foreseeable future site conditions in the absence of remediation and under conditions which would exist when the presumptive remedy described elsewhere in the RI report is applied to this operable unit. The HHRA consists of five components: data evaluation, identification of chemicals of potential concern (CPCs), exposure assessment, toxicity assessment, and risk characterization (including uncertainty analysis) (USEPA, 1989a). Collectively, these components are used to identify site-related contaminants and estimate the potential magnitude of exposure and the risks resulting from the estimated exposure conditions. An overview of the technical approach to be used in the Naval Air Station (NAS) Jacksonville OU 1 HHRA is presented here.

Location and Organization

NAS Jacksonville, the base, is located in southern Duval County approximately 9 miles south of downtown Jacksonville. The site occupies approximately 3,800 acres on the west bank of the St. Johns River upstream from downtown Jacksonville. The operating portion of the base lies between U.S. Highway 17 and the St. Johns River; however, the base also occupies 515 acres (included in the 3,800 acres) west of U.S. Highway 17, adjacent to the Ortega River.

The primary mission of the base is to provide a work place, service, and managerial support for the operation and maintenance of naval weapons and aircraft to activities and units of the operating forces as designated by the Chief of Naval Operations. The Base has five major tenants: the Naval Aviation Depot (NADEP) (formerly the Naval Air Rework Facility [NARF]), the Naval Hospital, the Naval Regional Supply Center, Patrol Wing Eleven, and Helicopter Antisubmarine Wing One.

Within OU 1, the two potential sources of contamination (PSCs) to be evaluated in this HHRA are PSC 26, the Old Main Registered Disposal Area (a former landfill) and PSC 27, the Former Transformer Storage Area. As shown on Figure 1-1, these PSCs are located in the southern portion of NAS Jacksonville.

As shown on Figure 1-3, PSC 26 and PSC 27 are bordered to the north by Childs Street and the base golf course, to the east by base housing, to the south by Gannet Road and an undeveloped wooded area, and to the west by the Restricted Weapons Storage Area. The St. Johns River is located east of the base housing area and south of the undeveloped wooded area directly south of PSCs 26 and 27.

The PSCs are currently fenced (with the exception of a small portion of PSC 26 northeast of Childs Street), with access by nonmilitary personnel minimal. There are currently no ongoing activities at either of the PSCs. An interim remedial measure, the installation of a perimeter drainage ditch system for OU 1 (with

provisions for removal of petroleum hydrocarbons) was implemented in 1983. Surface water from this ditch system and groundwater discharge to a series of unnamed ditches which drain to the south and eventually enter the St Johns River approximately 2,000 feet south of PSC 27. Brief descriptions of the two PSCs are presented below.

PSC No. 26-Old Main Registered Disposal Area. The Navy used this area for the disposal of a variety of wastes, including spent solvents and spent oils. Before 1940, the U.S. Army controlled and utilized the PSC for disposal of debris. From 1940 to 1968, the Navy operated the PSC as a disposal area for solid waste, demolition and construction debris, and spent solvent and spent oil. The Navy burned these wastes at the edge of trenches and pits, with the remains bulldozed into the trenches and pits and covered. Air pollution control requirements halted burning, and the solid wastes were then hauled offsite by a contractor. However, the Navy continued to dump spent solvents and oil into the pits. The Navy officially closed the PSC on January 15, 1979.

The Navy also used a portion of the disposal area for the disposal of low level radioactive wastes during World War II and until 1955. Instruments with radium dials were probably disposed of at PSC No. 26. Although the Navy did not consider the radiation levels measured at the time of disposal significant, the area was decontaminated. A contractor for the Navy excavated and placed dirt in approximately 500 steel drums for disposal at an approved facility in Barnwell, South Carolina.

The majority of PSC 26 is currently fenced to prevent access and is surrounded by a drainage ditch system. However, the portion of PSC 26 which is northeast of Childs Street is not fenced and is generally accessible.

PSC No. 27-Former Transformer Storage Area. The Navy used this area, approximately 100 feet by 100 feet, for the outdoor storage of transformers containing PCBs. The transformers were vandalized in 1978, resulting in the spillage of transformer fluids on the ground. The Navy removed the transformers, and the PCB-contaminated soil was removed and applied to the surface of PSC 26.

PSC 27 is currently fenced to prevent access.

R-1.1 Data Evaluation The data evaluation involves numerous activities, including sort data by medium; evaluate analytical methods; evaluate quantitation limits; evaluate quality of data with respect to qualifiers and codes; evaluate tentatively identified compounds (TICs); compare potential site-related contamination with background; develop data set for use in risk assessment; and identify CPCs. After a brief summary of the sampling and analysis activities conducted to date is presented, a description of each of these activities is provided below.

Available Data. There are at least three distinct analytical data sets for traditional chemical parameters and there is also a radiological data set. The traditional chemical parameters are characterized in three data sets: the Geraghty & Miller data set, the Round 1 data set, and the Round 2 data set. A through discussion of all data collection activities and a presentation of the analytical data is provided in the RI report and its appendices.

A sampling and analysis matrix is presented in Table R-1-1.

Table R-1-1
Summary Matrix for Sampling and Analysis - OU1

RI/FS, Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Analytical or Validation Parameter	Geraghty & Miller Data	Round 1 Data Set	Round 2 Data Set
Surface Soil			
VOCs	X	X	X
SVOCs	X	X	X
Inorganics	X	X	X
PCBs	X	X	X
Radiological	X	X	X
TPH	X		X
Subsurface Soil			
VOCs		X	X
SVOCs		X	X
Inorganics		X	X
PCBs		X	X
Radiological		X	X
TPH			X
Groundwater			
VOCs			X
SVOCs			X
Inorganics			X
PCBs			X
Radiological			X
TPH			X
Surface Water			
VOCs			X
SVOCs			X
Inorganics			X
PCBs			X
Radiological			X
TPH			X

Table R-1-1 (Continued)
Summary Matrix for Sampling and Analysis - OU1

RI/FS, Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Analytical or Validation Parameter	Geraghty & Miller Data	Round 1 Data Set	Round 2 Data Set
Sediment			
VOCs			X
SVOCs			X
Inorganics			X
PCBs			X
Radiological			X
TPH			X
Air			
VOCs			X
SVOCs			X
Inorganics			X
PCBs			X
Radiological			

R-1.1.1 **Evaluate the Analytical Methods** A detailed discussion of the analytical methods employed in developing analytical environmental data is presented in the RI report. The data used in this risk assessment will be the result of analyses conducted under the Contract Laboratory Program (CLP) with documented QA/QC procedures. The analytical data will be further evaluated for useability in the quantitative risk assessment by evaluating quantitation limits, evaluating qualified and coded data, comparing concentrations detected in samples to concentrations detected in blanks, and by evaluating tentatively identified compounds (TICs).

R-1.1.2 **Evaluate Quantitation Limits.** Sample Quantitation Limits (SQLs) are compared to Federal and State risk-based concentrations (RBCs) and for both soil and groundwater and maximum contaminant levels (MCLs) for groundwater potentially used for drinking water.

Analyte-specific SQLs which are above RBCs or MCLs are identified so that uncertainties in risk estimates for those analytes can be discussed.

The notable situations where the highest reported SQLs exceed an RBC or MCL in groundwater are antimony (SQL = 0.06 mg/ℓ, MCL = 0.006 mg/ℓ), beryllium (SQL = 0.005 mg/ℓ, MCL = 0.004 mg/ℓ), cobalt (SQL = 0.05 mg/ℓ, RBC = 0.001 mg/ℓ), and vanadium (SQL = 0.05 mg/ℓ, RBC = 0.026 mg/ℓ).

There are SQLs for several VOCs which are substantially higher than the soil cleanup goals based on leachability that have been communicated by the FDEP (FDEP, 1994a). Benzene, bromodichloromethane, methylene chloride, perchloroethene, and trichloroethene are the compounds for which SQLs are higher than the leaching-based soil cleanup goals. The sampling and analysis was conducted prior to the communication of these cleanup goals by the FDEP.

Overall, SQLs are adequate to insure that concentrations of concern from a risk or regulatory perspective could be detected and quantified.

R-1.1.3 **Evaluate Qualified and Coded Data** Both the laboratory and data validators may assign qualifiers to analytical results. The qualifiers assigned by the data validators supersede the laboratory qualifiers. The results of the data validation will be discussed in the RI report; the validated data, with qualifiers, are presented in appendices to that report. All positive detections (whether they are unqualified or qualified with a "J") have been considered detected concentrations for the risk assessment. All nondetects (qualified with a "U" qualifier) will be retained in the risk assessment data set as samples without positive detections. If all sample results for a given analyte in a given medium are nondetects, that analyte will not be retained as a detected analyte for the purposes of the risk assessment. Any sample results with an "R" validation qualifier will be eliminated from the risk assessment data set because quality control indicates that the result is unusable.

R-1.1.4 **Compare Concentrations Detected in Samples to Concentrations Detected in Blanks** Sample concentrations have been compared to the concentrations in associated blanks in order to distinguish artifacts from actual presence of analytes in environmental samples. The comparisons will be conducted as part of

the data validation process which has been previously discussed in this RI report. Those sample results considered artifacts will be identified in the RI report.

R-1.1.5 **Evaluate Tentatively Identified Compounds (TICs)** Tentatively identified compounds or TICs (both identity and concentration are uncertain) are reviewed. If the number of TICs is small relative to the TAL and TCL chemicals and there is no historical information to suggest the TICs should be present, the TICs will not be quantitatively evaluated. If the number of TICs is large relative to the TAL and TCL chemicals, the TICs will be included in the quantitative evaluation, and the uncertainty in the identity and concentrations of these analytes will be fully discussed in the uncertainty analysis.

R-1.1.6 **Develop Data Set For Use In Risk Assessment** Data management concludes with the summarization of data and statistics generation for each data set. Summary tables provide the chemical name, the frequency of detection, the minimum and maximum detected concentrations, the units associated with the results, the minimum and maximum quantitation limits, and the average of the detected concentrations. These tables are produced for each medium at each PSC.
The data sets used in the risk assessment are identified in Appendix R-2 and in the CPC Selection Tables in subsection 6.2.2.

R-1.2 Approach for Identification of Contaminants of Potential Concern
Contaminants for which data of sufficient quality are available for use in the risk assessment and that are present at concentrations greater than those measured at background locations are the starting point for the development of the list of CPCs. The final list of CPCs is generally a subset of all compounds detected in the various media and are selected based on concentration and frequency of detection; physical, chemical, and toxicological characteristics; and comparison of detected values to background, associated blanks, and risk-based values.

In selecting CPCs for human health (HHCPCs), USEPA criteria will be used (USEPA, 1989a). HHCPCs at each PSC will include chemicals that are positively identified in at least one sample. For each medium at each PSC, the following criteria will be employed to exclude detected analytes from the list of HHCPCs. Each criterion by itself is justification for excluding the analyte:

A. The maximum reported site concentration is less than 2 times the reported average background concentration (inorganics only) calculated from background sampling location data (USEPA, 1991a, 1993a). Details of this approach are presented in section R-1.2.1.

B. The maximum reported concentration in a given medium is less than the corresponding risk-based screening concentration(s) and applicable ARARs. Risk-based screening concentrations are obtained from USEPA and State of Florida regulations and guidance documents. In situations where multiple screening values are available, a chemical is excluded only if its maximum concentration is less than all of the corresponding screening values. Sections R-R-1.2.2 and R-1.2.4 and Appendix R-3 provide additional detail concerning risk-based screening, regulatory guidance values, and ARARs which are used in CPC selection.

C. The average concentration of an essential nutrient (sodium, potassium, magnesium, iron, and calcium) in a medium is below a toxic level and consistent with or only slightly above the background concentration for that essential nutrient. The HHCPC selection process for essential nutrients is further described in section R-1.2.3 and Appendix R-4.

D. The concentrations are within 5 times or 10 times the concentrations in associated blanks (USEPA 1989a, USEPA 1992a). This evaluation is conducted as part of the data validation process (which is described in the RI report).

E. Having a frequency of detection (number of samples in which the analyte is detected divided by the number of samples analyzed for that analyte) of less than 5 percent when there are a minimum of 20 samples (USEPA, 1989a) and the analyte is not a CPC in another medium.

Medium-specific HHCPCs are identified for each medium at OU 1. Chemicals not identified as HHCPCs are clearly identified and the justification for their exclusion noted. Transformation products or parent compounds of HHCPCs are not deleted from the HHCPC list.

R-1.2.1 **Background Data.** The baseline risk assessments being conducted at NAS Jacksonville OU 1 use a background screening as part of the HHCPC selection per USEPA Region IV guidance (USEPA, 1991a). This guidance states that HHCPCs would include "inorganics which are detected at concentrations significantly above background samples (The criteria for determining significance should generally be 2 times the background concentration)." This statement applies to all media. The screening criterion has been further defined as a comparison of the maximum detected PSC concentration to two times the arithmetic mean of the background location samples (USEPA, 1993a).

The comparison is conducted as follows. Maximum detected PSC concentrations are compared to two times the background mean concentration for inorganics. Organic analytes are not considered in the background evaluation. If the maximum PSC concentration is below two times the arithmetic mean of the background location samples, the analyte is considered to be consistent with background location concentrations. This approach is conservative in that it is likely to identify certain analytes as being inconsistent with background (including them as HHCPCs) even though the distribution of concentrations onsite is very similar to that of the background data set. The documentation of the background data sets, including sample lists and statistics, appears in Appendix R-5.

R-1.2.2 **Risk-based Screening.** Tables of medium-specific risk-based concentrations as well as standards and guidelines have been identified for each analytical parameter and are presented in Appendix R-3. The USEPA Region III COC Screening Table (USEPA, 1944a) residential soil risk-based concentrations (RBCs) and FDEP Soil Cleanup Goals for Military Sites in Florida are used at NAS Jacksonville OU 1 for surface soil to screen HHCPCs. Surface water is screened using USEPA Region III tapwater RBCs from the March 18, 1994, COC Screening Table, (USEPA, 1994b) Federal and State MCLs, and Florida water quality standards (Florida

Legislature, 1992a, 1995a) where appropriate. Sediment will be screened using the USEPA Region III COC Screening Table (March 18, 1994) for residential surface soil and Florida sediment criteria where appropriate for human health risk screening. Groundwater will be screened via Region III RBCs from the same COC Screening Table, and Federal and State MCLs (Florida Legislature, 1994a) and FDEP groundwater standards (Florida Legislature, 1994b) and groundwater guidance values (which include primary and secondary standards) (FDEP, 1994b).

For a given medium, the maximum reported concentration at each PSC will be compared to the corresponding screening value. If the maximum reported concentration is greater than the screening concentration, the contaminant will be selected as an HHCPC. However, if the maximum reported concentration is less than the risk-based concentration, the analyte will not be selected as an HHCPC unless it is a parent compound or transformation product of another CPC. A risk-based screening is not conducted for subsurface soils for direct contact exposures because no published screening values are available. FDEP leaching-based soil cleanup goals are used in HHCPC selection for subsurface soils for chemicals which have also been detected in groundwater at OU 1.

No RBC is available for lead in soil. Based on USEPA recommendation, a target level for cleanup at Superfund sites for lead of 400 mg/kg is used as the RBC for lead in soil (USEPA, 1994c). The risk-based screening does not address potential leaching of analytes from soil to groundwater.

For groundwater and surface water, tap water RBCs are used. No RBC is available for lead in groundwater; therefore, the treatment technology action level for lead in drinking water of 15 $\mu g/\ell$ is used (USEPA, 1994b).

TPH. When collected, TPH data in soil as well as sediment are compared to the available Florida guidance value of 50 mg/kg. The Florida guidance value is defined in the FAC under criteria for clean soil that has been thermally treated after contamination with petroleum (Florida Legislature, 1992b). This criterion may not be directly applicable to soil and sediment at all sites, but may provide some regulatory perspective.

R-1.2.3 **Essential Nutrients.** In the HHRA, analytes that are considered essential nutrients include sodium, potassium, magnesium, iron, and calcium. If an essential nutrient is present at a concentration (arithmetic mean) that is below a toxic level (as defined in Table R-1-2) and consistent with or only slightly above the background concentration (twice the reference mean) the analyte is eliminated as an HHCPC for the HHRA. The derivation of the essential nutrient screening values is presented in Appendix R-4. This approach is consistent with general USEPA guidance on essential nutrients (USEPA, 1989a).

The Risk Assessment Guidance for Superfund (RAGS), Volume I, Part A, regarding the evaluation of essential nutrients (calcium, iron, magnesium, potassium, and sodium) in a public health or ecological risk assessment, states that essential nutrients need not be quantitatively evaluated if they are 1) present at low concentrations (only slightly above background) and 2) toxic only at doses much higher than those which might be related to exposure at the site (USEPA, 1989a).

Table R-1-2
Essential Nutrient Screening Concentrations for Surface Soil and Groundwater

RI/FS, Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Essential Nutrient	Surface Soil Screening Concentration (mg/kg)	Groundwater Screening Concentration (µg/ℓ)
Calcium	1,000,000 [1]	1,055,398
Iron	47,824	13,267
Magnesium	460,468	118,807
Potassium	1,000,000 [1]	297,016
Sodium	1,000,000 [1]	396,022

[1] Actual calculated screening concentration is greater than 1,000,000 mg/kg (Table R-3.5), indicating that this essential nutrient would not be present at toxic levels in surface soil.

In this report, "only slightly above background" is interpreted to mean that the arithmetic mean of the site concentrations is less than two times the arithmetic mean of the detected background concentrations. Essential nutrients that are detected at concentrations that are consistent with background or at concentrations considered essentially "nontoxic" are considered to be contaminants that would not cause a public health concern and, therefore, are not further evaluated in the risk assessment.

Screening concentrations for surface soil and groundwater represent conservative screening concentrations for other media. These surface soil and groundwater screening concentrations are used to screen sediment and surface water, respectively.

R-1.2.4 **Regulatory Guidance.** Regulatory guidance available for the NAS Jacksonville OU 1 RI and HHRA includes the Federal drinking water standards which are called maximum contaminant levels (MCLs) (USEPA, 1994b), Florida primary and secondary standards applied to groundwater (Florida Legislature, 1994a; 1994b), and Florida "free froms." Based on the water quality standards for the State of Florida (FDEP, 1994b) under Section 62-3.402, groundwater must be "free from" domestic, industrial, agricultural or other manmade nonthermal components in concentrations that could cause harm to human health, especially cancer (62-3.402(b)). The State of Florida recognizes Florida primary standards (62-3.402(b)) to be the best guidance available for determining safe drinking water concentrations of contaminants; however, other FDEP guidance is considered.

There is also the FDEP memorandum, Cleanup Goals for Military Sites in Florida, July 5, 1995 (FDEP, 1994a). This memorandum contains a listing of "selected Soil Clean-up Goals" for "residents, trespassers, general worker, SAS Agric. worker and FT Agric. worker" for surface soil as well as a soil cleanup goal based on leachability. This guidance will be used, based on communications with the FDEP, for screening in CPC selection.

No analyte is eliminated from the HHCPCs list without some justification if the maximum concentration exceeds an enforceable regulatory standard (Federal MCLs and Florida primary or secondary standards). For those substances that do not currently have a Federal MCL or Florida primary standard, appropriate screening

takes place using the risk-based concentration screen. This comparison supplies a risk-based comparison and is appropriate for selection of HHCPCs. Those analytes with concentrations that exceed MCLs or other standards are identified.

R-1.3 Exposure Assessment The exposure assessment is conducted to estimate the pathways by which humans are potentially exposed, the magnitude of actual and/or potential human exposure, and the frequency and duration of exposure. This process is performed for both current and future site land uses. This process involves several steps:

- characterization of the exposure setting in terms of physical characteristics and the populations that may potentially be exposed to site-related chemicals;
- identification of potential exposure pathways and receptors; and
- quantification of exposure for each population in terms of the amount of chemical either ingested, inhaled, or absorbed through the skin from all complete exposure pathways.

R-1.3.1 **Characterization of Exposure Setting** In the characterization of the exposure setting for an HHRA, the physical setting and demographics near the waste site are identified. The physical setting is characterized in terms of the following attributes: climate, meteorology, geology, vegetation, soil type, groundwater, and surface water. This information is gathered from previous investigations and is presented in the RI (ABB-ES, 1995). The information generated from the evaluation of the physical setting aids in defining the physical mechanisms that control or influence how people could be exposed at a waste site and provides information on the potential migration of contaminants.

Demographics are also characterized and identified for the populations residing or working near the waste site; the activity patterns of residents and/or workers; and if any exist, the locations of potentially sensitive subgroups. Sources of this information include site visits, previous investigations, information generated during the RI, maps, aerial and standard photographs, and Navy personnel interviews. Key to this activity is determining current and foreseeable future land use of the waste site and surrounding areas (e.g., residential, commercial and industrial, or recreational). Future land use of OU 1 will be controlled in part by institutional controls associated with the presumptive remedy which is described in the up-front sections of the RI.

R-1.3.2 **Identification of Exposure Pathways and Receptors** The purpose of this step in the exposure assessment is the identification of all relevant exposure pathways through which specific populations may be exposed, under current and future land use, to contaminants at the site. An exposure pathway consists of four necessary elements: a source or mechanism of chemical release, a transport or retention medium, a point of human contact, and a route of exposure at the point of contact (USEPA, 1989a). Exposure pathways that have these elements are considered complete pathways. Only complete exposure pathways are evaluated in the HHRA.

Discussions of contaminant fate and transport are included in Chapter 5.0 of this report. In most cases, the source of contamination is either in the soil or soil

is the initial receiving medium. There are several mechanisms for migration of contaminants from soil. Contaminants may accumulate in plants and animals that are in contact with soil or are in food chains that include biota in direct contact with soil. Mechanisms for migration into air include volatilization (primarily volatile organic compounds [VOCs]) and wind erosion of contaminated soil (all types of contaminants). Overland flow of water can result in migration of contaminants to surface water and sediment and in relocation to other surface soil (all types of contaminants). Infiltration can result in migration into subsurface soil and into groundwater (soluble contaminants). Contaminants can be transported in groundwater (primarily soluble VOCs, semivolatile organic compounds [SVOCs], and inorganics) and may potentially also discharge to surface water. Analytes can also be transferred to sediment (generally insoluble forms of inorganics and relatively insoluble SVOCs and pesticides) and to fish (primarily nonpolar organics and some inorganics that tend to accumulate in tissue) and other biota.

Human receptors are identified based on the current and potential future land uses. Receptors commonly include future residents and excavation workers, and current site workers and trespassers. Exposure scenarios are constructed to evaluate each receptor (Subsection R-1.3.3).

R-1.3.3 **Quantification of Exposures** Once complete exposure pathways are selected for evaluation (Subsection R-1.3.2), the final step of the exposure assessment is to quantify exposure (i.e., intake) for each pathway. This quantification process involves developing assumptions regarding exposure conditions and exposure scenarios for each receptor to estimate the total amount of contaminants that a hypothetical receptor may ingest, dermally absorb, or inhale from each exposure pathway. These exposure scenarios are based on several variables, which can be grouped into chemical-, population-, and assessment-related variables.

The ultimate goal of this step, as defined in USEPA guidance, is to identify the combination of these exposure variables or parameters that results in the most intense level of exposure that may "reasonably" be expected to occur under current and future site conditions (USEPA, 1989a). This is performed for every complete exposure pathway selected for evaluation. The resulting exposure scenarios are referred to as the reasonable maximum exposure (RME) for each exposure pathway. More recent USEPA guidance (USEPA 1992b) recommends developing two exposure scenarios, an average exposure and a "high end," or RME. This guidance also suggests that other uncertainty analyses, including Monte Carlo analysis, can be useful in putting risk estimates into perspective.

Chemical-Related Variable. The chemical-related variable is the exposure point concentration (EPC), which is the representative concentration at the exposure point. The EPCs are calculated in a manner consistent with USEPA guidance (USEPA, 1989a; 1992b; 1992c). The EPCs are, with the exceptions noted below, the 95 percent upper confidence limit (UCL) on the arithmetic mean of the concentrations in the data set used to evaluate exposure. The following equation for calculating

the UCL on the arithmetic mean for a lognormal distribution (USEPA, 1991a; 1992c) is used to calculate all UCLs:

$$UCL = e^{\left(\bar{x} + 0.5\, s^2 + \frac{s\,H}{\sqrt{n-1}}\right)} \qquad (21)$$

where

UCL	=	upper confidence limit,
e	=	constant (base of the natural log, equal to 2.718),
xbar	=	mean of transformed data,
s	=	standard deviation of the transformed data,
H	=	H-statistic (from table published in Gilbert, 1987), and
n	=	number of samples.

In calculating the 95 percent UCLs, nondetects are assigned a value of one-half the associated reporting limits in the calculation of the arithmetic mean. In cases where there are fewer than four samples or where the UCL is greater than the maximum detected concentration, the maximum detected concentration is identified as the EPC.

Population-Related Variables. Population-related variables describe the characteristics of a hypothetical individual receptor within each potentially exposed population. These variables include contact rates, such as exposure frequencies and ingestion rates, and physical characteristics of human bodies, such as body weights and surface areas. When applicable, contact rates are selected from USEPA standard default exposure factor guidance (USEPA, 1991b) or USEPA dermal guidance (USEPA, 1992d). If site-specific factors indicate that such parameters are not appropriate, alternative parameters are used based on knowledge of human behavior and the relative accessibility of a site. Parameters describing the physical characteristics of the exposed populations are identified from appropriate USEPA guidance (USEPA, 1989a; 1989b; 1991b) and are presented in Appendix R-6.

Assessment-Related Variable. The assessment-related variable involved in exposure quantification is the averaging time. Averaging time reflects the duration of exposure and depends on the type of effect being evaluated. Exposure intake during a defined interval (e.g., a lifetime) is averaged over the entire period, resulting in an estimate of average daily intake.

There are essentially two types of effects typically evaluated in human health risk assessment: carcinogenic effects and noncarcinogenic effects. According to USEPA guidance, the averaging time for carcinogenic effects is assumed to be a 70-year lifetime (USEPA, 1989a). The averaging times for noncarcinogenic effects are equivalent to the duration of exposure and may vary depending on the nature of exposure. There is a wide range of possible estimates, from a day to a lifetime. However, based on USEPA guidance, exposure duration for noncarcinogenic effects can roughly be categorized into one of three periods: (1) chronic exposures: 7 years to a lifetime; (2) subchronic exposures: 2 weeks to 7 years; and (3) acute exposures: less than 2 weeks (USEPA, 1989f). The length of the exposure period depends on the potentially exposed population and the characteristics of exposure. The averaging times applied to receptors are used in the risk calculations. All exposure scenarios evaluated for noncarcinogenic effects at NAS Jacksonville are considered chronic or subchronic exposures.

Calculation of Intakes. Nonradiological analytes. The equations used to calculate chemical intake for nonradiological analytes are those presented in USEPA guidance (USEPA, 1989a). The general equation for calculating chemical intake is as follows:

$$Intake = \frac{C \times CR \times EF \times ED}{BW \times AT} \quad (22)$$

where

Intake	=	daily chemical intake per unit body weight averaged over the exposure period
C	=	concentration of the chemical in the exposure medium
CR	=	contact rate for the medium of concern
EF	=	exposure frequency
ED	=	exposure duration
BW	=	body weight of the hypothetically exposed individual
AT	=	averaging time (for carcinogens, AT = 70 years for 365 days per year; for noncarcinogens, AT = ED)

Some of the exposure pathways require additional calculations before intake values can be calculated. Brief explanations of the additional calculations required for the inhalation of particulates, inhalation of vapors while showering, and dermal absorption are provided below.

Inhalation of Particulates from Soil. This evaluation is conducted to estimate levels of site contaminants that could occur in ambient air as a result of wind erosion. To estimate atmospheric concentrations of fugitive air contaminants, a three-step modeling process is conducted. In the first step, respirable particle-phase emission rates are calculated. In the second step, contaminant emission rates on a unit surface area basis are calculated. In the third step, downwind ambient concentrations are estimated using air dispersion modeling. The three-step process is further defined in Appendix R-7.

Inhalation of Vapors while Showering. For this exposure scenario, the contaminant concentration in air is estimated based on release rates of volatiles from shower water. The model selected to predict indoor (bathroom) concentrations is that presented by Foster and Chrostowski (1987). The specific equations used to determine concentrations of contaminants in bathroom air are presented in Appendix R-8.

Dermal Absorption from Water. The permeability constant approach is used to estimate dermal exposures to contaminants detected in water in accordance with the USEPA *Dermal Exposure Assessment: Principles and Applications* Interim Report, (USEPA, 1992d). These models apply only to absorption from water. For inorganic chemicals, steady-state conditions and the permeability of water constant is assumed for all analytes. For organic compounds, a nonsteady-state model is used. The model employs a dermal permeability constant estimated from the compound's octanol-water partition coefficient. A further description of the process used to estimate absorption of contaminants in water through the skin can be found in Appendix R-9.

Dermal Absorption from Soil. Dermal absorption from soil is calculated in accordance with the USEPA *Dermal Exposure Assessment: Principles and Applications*,

Interim Report (USEPA, 1992d). Percutaneous absorption of chemicals detected in soil is chemical and matrix dependent. According to USEPA Region IV guidance (USEPA, 1992e), absorption factors for organics and inorganics are 0.1 percent and 0.01 percent, respectively. A soil adherence factor of 1 milligram of soil per square centimeter of skin (mg/cm^2) per event is used in the dermal intake equations (USEPA, 1992d). The equations used to describe dermal absorption from soil are located in Appendix R-9.

Calculation of Intakes. Radiological analytes. The calculation of intakes for radiological analytes utilize the same exposure parameters as the intake calculations for nonradiological parameters as presented in Appendix R-6. However, the actual calculation of intakes for radiological parameters is slightly different, in order to make the calculated intakes compatible with the nature of the cancer slope factors for radiological analytes. The general equation for calculating intake of radiological analytes is:

$$Intake = C \times CR \times EF \times ED \qquad (23)$$

where

Intake	=	intake of radioactive energy
C	=	concentration of the radiological analyte in the exposure medium
CR	=	contact rate for the medium of concern
EF	=	exposure frequency
ED	=	exposure duration

This intake equation does not include the body weight and averaging period which are incorporated into the general intake equation for nonradiological parameters and therefore does not yield a daily dose normalized to body weight. The cancer slope factors for radionuclides account for body weight and average risk over the lifetime of the individual, making it unnecessary to incorporate body weight into the intake calculation. The specific equations used to calculate intakes for the receptors and media evaluated in this assessment are presented in the individual risk calculation spreadsheets in Appendix R-10.

R-1.4 Toxicity Assessment The toxicity assessment evaluates the available evidence on the potential adverse effects associated with exposure to each HHCPC. With this information, a relationship between the extent of exposure and the likelihood or severity of adverse human health effects is developed. Two steps are typically associated with toxicity assessment: hazard identification and dose-response assessment.

R-1.4.1 **Hazard Identification** Hazard identification is the process of determining if exposure to an agent can cause a particular adverse health effect and, more importantly, if that effect will occur in humans. Characterizing the nature and strength of causation is a part of the hazard identification step. For a number of the chemicals at hazardous waste sites, potential toxic effects have already been identified. Consequently, the objectives of the hazard identification in the HHRA are to (1) identify which of the contaminants detected at the site are potential hazards, and (2) summarize their potential toxicity in brief narrative profiles.

R-1.4.2 **Dose-Response Assessment** A dose-response assessment is conducted to characterize and quantify the relationship between intake, or dose, of an HHCPC and the likelihood of a toxic effect or response. There are two major types of toxic effects evaluated in an HHRA: carcinogenic and noncarcinogenic. Following USEPA guidance for HHRAs (USEPA, 1989a), these two endpoints (cancer and noncancer) are evaluated separately. As a result of the dose-response assessment, identified dose-response values are used to estimate the incidence of adverse effects as a function of human exposure to a chemical.

Nonradiological analytes. There are two types of dose-response values: cancer slope factors (CSFs) for carcinogens and reference doses (RfDs) for noncarcinogens. For many compounds, both types of values have been developed by USEPA because many compounds cause both carcinogenic and noncarcinogenic effects. In addition, because the toxicity and/or carcinogenicity of a compound can depend on the route of exposure (i.e., oral, inhalation, or dermal), unique dose-response values are developed for the oral, dermal, and inhalation exposure routes. The source of the dose-response values are described below. All dose-response values for nonradiological analytes used in this risk assessment are presented in Appendix R-11.

Cancer Toxicity Values. Nonradiological analytes. The CSF is a chemical-specific toxicity value developed by the USEPA Carcinogenic Assessment Group (CAG) based upon the dose of a chemical and the probability of a carcinogenic response. The unit risk, a toxicity value developed by the USEPA, is an estimate of the relationship between the inhaled concentration of a chemical and the probability of a carcinogenic response from the exposure during the lifetime of the individual.

As required by USEPA Region IV guidance (USEPA, 1991a), risks associated with dermal exposures (most commonly for soil and water dermal contact) are evaluated using CSFs that are specific to dermally absorbed doses. Most oral CSFs are based on administered dose rather than the absorbed dose (trichloroethene's CSF is a notable exception). It is, therefore, necessary to adjust toxicity values that are based on administered doses so that they can be used for evaluation of absorbed doses. For dermal exposures, the toxicity values are adjusted as follows:

$$CSF_{adjusted} = \frac{CSF_{oral}}{ABSEFF_{oral}} \qquad (24)$$

where $ABSEFF_{oral}$ is the absorption efficiency in the study that is the basis of the oral toxicity value.

If there is no information available on oral absorption efficiency, the conservative default values (Keller, 1993b) of 80 percent for volatiles, 50 percent for SVOCs, and 20 percent for inorganics are used.

The oral CSF, inhalation CSF and unit risk, dermal CSF, weight of evidence classification, and cancer type observed for each carcinogenic HHCPC analyzed in an HHRA are normally provided in an appendix to the HHRA.

Cancer Toxicity Values. Radiological analytes. Cancer slope factors for radioisotopes are different than the cancer slope factors for nonradiological parameters. The USEPA has published cancer slope factors for radionuclides for ingestion, inhalation and external exposure routes. Radionuclide slope factors represent best estimate or 50th percentile potency estimates as opposed to the upper-bound or 95th percentile potency estimate represented by the non-radiological cancer slope factors.

Slope factors for radionuclides are calculated using a nonthreshold, linear dose-response model which accounts for the amount of each radionuclide absorbed into the body by ingestion or inhalation, the distribution and retention of each radionuclide in body tissues and organs, as well as the age, sex, and weight of an individual at the time of exposure. The slope factor averages the risk over an assumed 70 year lifetime. Therefore, radionuclide slope factors are not expressed as a function of bodyweight or time and do not require corrections for gastrointestinal absorption or lung transfer efficiencies (USEPA, 1994). Cancer slope factors for ingestion and inhalation are expressed with units of risk/pCi while slope factors for external exposure are expressed with units risk-gram/pCi-yr (or risk/year per Pci/g soil). The cancer slope factors for radionuclides available for use in this risk assessment are presented in Table R-1-3. These values have been obtained from HEAST (UESPA, 1994e). In order to account for decay-chain products, slope factors designated "+D" include the contributions to risk from all daughter products with half-lives of less than one year. These values are used only if the analysis has not measured the radionuclide and all of the members of the decay chain. If the radionuclide and all daughter products are included in the analysis, isotope-specific slope factors are employed.

Noncancer Toxicity Values. Nonradiological analytes. The RfD is an estimate (with uncertainty spanning an order of magnitude or more) of a daily intake for the human population, including sensitive subpopulations, that is likely to be without appreciable risk of deleterious effects during a lifetime. Noncarcinogenic risks due to inhalation are estimated by comparing the inhalation concentration to the inhalation correlate of the RfD, the reference concentration (RfC).

As required by USEPA Region IV guidance (USEPA, 1991a), risks associated with dermal exposures (most commonly for soil and water dermal contact) are evaluated using RfDs that are specific to absorbed doses. Most oral RfDs are based on an administered dose rather than on the absorbed dose. It is, therefore, necessary to adjust toxicity values that are based on administered doses so that they can be used for evaluation of absorbed doses. For dermal exposures, we adjust the toxicity values as follows:

$$RfD_{adjusted} = RfD_{oral} \times ABSEFF_{oral} \qquad (25)$$

where $ABSEFF_{oral}$ is the absorption efficiency in the study that is the basis of the oral toxicity value.

If there is no information available on oral absorption efficiency, the conservative default values (Keller, 1993b) of 80 percent for volatiles, 50 percent for SVOCs, and 20 percent for inorganics are used.

Separate sets of RfDs have been developed for several chemicals for evaluating chronic and subchronic exposures. When available, subchronic RfDs are used for evaluating exposures with a duration of less than 7 years but more than 2 weeks. Chronic RfDs are used when subchronic values are unavailable and when the exposure duration is greater than 7 years. There are no analogous reference values for evaluating acute exposures, those lasting less than 2 weeks.

The oral RfD, inhalation RfC, dermal RfD, critical study on which the RfD is based, critical effect in the study, any uncertainty and modifying factors applied to the RfD or RfC, and the degree of confidence assigned to the RfD or RfC for each HHCPC analyzed in an HHRA is normally provided in an appendix to the HHRA.

Noncancer Toxicity Values. Radiological analytes. Of the radionuclides reported at OU 1, only uranium-235 has an available noncancer toxicity dose-response value. Since uranium-235 sources at OU 1 appear to be natural, and since cancer risks tend to be substantially higher than noncancer risks for radionuclides, no evaluation of noncancer risks has been made for the radionuclides reported at OU 1.

Table R-1-3
Dose-Response Values for Radiological Parameters
Human Health Risk Assessment at OU 1

RI/FS, Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Radionuclide	Cancer Slope Factor Ingestion 1/pCi	Cancer Slope Factor Inhalation 1/pCi	Cancer Slope Factor External Exposure Risk/yr per pCi/g
Actinium-228	1.62 E-12	3.27 E-11	3.28 E-06
Bismuth-214	1.95 E-13	1.46 E-11	6.02 E-06
Cesium-137	3.16 E-11	1.91 E-11	0.00
Cesium-137 +D	3.16 E-11	1.91 E-11	2.09 E-06
Lead-212	1.80 E-11	3.85 E-11	3.00 E-07
Lead-214	2.94 E-13	6.23 E-12	7.09 E-07
Potassium-40	1.25 E-11	7.46 E-12	6.11 E-07
Radium-223	2.34 E-10	3.60 E-09	2.44 E-07
Radium-224	1.49 E-10	2.25 E--09	2.48 E-08
Radium-226	2.95 E-10	2.72 E-09	1.31 E-08
Radium-226 +D	2.96 E-10	2.75 E-09	6.74 E--06
Radium-228	2.46 E-10	9.61 E-10	0.00
Radium-228 +D	2.48 E-10	9.94 E-10	3.28 E-06
Radon-222 +D	NA	7.57 E-12	NA
Thallium-208	1.75 E-14	1.36 E-14	1.45 E-05
Thorium-232	3.28 E-11	1.93 E-08	1.97 E-11
Uranium-235	4.52 E-11	1.30 E-08	2.63 E-07
Uranium-235+D	4.70 E-11	1.30 E-08	2.65 E-07

NA = Not Available
0.00 = Reported in HEAST as 0.00

R-1.4.3 Source of Dose-Response Values The primary source for identifying dose-response values is the USEPA Integrated Risk Information System (IRIS), which is an on-line database containing health risk and USEPA regulatory information about specific chemicals (USEPA, 1995). Health risk information is included on IRIS only after a comprehensive review of chronic toxicity data by work groups composed of USEPA scientists. If no information is found in IRIS, the USEPA

Health Effects Assessment Summary Tables or HEAST (USEPA, 1994e; 1994f) are used as a source of information. If appropriate dose-response values are not located from either of these two sources, other USEPA sources (including past versions of IRIS and HEAST and the documents produced by the USEPA's Environmental Criteria and Assessment Office) are consulted. If no USEPA dose-response value is identified, surrogate values from structurally similar compounds may be assigned.

Dose-response values for each of the contaminants selected as an HHCPC are provided in Appendix R-11. Toxicity profiles for HHCPCs are presented in Appendix R-12.

R-1.4.4 **Toxicity Equivalency Factors for Carcinogenic Polynuclear Aromatic Hydrocarbons (PAHs).** Carcinogenic PAHs are a class of compounds with very similar, complex heterocyclic structures. From this group of compounds, only one, benzo(a)pyrene, has a USEPA published CSF. For the other carcinogenic PAHs, the variable toxicity has been addressed by using Toxicity Equivalency Factors (TEFs) published by USEPA (USEPA, 1993c). The TEFs identify the relative potency of each compound relative to that of benzo(a)pyrene.

The TEFs are not CSFs themselves nor are they used to calculate CSFs for the other PAHs. The TEFs are applied to carcinogenic PAH EPCs to determine the equivalent benzo(a)pyrene concentration. The benzo(a)pyrene equivalent EPC for each carcinogenic PAH is then multiplied by the CSF for benzo(a)pyrene to obtain an estimate of the cancer risk for these compounds. The TEFs are only used in estimating the cancer risk of these compounds and are not used to estimate the noncancer risks. The TEFs for the carcinogenic PAHs are provided in Table R-1-4.

R-1.1.5 **Toxic Equivalency Factors for Polychlorinated Dibenzo-Dioxins and Furans.** The individual congeners within the large group of dioxins and furans have variable toxicity which is a function of the degree of chlorination and the particular locations of the chlorine atoms within the chemical structure. Toxic equivalence factors have been developed by USEPA to allow estimation of carcinogenicity of various congener groups relative to the potency of 2,3,7,8-tetrachloro-dibenzodioxin (2,3,7,8-TCDD) which is considered the most potent of the dioxin and furan congeners (USEPA, 1989c) The toxic equivalency factors (TEFs) applied to dioxin and furan congeners and congener groups are presented in Table R-1-5.

<u>R-1.5 Risk Characterization</u> Risk characterization is the final step in the risk assessment process. This step involves the integration of the exposure and toxicity assessments into a qualitative or quantitative expression of potential human health risks associated with contaminant exposure. Quantitative estimates of both carcinogenic and noncarcinogenic risks are made for each HHCPC and each complete exposure pathway identified in the exposure assessment.

<u>Carcinogenic Risks</u>. Carcinogenic risks associated with exposure to individual chemicals are estimated by multiplying the chemical intake for each carcinogen by its CSF. This value is a chemical-specific excess lifetime cancer risk (ELCR) and represents an upper bound of the probability of an individual developing cancer over a lifetime as the result of exposure to a chemical. For each exposure pathway, the chemical-specific risks for all carcinogenic compounds are

Table R-1-4
Toxicity Equivalency Factors for
Carcinogenic Polycyclic Aromatic Hydrocarbons

RI/FS, Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Polynuclear Aromatic Hydrocarbon	Toxicity Equivalency Factors
Benzo(a)pyrene	1
Benzo(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenzo(a,h)anthracene	1
Indeno(1,2,3-c,d)pyrene	0.1

Source: U.S. Environmental Protection Agency (USEPA, 1993c).

Table R-1-5
Toxicity Equivalency Factors for
Polychlorinated Dioxins and Furans

RI/FS, Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Dioxin or Furan	Toxicity Equivalency Factors
DIOXINS	
1,2,3,4,6,7,8-HpCDD	0.01
HpCDD	0
OCDD	0.001
FURANS	
2,3,7,8-TCDF	0.1
HxCDFs (total)	0
1,2,3,4,6,7,8-HpCDF	0.01
HpCDF (total)	0
OCDF (total)	0.001

Source: U.S. Environmental Protection Agency (USEPA, 1989c), Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and -Dibenzofurans (CDDs and CDFs) and 1989 Update.

Notes: HpCDD = heptachlorodibenzo-p-dioxin.
OCDD = octachlorodibenzodioxin.
TCDE = tetrachlorodibenzo-p-dioxin.
HxCDF = hexachlorodibenzofuran.
HpCDF = heptachlorodibenzofuran.
OCDF = octachlorodibenzofuran.

summed to determine the pathway-specific lifetime cancer risk. The following equations are used to estimate the chemical- and pathway-specific cancer risks:

Chemical-Specific Excess Lifetime Cancer Risk

$$Risk_i = CDI_i \times CSF_i \tag{26}$$

where

$Risk_i$ = unitless probability of an individual developing cancer as the result of exposure to a chemical i

CDI_i = chronic daily intake of chemical i averaged over 70 years and expressed as milligrams per kilogram body weight per day (mg/kg-day)

CSF_i = USEPA cancer slope factor for chemical i $(mg/kg\text{-}day)^{-1}$

Pathway-Specific Incremental Lifetime Cancer Risk

$$Risk_T = \Sigma\, Risk_i \tag{27}$$

where

$Risk_T$ = unitless probability of an individual developing cancer as the result of multiple chemical exposures

$Risk_i$ = unitless cancer risk estimate for the ith chemical associated with an exposure pathway

The results from the carcinogenic risk assessment are compared with acceptable risks established by the USEPA and FDEP. The USEPA guidelines, established in the National Oil and Hazardous Substances Contingency Plan (NCP), indicate that the total lifetime cancer risk due to exposure to the HHCPCs at a site, by each complete exposure pathway, should not exceed a range of 1 in 1,000,000 ($1x10^{-6}$) to 1 in 10,000 ($1x10^{-4}$) (USEPA, 1990a). FDEP has indicated that risks greater than one in one million ($1x10^{-6}$) warrant further consideration. For reference, the average cancer burden in the United States in 1993 was 1 in 3 for women and 1 in 2 for men (American Cancer Society, 1994).

Noncarcinogenic Risks. Noncarcinogenic risk estimates are calculated by dividing chemical intake for each compound by the appropriate RfD. The result is called the hazard quotient (HQ). The HQs for individual compounds within an exposure pathway were summed to obtain the hazard index (HI) for that particular pathway.

The following equations are used to determine the HQs and HIs:

Hazard Quotient

$$HQ_i = \frac{I_i}{RfD_i} \tag{28}$$

where

HQ_i = hazard quotient of chemical i

I_i = intake of chemical i averaged over the exposure period (mg/kg-day)

RfD_i = reference dose for chemical i corresponding to the same exposure duration as the intake (mg/kg-day)

Hazard Index

$$HI = \Sigma HQ_i \quad (29)$$

where

HI = potential for noncarcinogenic effects from multiple chemical exposures

HQ_i = hazard quotient for i^{th} chemical associated with an exposure pathway

HQ less than 1 indicates that noncarcinogenic toxic effects are not expected to occur due to HHCPC exposure. HIs greater than 1 may be indicative of a possible noncarcinogenic toxic effect but the circumstances must be evaluated on a case-by-case basis (USEPA, 1989a). As the HI increases, so does the likelihood that adverse effects might be associated with exposure. In general, chronic HI values are calculated.

R-1.5.1 **Summary** Risk estimates are calculated for each waste site and are summarized in risk summary tables. The risks are presented by medium for both current and future land uses. The calculations of these estimates are documented in an appendix with all spreadsheets used to complete calculations. Within the risk summary text for each medium and site, the relative confidence in each risk estimate is discussed. The relative significance of risk estimates is evaluated in terms of a comparison with acceptable risk levels established by USEPA.

R-1.5.2 **Uncertainty Analysis** Risk estimates are generally conservative values that result from multiple layers of conservative assumptions inherent in the risk assessment process. Quantitative estimates of risk are based on numerous assumptions, most intended to be protective of human health (i.e., conservative). As such, risk estimates are not truly probabilistic estimates of risk, but rather conditional estimates given a series of conservative assumptions about exposure and toxicity.

A thorough discussion of all potential sources of uncertainty in risk assessment is not feasible. In general, sources of uncertainty can be categorized into site-specific factors (e.g., variability in analytical data and exposure assessment) and toxicity and risk characterization assessment factors. Most toxicity- and risk characterization-specific uncertainties apply to all HHRAs equally in their impact on the calculated risk estimates. Common (not site-specific) sources of uncertainty and their potential effects on the magnitude of estimated risks are discussed here. Table R-1-6 summarizes some of the sources of uncertainty that are common to all HHRAs. Site-specific uncertainties are normally discussed in the site-specific uncertainty section in an HHRA to provide perspective for the interpretation of the site-specific risk estimates.

Data Collection, Analysis, and Evaluation. A certain amount of uncertainty is associated with the representative nature of the data collected to complete the risk evaluation at each site. Additional uncertainties associated with estimating exposure result from the variance in sampling and analytical techniques. There

are three general uncertainties related to data collection, analysis, and evaluation:

- nature and extent of contamination,
- adequate characterization of exposure areas, and
- differences between site-specific inorganic concentrations and background inorganic concentrations.

Nature and Extent of Contamination. The nature and extent of contamination is normally discussed in detail as part of the RI. The extensive sampling and analytical program of an RI should adequately characterize the types of contaminants present, the physical location of those contaminants, and the concentrations that are present. There is inherent uncertainty in the characterization of the nature and extent of contamination even in a comprehensive investigation. Complex geology and hydrogeology provide variable physical conditions at a site, thereby complicating characterization of the nature and extent of contamination.

Adequate Characterization of Exposure Areas. Contaminated areas, specifically soil, are sometimes small relative to the area in which a receptor would potentially be exposed. Nonrandom sampling may be conducted in areas of known or visible contamination. Because a receptor's exposure area may actually be larger than the area of contamination and a receptor's exposure would often be random, the nonrandom sampling may actually result in overestimation of exposures.

Differences between Site and Background Concentrations. A comparison between site-specific and background inorganic concentrations is conducted as part of the selection of HHCPCs (Subsection R-1.2). Both organic contaminants and inorganic analytes are commonly detected in surface soil, surface water, sediment, and groundwater background locations.

Organics (e.g., pesticides) that are sometimes detected in background samples, which would be expected in an industrialized area such as NAS Jacksonville, do not necessarily indicate that the inorganic concentrations in those samples do not represent background reference concentrations. Phthalates are also commonly detected in background samples. Phthalates are common sampling and laboratory contaminants, but sometimes cannot be conclusively associated with laboratory or sampling contamination and, therefore, are retained in the background data set. In summary, the presence of organic contamination in a particular background location does not necessarily indicate that the inorganic concentrations in that sample is not representative of inorganic reference concentrations. The use of the background sample data as a reference point for inorganics detected in surface soil, surface water, sediment, and surficial groundwater is generally considered appropriate based on carefully chosen sampling locations.

Selection of Chemicals of Potential Concern. Although a USEPA approach is criteria are used in selecting HHCPCs (USEPA, 1989a), there are uncertainties in the general selection process based on the use of a risk-based screening and comparison to inorganic concentrations at reference locations.

USEPA Region III COC Screening Table (March 18, 1994). USEPA Region IV prefers to exclude contaminants that do not contribute significantly to the risk from the risk calculations (ABB-ES, 1991a). The HHRA uses medium-specific RBCs that are

Table R-1-6
Potential Sources of Uncertainty

Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Potential Source	Direction of Effect	Justification
Exposure Assessment		
Likelihood of exposure pathways	Overestimate	Actual exposure may not occur.
Exposure point concentrations	Overestimate	Sampling data are assumed to be representative of the exposures.
Exposure assumptions (e.g., frequency)	Overestimate	Parameters selected are conservative estimates of exposure representing a reasonable maximum exposure.
Degradation of chemicals not considered	Overestimate	Risk estimates are based on recent chemical concentrations. Concentrations tend to decrease over time as a result of degradation for many organics.
Absorption of soil contaminants through the skin	Overestimate	Dermal absorption of chemicals is a function of the length of actual skin contact. Contact at this solid waste management unit (SWMU) or area of concern (AOC) may be insufficient to result in the absorption assumed.
Modeled exposure point concentrations	Unknown, probably overestimate.	Models are based on numerous assumptions resulting in conservative exposure point concentrations (EPCs).
Lack of dermal groundwater evaluation	Underestimate	Dermal absorption of chemicals in groundwater is not normally a driving exposure pathway.
Toxicity Assessment		
Extrapolation of animal toxicity data to humans	Unknown, probably overestimate.	Animals and humans differ with respect to adsorption, metabolism, distribution, and excretion of chemicals. The magnitude and direction of the difference varies with each chemical. Animal studies typically involve high-dose exposures, whereas humans are exposed to low doses.
Use of linearized, multistage model to derive cancer slope factors	Overestimate	Model assumes a nonthreshold, linear at low dose relationship for carcinogens. Many compounds induce cancer by nongenotoxic mechanisms. Model results in 95 percent upper confidence limits of cancer potency. Potency is unlikely to be higher and may be as low as zero.
Lack of oral toxicity values for lead	Underestimate	Dose-response values for lead are not available for exposures to lead in soil or groundwater. Risk from exposure to lead in soil and groundwater is not quantitatively evaluated.
Lack of inhalation toxicity values	Underestimate	Inhalation reference doses (RfDs) and cancer slope factors (CSFs) will not be available for all human health chemicals of potential concern (HHCPCs) being evaluated for inhalation exposures (fugitive dust and volatiles while showering). Therefore, risks cannot be quantified and are underestimated.
Risk Characterization		
Summation of risk among chemicals within exposure pathways	Unknown	Little is known about the toxicity of chemical mixtures. In the absence of evidence to the contrary, additivity of risk is assumed.

calculated by assuming residential exposures and calculating risk-based levels in water (e.g., tap water) and soil (e.g., residential surface soil) using an acceptable cancer risk level of 10^{-6} and an HQ of 0.1 (USEPA, 1994a) as a risk-based screening for the maximum concentration of each contaminant detected in surface soil and groundwater, respectively.

The risk-based levels in water (i.e., tap water) and soil (i.e., residential soil) are also used as a risk-based screening for surface water and sediment, respectively. This approach is conservative because the exposure assumptions for tap water and residential soil are similar, but more intense, than exposure to surface water and sediment. The assumed exposure assumptions used to derive the RBCs are likely to overestimate exposures to surface water used for nondrinking purposes and sediment. This approach is appropriate for a surface water and sediment risk-based screening to remove contaminants from the HHCPCs list that are not likely to contribute a significant amount of risk.

Further, in several cases, the USEPA Region III COC screening table does not provide values for chemicals in surface soil or groundwater. For those chemicals where a USEPA Region III COC screening value does not exist, a chemical in the table that is similar in structure and physical properties to the detected contaminant may be used to provide a risk-based comparison (for example, using the pyrene residential soil value as a surrogate for benzo(g,h,i)perylene, or di-n-octylphthalate for di-n-butylphthalate). Based on the similarities in toxicological properties between the compounds and their surrogates, it is reasonable to conclude that the USEPA Region III screening values are adequately health-protective for the chemicals detected. Generally, the use of surrogates is an approach to help focus effort on those contaminants that are contributing a significant amount of risk (e.g., cancer risk of greater than 10^{-6} and an HQ of greater than 0.1). In the cases where surrogates were not available or appropriate and there are no FDEP cleanup goals or guidance values, a risk-based screening is not completed during the HHCPC selection process for specific chemicals.

Background Screening for Inorganics. For a given inorganic analyte, the maximum reported soil or groundwater concentration at a waste site is compared to two times the average of the medium-specific concentrations in the background (Subsection R-1.2) locations. This comparison is conducted as part of the selection of HHCPCs. If the maximum site concentration is less than two times the arithmetic mean of the inorganic reference concentrations, the analyte is considered to be consistent with background concentrations. This approach is conservative in that it is likely to identify certain analytes as being inconsistent with background (including them as HHCPCs) even though the distribution of concentrations onsite is very similar to that of the background data set. This can occur when the average inorganic screening concentration at a reference location is less than the maximum detected value at the site being investigated. For example, a site-specific inorganic could be present at a concentration greater than the corresponding screening concentration, including it as an HHCPC, but still be within the detected range of inorganic concentrations for the reference locations. This is the result of natural variability for inorganic concentrations in soil. Therefore, it is quite possible that an analyte could have a concentration distribution at a site that is identical to the distribution of concentrations for that analyte in the background data set, but also have a maximum detected concentration that is more than twice the arithmetic mean of the concentrations in the reference data set.

Toxicity Equivalency Factors for Carcinogenic Polycyclic Aromatic Hydrocarbons. In selecting HHCPCs (Subsection R-1.2), the selection of a single PAH in a particular medium requires that the additional PAHs detected in that medium be retained as HHCPCs even if the PAH is less that the available risk-based screening level. This is a protective approach that is unlikely to underestimate risks.

Exposure Assessment. There are four major issues that contribute to uncertainties in the exposure assessment of most HHRAs:

- land use,
- use of the reasonable maximum exposure,
- determination of the exposure point concentration, and
- exposure parameters.

Land Use. Generally, exposure scenarios associated with future land use are difficult to predict. In an HHRA, residential land use is typically evaluated. A residential land use analysis normally includes an evaluation of the domestic use of groundwater (ingestion and inhalation of volatiles while showering) and residential use of soils, as well as residential use of nearby surface water or sediment (for recreation). The inclusion of a residential land use scenario in an HHRA is intended to represent a worst-case scenario. Future residential land use at or near a historic waste site is normally possible, but not always probable.

Future residential land use is unlikely in many locations at NAS Jacksonville because the land at and associated with historic waste sites is likely to remain industrial.

Reasonable Maximum Exposure. The exposure assessments conducted in an HHRA can be characterized as RME. As such, the exposure estimates represent a mix of "high end" and average exposure parameter values that result in an exposure estimate that is unlikely to be exceeded in an exposed population. Because some of these parameters are functions of the behavior patterns and personal habits of the exposed populations, no one value can be assumed representative of all possible exposure conditions. Further, uncertainties associated with assigning single exposure parameters to a heterogeneous population, which includes both men and women of all ages (e.g., body weight, surface area, and ingestion rates) are considered significant. However, the risk assessment incorporates assumptions or procedures that result in the estimate of an upper bound of risk. This type of exposure assessment tends to overestimate risks for the large majority of an exposed population. To address the most conservative exposure scenario available, the future resident (an RME) is normally evaluated in an HHRA.

Exposure Point Concentration. The EPCs used in the HHRA are the 95 percent UCL on the arithmetic mean concentration or the maximum reported concentration in a contaminated area (whichever is lower). In many cases, there is a relatively small number of samples available, and the 95 percent UCL is actually higher than the maximum detected concentration of a contaminant. In such cases, the maximum detected concentration has been used to represent the exposure concentrations. Because the cancer risks and HI calculations theoretically evaluate risks for average concentrations (USEPA, 1992b), the use of the 95 percent UCL or the maximum detected concentration is a conservative estimate of exposure and, therefore, risk.

Exposure Parameters. The selection and use of exposure parameters contribute to the uncertainty inherent in a risk estimate. There are several exposure parameters that impact most risk assessments as described below.

Residence Time. Future residential exposure scenarios evaluated in the HHRA assume that an individual may be exposed to contaminants at one location for 30 years. This value represents a high end (90th percentile value) estimate of the time spent in a single residence (USEPA, 1991b). The median (50th percentile) time for an individual to reside in one location is 9 years. There is considerable variability in the time spent in a residence for the individuals within the population. The estimate used in this analysis is likely to overestimate exposure duration for roughly 90 percent of a population that might live in the area.

Sediment Ingestion. For ingestion of sediment by a child, it was assumed that a child would consume 200 milligrams per day (mg/day) of sediment at a given surface water or sediment location. This estimate of the daily inadvertent sediment ingestion is an assumption that the sediment intake rate is equal to the daily soil ingestion rate published by USEPA (USEPA, 1991b). There are actually very little data available concerning actual sediment ingestion rates in children. Because the commonly used soil ingestion rate includes both outdoor soil exposures as well as indoor dust exposures, it is likely an overestimate of sediment exposure.

Dermal Exposure to Surface Water. The approach for calculating dermal exposures to surface soil, surface water, and sediment at a specific site is described in Appendix R-9. In calculating dermal exposures to surface water, permeability constants (K_p) are used to estimate the movement of a chemical across the skin surface. Although some K_p values are empirically based, most are estimated based on characteristics such as octanol water partition coefficients (K_{ow}) and molecular weights. There are uncertainties inherent in these calculations.

Particulate Emission Factor. The derivation of the particulate emission factor that is used as an exposure parameter to evaluate exposure to particulates resulting from soil suspension by wind is described in Appendix R-7. The particulate emission factor (PEF) that is used to calculate the concentration of soil particles that a receptor may inhale is the same for multiple receptors (for example, the resident and excavation worker). However, it is likely that more soil particles would be suspended in air during soil excavation activities and, therefore, that an excavation worker would be exposed to greater concentrations of HHCPCs associated with airborne soil particles than a resident. Risk associated with inhalation exposures for the excavation worker may be underestimated in the HHRA. It is likely, however, that use of a PEF representing greater particulate concentrations would only result in additional risks of less than an order of magnitude. If risk estimates for the excavation worker are orders of magnitude below USEPA threshold ranges, the use of an excavation worker-specific PEF will not normally be evaluated.

Dermal Exposures to Groundwater. Ingestion of drinking water is normally the exposure pathway that produces the greatest risk associated with contaminated groundwater. The approach to the calculation of air concentrations of VOCs during showering is described in Appendix R-8. Dermal exposure to groundwater while showering is not evaluated in the HHRA (USEPA, 1994g). This may result in an underestimation of risk, particularly to SVOCs in groundwater. However, SVOC

compound concentrations in groundwater are very low (less than 10 $\mu g/\ell$). For VOCs, the analytes will tend to migrate to air prior to and during contact. This lessens the potential for dermal absorption.

Drinking Water Ingestion Rate. The drinking water ingestion scenario assumes an ingestion rate of 2ℓ of water per day, 350 days per year for 30 years. The 2-ℓ ingestion rate is a 90th percentile rate whereas the average consumption rate is 1.4ℓ per day (USEPA, 1989a). The use of the 2-ℓ value may overestimate exposure and risk from drinking water for a large part of a potentially exposed population.

Toxicity Assessment. Toxicity information for many chemicals is very limited, leading to varying degrees of uncertainty associated with calculated toxicity values obtained in IRIS or HEAST. General sources of uncertainty for calculating toxicity factors include extrapolation from animal to human populations, low to high dose extrapolation, short-term to long-term exposures, interspecies sensitivity variation, extrapolation from subchronic to chronic no observed adverse effect level (NOAEL), extrapolation from lowest observed adverse effect level (LOAEL) to NOAEL, amount of data supporting the toxicity factors (i.e., inadequate studies), consistency of different studies for the same chemical, and responses of various species to equivalent doses.

The identification of human carcinogens and noncarcinogens, based on animal data, is a primary source of uncertainty in the use of toxicity values. It is not certain that the identification of carcinogenic activity in an animal species means that carcinogenic activity in humans will occur. In some cases, the metabolic processes involved in carcinogenic activity in a particular organ in animals may not exist in humans. Available evidence indicates that there are a limited number of substances that are classified as human carcinogens (USEPA Class A substances). The extrapolation of short-term to long-term exposures is also a component in some cases for the carcinogen dose-response values. The use of toxicity measures (e.g., RfDs and CSFs) introduces additional uncertainties. These parameters are generally based on animal studies, many of which are performed at high doses relative to the site-specific exposures that potentially could occur. These data require interpretation and/or extrapolation in the low dose area of the dose-response curve. The CSFs used in the risk assessment generally represent a "high end" estimate. The CSFs are the 95 percent UCL on the actual slope derived from the scientific data and, therefore, are likely overestimates of the potency.

Risk Characterization. A mixture of analytes is present in each media evaluated at NAS Jacksonville. The USEPA's *Guidelines for the Health Risk Assessment of Chemical Mixtures* (USEPA, 1986) states that if sufficient data are not available on the effects of the chemical mixture of concern, or a reasonably similar mixture, additivity of effects for constituents of the mixture should be assumed. This assumption, according to USEPA, is expected to yield generally neutral risk estimates (i.e., neither conservative nor lenient). More recent guidance from USEPA (USEPA, 1992b) also references the *Guidelines for the Health Risk Assessment of Chemical Mixtures*, but further states that the assumption of additivity assumes independence of action and that, if this assumption is incorrect, overestimation or underestimation of the actual multiple substance risk may occur. In calculating HI values, additivity is assumed, but in some cases the analytes in a mixture have significantly different toxic mechanisms of action and impact

different organs. In these cases, the overall HI likely overestimates noncancer risks.

R-1.6 Remedial Goal Options. Those media with estimated incremental lifetime cancer risks above 1 in 10,000 or with a total HI greater than 1 (USEPA guidance) or cancer risks above 1 in 1,000,000 (FDEP guidance) are identified for each relevant site. These media are selected for development of media cleanup levels in accordance with USEPA Region IV guidance (USEPA, 1993b). Remedial goal options (RGOs) and available criteria are intended to provide the basis for the development of remedial alternatives in the FS, which follows the RI.

Each RGO table contains the potential media cleanup levels for those media that have cancer risk estimates in excess of 10^{-4} (actually in excess of 10^{-6} per FDEP guidance) or an HI greater than 1 or which have exposure point concentrations which are greater than relevant Federal or State standards and guidelines. Only analytes that individually contribute cancer risk greater than 10^{-6} or an HQ greater than 0.1 for a given medium or exceed a standard or guideline are included in an RGO table. The table includes the concentrations associated with cancer risk levels of 10^{-4}, 10^{-5}, and 10^{-6}; with HQs of 0.1, 1, and 10; and any State or Federal regulatory guidance for an environmental medium. The concentrations at these risk levels are calculated using the rearranged site-specific RME daily dose equation used in the risk assessment.

RGOs are presented for informational purposes during risk management activities and are not considered actual cleanup goals. Actual clean-up goals are to be developed further along in the RI/FS/ROD process.

APPENDIX R-2

CONTAMINATION DELINEATION SAMPLES USED IN THE HUMAN HEALTH BASELINE RISK ASSESSMENT

This appendix identifies the contamination delineation samples which have been utilized in the human health baseline risk assessment for OU 1 at NAS Jacksonville. One table is presented for each of the four media, surface soil, surface water, sediment and groundwater, which has been evaluated here. In each case, the samples identified were collected in locations which are outside the boundaries of the presumptive remedy.

NOTE: The Orig Samp ID is the sample identifier which corresponds to all discussions in the RI report and in the presentation of raw data. "Sample ID" in the tables below is a sample identifier assigned during and used by the risk assessment. "Number of Occurrences" identifies the number of records (chemical or radiological parameters) associated with each sample.

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TABLE R-1.1 LIST OF SURFACE SOIL CONTAMINATION DELINEATION SAMPLES NORTH OF CHILD STREET USED IN THE RISK ASSESSMENT IS PRESENTED BELOW.

Sample locations for surface soil are identified in the attached Figure 4-17 from the Preliminary Characterization Summary Report for OU 1. Sample locations are designated "SLXXX" on that figure and they correspond with Orig Sample IDs "SLXXX" or "SLXXX 0-3". Orig Samples IDs which contain "..RP.." are duplicates.

Sample ID	Orig Samp ID	Collect Date	Number of Occurrences
01S05801	SL53A	02/19/1991	75
01S05802	SL053 0-3	03/07/1992	27
01S05802	SL053 0-3DL	03/07/1992	4
01S05901	SL54A	02/19/1991	75
01S06001	SL55A	02/19/1991	75
01S08001	SL075 0-3	03/10/1992	28
01S08002	SL075 0-3	03/11/1992	125
01S08301	SL078 0-3	03/11/1992	27
01S08401	SL079 0-3	03/06/1992	153
01S08501	SL080 0-3	03/10/1992	28
01S08502	SL080 0-3	03/11/1992	125
01S08502D	SLRP006 0-3	03/11/1992	153
01S09002	SL085 0-3	03/11/1992	125
01S09002D	SLRP007 0-3	03/11/1992	125
01S09101	SL086 0-3	03/10/1992	24
01S09101D	SLRP008 0-3	03/10/1992	28
01S09102	SL086 0-3	03/11/1992	98
01S09102D	SLRP008 0-3	03/11/1992	125
01S09201	SL087 0-3	03/08/1992	152
01S11001	SL109 0-3	03/11/1992	27
01S11201	SL111 0-3	03/11/1992	27
01S11401	SL113 0-3	03/11/1992	27
01S12501	SL124 0-3	03/11/1992	27
01S12701	SL126 0-3	03/11/1992	27

TABLE R-~~1~~2.2 LIST OF SURFACE SOIL CONTAMINATION DELINEATION SAMPLES SOUTH OF CHILD STREET USED IN THE RISK ASSESSMENT IS PRESENTED BELOW.

Sample locations for surface soil are identified in the attached Figure 4-17 from the Preliminary Characterization Summary Report for OU 1. Sample locations are designated "SLXXX" on that figure and they correspond with Orig Sample IDs "SLXXX" or "SLXXX 0-3". Orig Samples IDs which contain "..RP.." are duplicates.

01S02001	SL15A	02/12/1991	75
01S02002	SL015	12/17/1991	27
01S02002D	SL015 0-3	03/10/1992	27
01S02501	SL20A	02/12/1991	82
01S02502	SL020 0-3	03/10/1992	27
01S02601	SL21A	02/12/1991	75
01S02602	SL021	12/17/1991	27
01S02603	SL021 0-3	03/10/1992	27
01S03101	SL26A	02/13/1991	75
01S03102	SL026 0-3	03/08/1992	27
01S03601	SL31A	02/13/1991	82
01S06101	SL056	02/05/1992	149
01S06201	SL057	02/05/1992	153
01S06301	SL058	02/05/1992	153
01S06401	SL059	02/05/1992	153
01S06501	SL060	02/05/1992	153
01S06601	SL061	02/05/1992	118
01S06601	SL061DL	02/05/1992	5
01S06701	SL062	02/05/1992	118
01S06801	SL063 0-3	03/10/1992	153
01S07001	SL065 0-3	03/11/1992	153
01S07101	SL066 0-3	03/08/1992	152
01S07201	SL067 0-3	03/11/1992	153
01S07301	SL/RP 068 DUP		178
01S07301D	SL068 0-3	03/10/1992	5
01S07301D	SL068 0-3	03/11/1992	82
01S07301D	SL068 0-3	03/10/1992	22
01S07301D	SL068 0-3	03/11/1992	10
01S07301D	SL068 0-3	03/10/1992	1
01S07301D	SL068 0-3	03/11/1992	33
01S07401	SL069 0-3	03/10/1992	53
01S07402	SL069 0-3	03/11/1992	125
01S07402D	SLRP013 0-3	03/11/1992	27
01S07501	SL070	12/17/1991	176
01S07501D	SL070 0-3	03/10/1992	5
01S07501D	SL070 0-3	03/11/1992	82
01S07501D	SL070 0-3	03/10/1992	22
01S07501D	SL070 0-3	03/11/1992	10
01S07501D	SL070 0-3	03/10/1992	1
01S07501D	SL070 0-3	03/11/1992	33
01S07601	SL071 0-3	03/11/1992	153
01S07801	SL073	12/17/1991	176

01S07801D	SL073 0-3	03/07/1992	153
01S07901	SL074	12/17/1991	176
01S07901D	SL074 0-3	03/07/1992	153
01S08101	SL076 0-3	03/11/1992	153
01S08201	SL077 0-3	03/07/1992	153
01S08601	SL081 0-3	03/07/1992	153
01S08901	SL084 0-3	03/11/1992	153
01S09001	SL085 0-3	03/10/1992	28
01S09001D	SLRP007 0-3	03/10/1992	28
01S09401	SL089 0-3	03/10/1992	153
01S09501	SL090 0-3	03/11/1992	153
01S09701	SL092 0-3	03/10/1992	153
01S10001	SL095 0-3	03/10/1992	24
01S10002	SL095 0-3	03/11/1992	129
01S10101	SL096 0-3	03/08/1992	177
01S10101D	SLRP002 0-3	03/08/1992	178
01S10501	SL104	12/17/1991	27
01S10501D	SL104 0-3	03/11/1992	27
01S10602	SL105 0-3 / SLRP0111		27
01S10602D	SL105	12/17/1991	27
01S10701	SL106	12/17/1991	27
01S10701D	SL106 0-3	03/11/1992	27
01S10801	SL107	12/17/1991	27
01S10801D	SL107 0-3	03/11/1992	27
01S10901	SL108 0-3	03/11/1992	27
01S11101	SL110 0-3	03/11/1992	27
01S11301	SL112 0-3	03/11/1992	27
01S11301D	SLRP012 0-3	03/11/1992	27
01S11501	SL114 0-3	03/11/1992	27
01S11601	SL115 0-3	03/11/1992	27
01S11701	SL116 0-3	03/11/1992	27
01S11801	SL117 0-3	03/11/1992	27
01S11901	SL118 0-3	03/11/1992	27
01S12001	SL119 0-3	03/11/1992	27
01S12101	SL120 0-3	03/11/1992	27
01S12201	SL121 0-3	03/11/1992	27
01S12301	SL122 0-3	03/11/1992	27
01S12401	SL123 0-3	03/11/1992	27
01S12601	SL125 0-3	03/11/1992	27
01S12801	SL127 0-3	03/11/1992	27

TABLE R-2.3 LIST OF SUBSURFACE SOIL CONTAMINATION DELINEATION SAMPLES UTILIZED IN

THE RISK ASSESSMENT IS PRESENTED BELOW.

Sample ID	Old Samp ID	Collect Date	Number of Occurrences
01B01401	SL04	02/20/1991	105
01B01601	SL06	02/20/1991	105
01B01701	SL07	02/20/1991	1
01B01702	SL07	02/21/1991	103
01B01801	SL08	02/20/1991	105
01B07201	SL079 4-6	03/06/1992	151
01B07401	SL082 3-5	03/06/1992	149
01B07401	SL082 3-5DL	03/06/1992	2

TABLE R-2.4 LIST OF SURFACE WATER CONTAMINATION DELINEATION SAMPLES UTILIZED IN THE RISK ASSESSMENT IS PRESENTED BELOW.

Sample ID	Old Samp ID	Collect Date	Number of Occurrences
01W00601	SW006	01/30/1992	154
01W00701	SW007	01/30/1992	154
01W00801	SW008	01/31/1992	154
01W00901	SW009	01/31/1992	154
01W01301	SW014	02/02/1992	153
01W01601	SW017	02/02/1992	153
01W01701	SW018	02/02/1992	153
01W01801	SW019	02/02/1992	153
01W01901	SW020	02/03/1992	153
01W02001	SW021	02/03/1992	153
01W02201	SW023	02/03/1992	153
01W02301	SW024	02/03/1992	153
01W02501	SW026	02/03/1992	153
01W02501D	SWRP003	02/03/1992	153
01W02601	SW027	02/04/1992	152
01W02601D	SWRP004	02/04/1992	151
01W02701	SW028	02/04/1992	152
01W02801	SW029	02/04/1992	152
01W02901	SW030	02/04/1992	152
01W03001	SW031	02/04/1992	152
01W03301	JXSW03401	08/23/1993	161
01W03401	JXSW03501	08/19/1993	161
01W03501	JXSW03601	08/19/1993	161
01W03801	JXSW04001	09/07/1993	161
01W03901	JXSW04101	09/02/1993	161
01W04001	JXSW04201	09/02/1993	161
01W04101	JXSW04301	09/01/1993	161
01W04101D	JXSW04301DUP	09/01/1993	161
01W04301	JXSW04601	08/26/1993	11
01W04302	JXSW04601	08/27/1993	149
01W04401	JXSW04701	08/26/1993	11
01W04402	JXSW04701	08/27/1993	150
01W04501	JXSW05001	08/24/1993	161
01W04601	JXSW05101	08/23/1993	137
01W04602	JXSW05102	08/18/1994	22
01W04602D	JXSW05102DUP	08/18/1994	22
01W04701	JXSW05401	08/24/1993	161
01W04701D	JXSW05401DUP	08/24/1993	161
01W04801	JXSW05501	08/26/1993	161
01W04901	JXSW05601	08/23/1993	137
01W04902	JXSW05602	08/18/1994	22
01W05601	JXSW06301	08/18/1994	22
01W05701	JXSW06601	09/13/1994	33
01W05801	JXSW06701	09/13/1994	33
01X03301	JXSW03401	08/23/1993	23
01X03401	JXSW03501	08/19/1993	23
01X03501	JXSW03601	08/19/1993	23
01X03501D	JXSW03601DUP	08/19/1993	23

01X03801	JXSW04001	09/07/1993	23
01X03901	JXSW04101	09/02/1993	23
01X04001	JXSW04201	09/02/1993	23
01X04101	JXSW04301	09/01/1993	23
01X04101D	JXSW04301DUP	09/01/1993	23
01X04301	JXSW04601	08/26/1993	22
01X04401	JXSW04701	08/26/1993	22
01X04501	JXSW05001	08/24/1993	23
01X04602	JXSW05102	08/18/1994	22
01X04701	JXSW05401	08/24/1993	23
01X04701D	JXSW05401DUP	08/24/1993	23
01X04801	JXSW05501	08/26/1993	23
01X04902	JXSW05602	08/18/1994	22
01X05601	JXSW06301	08/18/1994	22

R-1.5 LIST OF SEDIMENT CONTAMINATION DELINEATION SAMPLES UTILIZED IN THE RISK ASSESSMENT IS PRESENTED BELOW.

Sample locations for sediment are identified in the attached Figure 2-2. The location identification numbers on the figure correspond directly with the Orig Sample IDs below. Orig Sample IDs with "..RP.." designations are duplicate samples.

Sample ID	Old Samp ID	Collect Date	Number of Occurrences
01D00601	SD006	01/30/1992	149
01D00601	SD006DL	01/30/1992	2
01D00701	SD007	01/30/1992	149
01D00701	SD007DL	01/30/1992	2
01D00801	SD008	01/31/1992	152
01D00901	SD009	01/31/1992	152
01D01301	SD014	02/02/1992	151
01D01601	SD017DL	02/02/1992	23
01D01701	SD018	02/02/1992	151
01D01801	SD019	02/02/1992	151
01D01901	SD020	02/03/1992	26
01D02001	SD021	02/03/1992	151
01D02201	SD023	02/03/1992	151
01D02301	SD024	02/03/1992	152
01D02501	SD026	02/03/1992	152
01D02501D	SDRP003	02/03/1992	151
01D02601	SD027	02/04/1992	152
01D02601D	SDRP004	02/04/1992	152
01D02701	SD028	02/04/1992	152
01D02801	SD029	02/04/1992	152
01D02901	SD030	02/04/1992	152
01D03001	SD031	02/04/1992	152
01D03301	JXSD03401	08/23/1993	149
01D03401	JXSD03501	08/19/1993	149
01D03501	JXSD03601	08/19/1993	149
01D03501D	JXSD03601DUP	08/19/1993	149
01D03901	JXSD04001	09/07/1993	163
01D04001	JXSD04101	09/02/1993	163
01D04101	JXSD04201	09/02/1993	163
01D04201	JXSD04301	09/01/1993	163
01D04201D	JXSD04301DUP	09/01/1993	163
01D04501	JXSD04601	08/26/1993	14
01D04502	JXSD04601	08/27/1993	149
01D04601	JXSD04701	08/26/1993	14
01D04602	JXSD04701	08/27/1993	149
01D04701	JXSD04801	08/19/1993	149
01D04801	JXSD04901	08/24/1993	149
01D04901	JXSD05001	08/24/1993	148
01D05001	JXSD05101	08/23/1993	125
01D05002	JXSD05102	08/18/1994	23
01D05101	JXSD05201	08/19/1993	149

01D05201	JXSD05301	08/19/1993	149
01D05301	JXSD05401	08/24/1993	149
01D05301D	JXSD05401DUP	08/24/1993	149
01D05401	JXSD05501	08/26/1993	163
01D05501	JXSD05601	08/23/1993	125
01D05502	JXSD05602	08/18/1994	23
01D06201	JXSD06301	08/18/1994	23
01D06301	JXSD06401	08/18/1994	23
01D06401	JXSD06501	08/18/1994	23
01D06401D	JXD06501DUP	08/18/1994	23
JXD01902	JXD01902	10/13/1994	32
JXD02602	JXD02602	10/13/1994	32
JXD02702	JXD02702	10/13/1994	32
JXD02702D	JXD02702D	10/13/1994	32
JXD03402	JXD03402	10/13/1994	14
JXD03502	JXD03502	10/13/1994	14
JXD03602	JXD03602	10/13/1994	14
JXD03602D	JXD03602D	10/13/1994	14

TABLE R-1.6 LIST OF GROUNDWATER CONTAMINATION SAMPLES UTILIZED IN THE RISK ASSESSMENT IS PRESENTED BELOW.

For groundwater, sample locations are identified in Figure 2-1 (DPT confirmation samples labelled DPTXXX on this figure correspond with Orig Sample IDs which contain "..CWXXX.."), Figure 2-5 (contamination delineation well locations designated "U1..MWXXX" on this figure correspond with Orig Sample IDs which are designated below as "U1MWXXX.."), Figure 2-8 (monitoring well locations designated "U1..MWX" or "U1..MWXX" on this figure correspond with Orig Sample IDs designated below as "U1MW00X.." or "U1MW0XX.." or "SSMW-X" or "DSMW-X" or "SSMW-XX" or DSMW-XX").

Sample ID	Old Samp ID	Collect Date	Number of Occurrences
01G00301	U1CW10001	08/09/1994	33
01G00601	U1CW10401	08/09/1994	33
01G00602	U1CW10402	08/09/1994	33
01G00701	U1CW10501	08/09/1994	33
01G00702	U1CW10502	08/10/1994	33
01G01301	JXCW01701	09/08/1993	33
01G01302	JXCW01702	09/08/1993	33
01G01302D	JXCW01702DUP	09/08/1993	33
01G07901	JXCW07701	10/15/1993	33
01G08001	JXCW07801	10/15/1993	33
01G08001D	JXCW07801DUP	10/15/1993	33
01G08401	JXCW08101	10/15/1993	33
01G09701	U1CW09301	04/12/1994	33
01G09702	U1CW09302	04/12/1994	31
01G09702	U1CW09302DL	04/12/1994	1
01G09702D	U1CW09302DUP	04/12/1994	33
01G09801	U1CW09401	04/12/1994	33
01G10001	U1CW09601	04/13/1994	33
01G10101	U1CW09701	04/13/1994	33
01G10201	U1CW09801	04/13/1994	32
01G14601	JXMW06701	07/29/1993	126
01G14602	U1MW06702	03/09/1994	33
01G15801	U1MW10001	12/02/1993	127
01G15802	U1MW10002	03/09/1994	33
01G15901	U1MW10201	11/30/1993	127
01G15902	U1MW10202	03/09/1994	33
01G16802	U1MW08601	12/08/1993	127
01G16803	U1MW08602	03/18/1994	33
01G16902	U1MW08801	12/08/1993	127
01G16902D	U1MW08801DUP	12/08/1993	127
01G16903	U1MW08802	03/07/1994	33
01G17101	U1MW09201	12/02/1993	127
01G17102	U1MW09202	03/18/1994	33
01G17201	U1MW09401	12/02/1993	127
01G17202	U1MW09402	03/18/1994	31
01G17202	U1MW09402DL	03/18/1994	2
01G17301	U1MW09601	12/02/1993	127
01G17302	U1MW09602	03/08/1994	33
01G17401	U1MW09801	12/07/1993	64
01G17402	U1MW09801	12/08/1993	63
01G17403	U1MW09802	03/08/1994	33

01G18201	SSMW-11	05/31/1992	119
01G18202	U1MW01102	03/17/1994	33
01G18301	DSMW-12	05/31/1992	120
01G18302	U1MW01202	03/17/1994	33
01G18401	DSMW-14	06/03/1992	120
01G18403	U1MW01403	03/17/1994	33
01G18403D	U1MW01403DUP	03/17/1994	33
01G18501	DSMW-15	05/31/1992	119
01G18503	U1MW01503	03/17/1994	33
01G18601	SSMW-16	05/31/1992	119
01G18603	U1MW01603	03/17/1994	33
01G18701	SSMW-017	05/30/1992	120
01G18703	U1MW01703	03/09/1994	33
01G18801	DSMW-018	05/30/1992	120
01G18802	U1MW01802	03/09/1994	33
01G18901	DSMW-19	05/31/1992	119
01G18902	U1MW01902	03/17/1994	31
01G18902	U1MW01902DL	03/17/1994	2
01G19001	DSMW-2	06/02/1992	116
01G19002	U1MW00202	03/14/1994	32
01G19102	U1MW02002	03/17/1994	33
01G19201	SSMW-21	06/01/1992	119
01G19203	U1MW02103	03/09/1994	33
01G19301	DSMW-22	06/01/1992	119
01G19302	U1MW02202	03/16/1994	33
01G19401	SSMW-23	06/01/1992	120
01G19402	U1MW02302	03/16/1994	33
01G20901	SSMW-7	05/31/1992	120
01G20902	U1MW00702	03/15/1994	32
01G21001	DSMW-8	05/31/1992	119
01G21002	U1MW00802	03/15/1994	32
01G21101	U1MW10101	12/02/1993	127
01G21102	U1MW10102	03/09/1994	32
01G21102	U1MW10102DL	03/09/1994	1
01G22002	U1MW08701	12/08/1993	127
01G22003	U1MW08702	03/18/1994	33
01G22102	U1MW08901	12/08/1993	127
01G22103	U1MW08902	03/07/1994	27
01G22103	U1MW08902DL	03/07/1994	6
01G22301	U1MW09301	11/30/1993	127
01G22302	U1MW09302	03/18/1994	33
01G22401	U1MW09501	12/02/1993	127
01G22402	U1MW09502	03/18/1994	33
01G22501	U1MW09701	12/06/1993	64
01G22502	U1MW09701	12/07/1993	63
01G22503	U1MW09702	03/08/1994	33
01G22503D	U1MW09702DUP	03/08/1994	33
01G22601	U1MW09901	12/07/1993	64
01G22602	U1MW09901	12/08/1993	63
01G22603	U1MW09902	03/08/1994	33
X01G01301	JXCW01701	09/08/1993	11
X01G01302	JXCW01702	09/08/1993	11
X01G07901	JXCW07701	10/15/1993	4
X01G08001	JXCW07801	10/15/1993	4
X01G08401	JXCW08101	10/15/1993	5

APPENDIX R-3A

DOCUMENTATION OF SCREENING CONCENTRATIONS USED FOR SELECTION OF HUMAN HEALTH CHEMICALS OF POTENTIAL CONCERN

This appendix contains documentation of the selection of a single screening concentration (based on risk-based screening levels, standards and guidelines) for each chemical in each medium for the purposes of chemical of potential concern (CPC) selection in the human health baseline risk assessment. The selected screening concentration for each chemical in each medium incorporates the U.S. EPA Region III Risk-based concentrations for COC selection (based on cancer risk of 1×10^{-6} or hazard quotient of 0.1) and available Federal standards and State of Florida standards and guidelines. Footnotes for each table within this appendix identify the specific standards and guidelines which are incorporated into the CPC selection process.

The selected screening concentration is, in each case, the lowest of the risk-based concentration and all appropriate standards and guidelines. The application of this approach in the CPC selection process means that chemicals will not be eliminated from the risk assessment based on U.S. EPA criteria unless they are at least as stringent as the corresponding State of Florida concentration values.

Table R-3A.1
Screening Concentrations for Surface Soil
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Risk-Based Screening Concentration [2]	Florida Cleanup Goal [3]	Selected Screening Concentration [4]
Volatiles (µg/kg)			
1,2-Dichloroethene	70,000	NP	70,000
Acetone	780,000	2,290,000	780,000
Benzene	22,000	2,600	2,600
Carbon Disulfide	780,000	NP	780,000
Methylene Chloride	85,000	20,700	20,700
Toluene	1,600,000	NP	1,600,000
Xylene (total)	16,000,000	37,900,000	16,000,000
Semivolatiles (µg/kg)			
1,2,4-Trichlorobenzene	78,000	NP	78,000
2-Methylnaphthalene	[5] 310,000	ND	310,000
4-Methylphenol	39,000	NP	39,000
Acenaphthene	470,000	4,000,000	470,000
Acenaphthylene	[6] 230,000	ND	230,000
Anthracene	2,300,000	18,300,000	2,300,000
Benzo(a)Anthracene	880	1,480	880
Benzo(a)Pyrene	88	148	88
Benzo(b)Fluoranthene	880	1,480	880
Benzo(g,h,i)Perylene	[6] 230,000	ND	230,000
Benzo(k)Fluoranthene	8,800	1,470	1,470
Benzoic Acid	31,000,000	NP	31,000,000
Butylbenzylphthalate	1,600,000	15,300,000	1,600,000
Carbazole	32,000	58,100	32,000
Chrysene	88,000	14,800	14,800
Di-n-Butylphthalate	[7] 780,000	NP	780,000
Dibenz(a,h)Anthracene	88	148	88
Dibenzofuran	NA	290,000	290,000
Fluoranthene	310,000	2,990,000	310,000
Fluorene	310,000	2,780,000	310,000
Indeno(1,2,3-cd)Pyrene	880	1,480	880
Naphthalene	310,000	2,290,000	310,000
Phenanthrene	[6] 230,000	ND	230,000
Pyrene	230,000	2,224,000	230,000
bis(2-Ethylhexyl)Phthalate	46,000	NP	46,000

See notes at end of table.

Table R-3A.1 (Continued)
Screening Concentrations for Surface Soil
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Risk-Based Screening Concentration [2]	Florida Cleanup Goal [3]	Selected Screening Concentration [4]
Pesticides/PCBs (µg/kg)			
4,4-DDD	2,700	4,740	2,700
Pesticides/PCBs (µg/kg)			
4,4-DDE	1,900	3,340	1,900
4,4-DDT	1,900	3,180	1,900
Aldrin	38	NP	38
Aroclor-1254	[8] 83	NP	83
Aroclor-1260	[8] 83	NP	83
Dieldrin	40	71.2	40
Heptachlor	140	NP	140
Heptachlor epoxide	70	43.4	43.4
alpha-BHC	100	NP	100
alpha-Chlordane	[9] 470	869	470
gamma-Chlordane	[9] 470	869	470
Dioxins/Furans (µg/kg)			
1,2,3,4,6,7,8-HpCDF	[10] 0.1	NP	0.1
HpCDFs (total)	[10] 0.1	NP	0.1
HxCDFs (total)	[10] 0.1	NP	0.1
OCDF	[10] 0.1	NP	0.1
1,2,3,4,6,7,8-HpCDD	[10] 0.1	NP	0.1
HpCDDs (total)	[10] 0.1	NP	0.1
OCDD	[10] 0.1	NP	0.1
Inorganics (mg/kg)			
Aluminum	23,000	ND	23,000
Antimony	3.1	NP	3.1
Arsenic	[11] 0.37	0.71	0.37
Barium	550	NP	550
Beryllium	0.15	NP	0.15
Cadmium	3.9	37.5	3.9
Calcium	1,000,000	NP	1,000,000
Chromium	39	[12] 201	39
Cobalt	NA	ND	NSC
Copper	290	2,880	290
Cyanide	[13] 160	NP	160
Iron	47,824	ND	47,824

See notes at end of table.

Table R-3A.1 (Continued)
Screening Concentrations for Surface Soil
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Risk-Based Screening Concentration [2]	Florida Cleanup Goal [3]	Selected Screening Concentration [4]
Lead	[14] 400	ND	400
Magnesium	460,468	NP	460,468
Manganese	39	5,710	39
Inorganics (mg/kg)			
Mercury	2.3	NP	2.3
Nickel	[15] 160	1,510	160
Potassium	1,000,000	NP	1,000,000
Selenium	39	NP	39
Silver	39	NP	39
Sodium	1,000,000	NP	1,000,000
Vanadium	55	501,000	55
Zinc	2,300	23,300	2,300
Radioisotopes (pci/g)			
Gross Alpha			
Gross Beta			
Radium-226			
Radium-228			

See notes at end of table.

[1] The chemicals listed are those that were positively detected in the surface soil at NAS Jacksonville OU 1.
[2] For all chemicals except the essential nutrients, the USEPA Region III COC Screening Table for residential soil per January 1993 guidance has been used, unless otherwise noted. Actual values are taken from the COC Screening Table dated March 18, 1994 which calculates screening values based on a cancer risk of 10^{-6} and a hazard quotient of 0.1. For essential nutrients (calcium, iron, potassium, magnesium, and sodium), ABB-ES has calculated screening concentrations. Derivation of screening concentrations is presented in Appendix R-3.
[3] Florida Department of Environmental Protection (FDEP) memorandum dated July 5, 1994. Values presented are the lesser of the Clean-up Goals based on the hazard index for the child resident or the cancer risk for the aggregate resident.
[4] The selected screening concentration for the human health risk assessment is the lowest value of the RBC and Florida Cleanup Goal.
[5] RBC value for 2-methylnaphthalene is not available; RBC for naphthalene is used as a surrogate.
[6] RBC value for this PAH is not available; RBC for pyrene used as a surrogate.
[7] RBC value for di-n-butylphthalate is not available; RBC for dibutylphthalate is used as a surrogate.
[8] RBC value for this specific Aroclor is not available; the general RBC for polychlorinated biphenyls is used as a surrogate.
[9] RBC values for alpha or gamma chlordane are not available; RBC for chlordane is used as a surrogate.
[10] RBC value for this dioxin is not available; RBC for hexachlorodibenzo-p-dioxin mixture is used as a surrogate.
[11] RBC is based on arsenic as a carcinogen.
[12] RBC is based on chromium VI.
[13] RBC value for cyanide is not available; RBC for hydrogen cyanide is used as a surrogate.
[14] RBC is not available; value is from Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER directive 9355.4-12).
[15] RBC value for nickel is not available; RBC for nickel soluble salts is used as a surrogate.

Notes:
µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
pci/g = picocuries per gram.
NSC = no screening concentration available.
RBC = risk-based concentration.
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene.
DDT = dichlorodiphenyltrichloroethane.
HHRA = human health risk assessment.
COC = contaminant of concern.
NA = not applicable.
NP = analyte is not presented in FDEP guidance.
ND = analyte is presented in FDEP guidance but no data is provided.
OCDF = octachlorodibenzofuran.
OCDD = octachlorodibenzo-p-dioxin.
HpCDD = heptachlorodibenzo-p-dioxin.
TCDF = tetrachlorodibenzofuran.

Table R-3A.2
Screening Concentrations for Subsurface Soil
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Selected Screening Concentration [2]
Volatiles (µg/kg)	
1,2-Dichloroethane	8
1,2-Dichloroethene	200
Acetone	1,400
Benzene	3
Chlorobenzene	600
Chloroform	20
Ethylbenzene	200
Tetrachloroethene	30
Toluene	200
Trichloroethene	10
Xylene (total)	100
Semivolatiles (µg/kg)	
2-Methylnaphthalene	ND
Acenaphthene	2,000
Benzo(a)Anthracene	29,000
Benzo(b)Fluoranthene	71,000
Benzo(k)Fluoranthene	44,000
Chrysene	31,000
Di-n-Butylphthalate	240,000
Dibenzofuran	ND
Fluoranthene	280,000
Naphthalene	100
Phenanthrene	2,800
Pyrene	290,000
bis(2-Ethylhexyl)Phthalate	11,000
See notes at end of table.	

Table R-3A.2 (Continued)
Screening Concentrations for Subsurface Soil
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Selected Screening Concentration [2]
Pesticides/PCBs (µg/kg)	
Aroclor-1260	44,000
Inorganics (mg/kg)	
Aluminum	ND
Barium	ND
Cadmium	ND
Calcium	ND
Chromium	ND
Copper	ND
Iron	ND
Lead	ND
Magnesium	ND
Manganese	ND
Mercury	ND
Nickel	ND
Selenium	ND
Sodium	ND
Vanadium	ND
Zinc	ND
Total Petroleum Hydrocarbons (µg/kg)	
Total Petroleum hydrocarbons	ND
Radioisotopes (pci/g)	
Gross Alpha	ND
Gross Beta	ND
Radium-226	ND
Radium-228	ND

[1] The chemicals listed are those that were positively detected in the subsurface soil at NAS Jacksonville OU 1.
[2] Florida Department of Environmental Protection (FDEP) memorandum dated April 5, 1995. Values presented are the leaching-based Cleanup Goals.

Notes: µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
pci/g = picocuries per gram.
HHRA = human health risk assessment.
ND = analyte is presented in FDEP guidance but no data is provided.

Table R-3A.3
Screening Concentrations for Groundwater and Surface Water
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Risk-Based Concentration [2]	Federal Maximum Contaminant Level [3]	Florida Guidance Concentration [4]	Selected Screening Concentration [5]
Volatiles (µg/l)				
1,1,2,2-Tetrachloroethane	0.052	NA	0.2	0.052
1,1,2-Trichloroethane	0.19	5	5	0.19
1,1-Dichloroethane	81	NA	700	81
1,1-Dichloroethene	0.044	7	7	0.044
1,2-Dichloroethane	0.12	5	3	0.12
1,2-Dichloroethene (total)	5.5	[14] 70	[14] 70	5.5
2-Butanone	2,200	NA	4,200	2,200
Acetone	370	NA	700	370
Benzene	0.087	5	1	0.087
Carbon Disulfide	2.1	NA	700	2.1
Chlorobenzene	3.9	NA	NA	3.9
Chloroform	0.15	100	6	0.15
Ethylbenzene	130	700	30	30
Methylene chloride	4.1	5	5	4.1
Tetrachloroethene	1.1	5	3	1.1
Toluene	75	1,000	1,000	75
Trichloroethene	1.6	5	3	1.6
Vinyl Chloride	0.019	2	1	0.019
Xylene (total)	1,200	10,000	10,000	1,200
Semivolatiles (µg/l)				
1,2,4-Trichlorobenzene	1.8	70	70	1.8
1,2-Dichlorobenzene	37	600	600	37
1,4-Dichlorobenzene	0.44	75	75	0.44
2,4-Dimethylphenol	73	NA	400	73
2-Methylnaphthalene	[6] 150	NA	NA	150
2-Methylphenol	180	NA	350	180
4-Methylphenol	18	NA	35	18

See notes at end of table.

Table R-3A.3 (Continued)
Screening Concentrations for Groundwater and Surface Water
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Risk-Based Concentration [2]	Federal Maximum Contaminant Level [3]	Florida Guidance Concentration [4]	Selected Screening Concentration [5]
Semivolatiles (µg/l)				
Acenaphthene	220	NA	20	20
Benzoic Acid	15,000	NA	28,000	15,000
bis(2-Chloroethyl)ether	0.0092	NA	1.5	0.0092
bis(2-Ethylhexyl)phthalate	4.8	6	6	4.8
Carbazole	3.4	NA	7.5	3.4
Dibenzofuran	NA	NA	NA	NSC
Diethylphthalate	2,900	NA	5,600	2,900
Di-n-butylphthalate	370	NA	700	370
Di-n-octylphthalate	73	NA	140	73
Fluorene	150	NA	280	150
Naphthalene	150	NA	6.8	6.8
Phenanthrene	[7] 110	NA	10	10
Phenol	2,200	NA	10	10
Pesticides/PCBs (µg/l)				
4,4-DDD	0.28	NA	0.1	0.1
Inorganics (µg/l)				
Aluminum	11,000	NA	200	200
Antimony	1.5	6	6	1.5
Arsenic	[8] 0.038	50	50	0.038
Barium	260	2,000	2,000	260
Beryllium	0.016	4	4	0.016
Cadmium	1.8	5	5	1.8
Calcium	1,055,398	NA	NA	1,055,398
Chromium	[9] 18	100	100	18
Cobalt	NA	NA	NA	NSC
Copper	140	[15] 1,300	1,000	140
Cyanide	[10] 73	200	200	73

See notes at end of table.

Table R-3A.3 (Continued)
Screening Concentrations for Groundwater and Surface Water
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Risk-Based Concentration [2]	Federal Maximum Contaminant Level [3]	Florida Guidance Concentration [4]	Selected Screening Concentration [5]
Inorganics (µg/l)				
Iron	13,267	NA	300	300
Lead	[11] 15	[16] 15	15	15
Magnesium	118,807	NA	NA	118,807
Manganese	18	NA	50	18
Mercury	1.1	2	2	1.1
Nickel	[12] 73	100	100	73
Potassium	297,016	NA	NA	297,016
Selenium	18	50	50	18
Silver	18	NA	100	18
Sodium	396,022	NA	NA	396,022
Thallium	[13] 0.29	2	2	0.29
Vanadium	26	NA	49	26
Zinc	1,100	NA	5,000	1,100

See notes at end of table.

Table R-3A.3 (Continued)
Screening Concentrations for Groundwater and Surface Water For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

[1] The chemicals listed are those that were positively detected in the groundwater at NAS Jacksonville OU 1.
[2] For all chemicals except the essential nutrients, the USEPA Region III COC Screening Table for tap water per January 1993 guidance has been used, unless otherwise noted. Actual values are taken from the COC Screening Table dated March 18, 1994 which calculates screening values based on a cancer risk of 10^{-6} and a hazard quotient of 0.1. For essential nutrients (calcium, iron, potassium, magnesium, and sodium), ABB-ES has calculated screening concentrations. Derivation of screening concentrations is presented in Appendix R-3.
[3] Federal MCLs are taken from USEPA Drinking Water Regulations and Health Advisories from May 1994.
[4] Florida Guidance Concentrations are taken from Chapter 6 (Guidance Concentrations Index) of the Florida Department of Environmental Protection Groundwater Guidance Concentrations from June, 1994. Guidance concentration may be listed as a Florida Primary Standard, Florida Secondary Standard, carcinogen, organoleptic, or a systemic toxicant in the Guidance Concentration Index. The identity of the concentration is not listed in this table.
[5] The selected screening concentration for the human health risk assessment is the lowest value of the RBC, Federal MCL, and Florida Guidance Concentration.
[6] RBC value for 2-methylnaphthalene is not available; RBC for naphthalene is used as a surrogate.
[7] RBC value for this PAH is not available; RBC for pyrene used as a conservative surrogate.
[8] RBC is based on arsenic's properties as a carcinogen.
[9] RBC is based on value for chromium VI.
[10] RBC value for cyanide is not available; RBC for hydrogen cyanide is used as a surrogate.
[11] Treatment technology action limit for lead in drinking water distribution system identified in the Drinking Water Standards and Health Advisories (USEPA, 1994)..
[12] RBC value for nickel is not available; RBC for nickel soluble salts is used as a surrogate.
[13] RBC value for thallium is not available; RBC for thallium sulfate is used as a surrogate.
[14] Primary MCL is for cis-1,2-Dichloroethylene.
[15] Treatment technology action limit for copper in drinking water distribution system identified in the USEPA Drinking Water Standards and Health Advisories from May, 1994.
[16] Treatment technology action limit for lead in drinking water distribution system identified in the USEPA Drinking Water Standards and Health Advisories from May, 1994.

Notes:
NA = not available.
RBC = risk-based concentration.
MCL = maximum contaminant level.
PAH = polyaromatic hydrocarbon.
NE = not an essential nutrient.
NSC = no screening concentration.
DDD = dichlorodiphenyldichloroethane.

Table R-3A.4
Sediment Screening Concentrations
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Selected Screening Concentration [2]
Volatiles (µg/kg)	
1,1-Dichloroethane	780,000
1,2-Dichloroethene (total)	70,000
2-Butanone	4,700,000
Acetone	780,000
Benzene	22,000
Carbon Disulfide	780,000
Chlorobenzene	160,000
Methylene Chloride	85,000
Tetrachloroethene	12,000
Toluene	1,600,000
Trichloroethene	47,000
Vinyl Chloride	340
Xylene (total)	16,000,000
Semivolatiles (µg/kg)	
Acenaphthene	470,000
Benzo(a)Anthracene	880
Benzo(a)Pyrene	88
Benzo(b)Fluoranthene	880
Benzo(g,h,i)Perylene	[3] 230,000
Benzo(k)Fluoranthene	8,800
Chrysene	88,000
Di-n-Octyl Phthalate	160,000
Fluoranthene	310,000
Indeno(1,2,3-cd)Pyrene	880
Phenanthrene	[3] 230,000
Phenol	4,700,000
Pyrene	230,000
bis(2-Ethylhexyl)Phthalate	46,000
Pesticides/PCBs (µg/kg)	
4,4-DDT	1,900
4,4-DDD	2,700
4,4-DDE	1,900
Aroclor-1248	[4] 83
Aroclor-1260	[4] 83
See notes at end of table.	

Table R-3A.4 (Continued)
Sediment Screening Concentrations
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Selected Screening Concentration [2]
alpha-Chlordane	[5] 470
gamma-BHC (Lindane)	490
Pesticides/PCBs (µg/kg)	
gamma-Chlordane	[5] 470
Dioxins (µg/kg)	
1,2,3,4,6,7,8-HpCDD	[6] 0.1
OCDD	[6] 0.1
2,3,7,8-TCDF	[6] 0.1
OCDF	[6] 0.1
Inorganics (mg/kg)	
Aluminum	23,000
Antimony	3.1
Arsenic	[7] 0.37
Barium	550
Beryllium	0.15
Cadmium	3.9
Calcium	1,000,000
Chromium	[8] 3.9
Cobalt	NSC
Copper	290
Cyanide	[9] 160
Iron	47,824
Lead	[10] 400
Magnesium	460,468
Manganese	39
Mercury	2.3
Nickel	[11] 160
Potassium	1,000,000
Selenium	39
Silver	39
Sodium	1,000,000
Thallium	[12] 0.63
Vanadium	55
Zinc	2,300
See notes at end of table.	

Table R-3A.4 (Continued)
Sediment Screening Concentrations
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical [1]	Selected Screening Concentration [2]
Total Petroleum Hydrocarbons (mg/kg)	
Total Petroleum Hydrocarbons	[13] 50
Radioisotope (µg/l)	
Actinium-228	
Bismuth-212	
Bismuth-214	
Cesium-137	
Gross Alpha	
Gross Beta	
Lead-212	
Lead-214	
Potassium-40	
Radium-226	
Radium-228	
Thallium-208	
Uranium-235	

See notes at end of table.

Table R-3A.4 (Continued)
Sediment Screening Concentrations
For Selection of Human Health Chemicals of Potential Concern

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

[1] The chemicals listed are those that were positively detected in the sediment at NAS Jacksonville OU 1.
[2] For all chemicals except the essential nutrients, the USEPA Region III COC Screening Table for residential soil per January 1993 guidance has been used, unless otherwise noted. Actual values are taken from the COC Screening Table dated March 18, 1994 which calculates screening values based on a cancer risk of 10^{-6} and a hazard quotient of 0.1. For essential nutrients (calcium, iron, potassium, magnesium, and sodium), ABB-ES has calculated screening concentrations. Derivation of screening concentrations is presented in Appendix R-3.
[3] RBC value for this PAH is not available; RBC for pyrene used as a conservative surrogate.
[4] RBC value for this specific Aroclor is not available; the general RBC for polychlorinated biphenyls is used as a surrogate.
[5] RBC values for alpha or gamma chlordane are not available; RBC for chlordane is used as a surrogate.
[6] RBC value for this dioxin is not available; RBC for hexachlorodibenzo-p-dioxin mixture is used as a surrogate.
[7] RBC is based on arsenic as a carcinogen.
[8] RBC is based on chromium VI.
[9] RBC value for cyanide is not available; RBC for hydrogen cyanide is used as a surrogate.
[10] RBC is not available; value is from Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER directive 9355.4-12).
[11] RBC value for nickel is not available; RBC for nickel soluble salts is used as a surrogate.
[12] RBC value for thallium is not available; RBC for thallium sulfate is used as a surrogate.
[13] Screening value is the Florida total petroleum hydrocarbon soil clean-up goal for thermally treated soil as cited in Chapter 62-775, of the Florida Administrative Code (Florida Legislature, 1992).

Notes: µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
NSC = no screening concentration available.
RBC = risk-based concentration.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethylene.
DDT = dichlorodiphenyltrichloroethane.
HHRA = human health risk assessment.
COC = contaminant of concern.

APPENDIX R-3B

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION III CONTAMINANT pf POTENTIAL CONCERN SCREENING GUIDANCE

United States
Environmental Protection Agency

Region III
Philadelphia, PA 19107

EPA/903/R-93-001
January 1993

Region III
Technical Guidance Manual
Risk Assessment

Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening

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EPA
Region III

Hazardous Waste Management Division
Office of Superfund Programs
January 1993

Human health risk assessment includes effort-intensive steps which require many detailed calculations by experts. Most baseline risk assessments are dominated by a few chemicals and a few routes of exposure. Effort expended on minor contaminants and exposure routes, i.e., those which do not influence overall risk, is essentially wasted. This guidance is intended to identify and focus on dominant contaminants of concern and exposure routes at the earliest feasible point in the baseline risk assessment. Use of these methods will decrease effort and time spent assessing risk, without loss of protectiveness. This guidance is not intended for other risk assessment activities, such as determining preliminary remediation goals.

SELECTING CONTAMINANTS AND EXPOSURE ROUTES OF CONCERN

Most samples from hazardous waste sites are analyzed for 103 target compounds and analytes recommended by the EPA Superfund program. Semi-volatile analysis can detect additional tentatively identified compounds not on the target lists. Special analytical services procedures, if used, may find still more contaminants. The combined number of contaminants detected at a site sometimes exceeds one hundred.

While EPA considers it necessary to gather information on many contaminants, very little of this data actually influences the overall quantitative assessment of health risk. For most sites, baseline risk assessments are dominated by a few contaminants and a few routes of exposure. The remaining tens, or hundreds, of detected contaminants have a minimal influence on total risk. This small impact is lost by rounding. Entire environmental media may contain not a single contaminant at a concentration which could adversely affect public health. Quantitative risk calculations using data from such "risk-free" media have no effect on the overall risk estimate for the site.

The EPA baseline risk assessment process at several points requires careful data evaluation by scientific experts. These evaluations, which are contaminant-specific, include: (1) statistical comparisons between site-related and background samples, (2) special handling of undetected contaminants, (3) calculation of toxicity equivalence, (4) evaluation of frequency of detection, and (5) comparison with ARARs. Because overall risk is usually driven by a few contaminants and exposure routes, effort spent in detailed evaluation of minor contaminants and routes of exposure is essentially wasted. For some sites, this wasted effort exceeds 90% of the total.

The baseline risk assessment process can be made more efficient by focusing on dominant contaminants and routes of exposure at the earliest feasible stage. The mechanisms recommended for this are (1) a re-ordering of the process of eliminating contaminants and routes of exposure, and (2) use of a risk-based concentration screen. Appropriately used, this process can dramatically reduce the effort of risk assessment, while not changing the result significantly.

EXISTING GUIDANCE

Chapter 5 of "RAGS IA" (Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A); EPA, 1989) provides a detailed procedure for evaluating data for a baseline risk assessment. This

procedure includes steps by which the risk assessor selects contaminants of concern in each exposure medium. These steps are summarized in Table 1.

There are two major limitations to the RAGS procedure. First, the eliminating step (a concentration toxicity screen) comes late in the process. Many of the preceding steps (e.g., evaluation of quantitation limits, comparison with background, calculation of toxicity equivalence, and evaluation of frequency of detection) are contaminant- and medium-specific. They require the sustained attention of an expert, and cannot be automated. If the contaminant is eliminated, this work is wasted.

The second limitation is that the concentration toxicity screen compares only relative risk among contaminants in the same medium. While very efficient at selecting dominant contaminants in each medium, this method does not evaluate significance of total risk for the medium. Thus, the concentration toxicity screen can eliminate contaminants, but not routes of exposure.

RECOMMENDED METHODOLOGY

This guidance makes two changes intended to remove the limitations in existing guidance. These recommendations are intended for baseline risk assessments.

1. Re-ordering of steps. The eliminating screen is moved forward in the data evaluation process to a point immediately following data quality evaluation. The new process is shown in Table 2. Effort-intensive steps such as evaluation of quantitation limits and comparison with background now follow the eliminating screen. The steps are divided into four categories: data quality evaluation, initial data set reduction, re-inclusion of special cases, and optional final data set reduction.

The data quality evaluation steps (evaluating appropriateness of methods and qualifiers, significance of blank contamination, and need for special analyses) should be done as described in RAGS IA, Chapter 5. Next, the risk assessor should consult with the RPM to discuss the use of the risk-based concentration table (described in item [2] below) as a screening mechanism. With the RPM's approval, the risk assessor should reduce the data set and document the rationale for eliminating contaminants and routes of exposure from further analysis.

After the initial data set reduction, the risk assessor and RPM should consider re-including specific contaminants on the basis of historical data, toxicity, mobility, persistence, bioaccumulation, special exposure routes, special treatability problems, or exceedance of ARARs. These activities should proceed as described in Section 5.9 of RAGS IA.

Finally, optional further reductions in the data set may be justified, based on the status of a contaminant as an essential nutrient, low frequency of detection, or no statistical difference between site and background levels. These evaluations, the most complicated and contaminant-specific, are saved for last.

2. Screening by risk-based concentrations. The screening method is changed from the relative concentration toxicity screen of RAGS IA to an absolute comparison of risk. This is done by means of a table of risk-based concentrations (Appendix I). This table contains levels of nearly 600 contaminants in air, drinking water, fish tissue, and soil, which correspond to a systemic hazard quotient of 0.1 or a lifetime cancer risk of 10^{-6}. The risk-based concentrations were developed using protective default exposure scenarios suggested by EPA (1991) and the best available reference doses and carcinogenic potency slopes (see the table for sources), and represent relatively protective environmental concentrations at which EPA would typically not take action.

The risk-based concentration screen is used as follows:

(a) The risk assessor extracts the maximum concentration of each substance detected in each medium.

(b) If the maximum concentration exceeds the risk-based concentration for that medium, the contaminant is retained for risk assessment, for all routes of exposure involving that medium. Otherwise the contaminant is dropped for that medium.

(c) If a specific contaminant does not exceed its risk-based concentration for any medium, the contaminant is dropped from the risk assessment.

(d) If no contaminant in a specific medium exceeds its risk-based concentration, the medium is dropped from the risk assessment.

(e) All contaminants and exposure routes which are dropped are kept on a sub-list and considered for re-inclusion, based on special properties.

(f) If the risk assessor wants to include a route of exposure not covered in the risk-based concentration table, the equations provided in Appendix I can serve as the basis for new ris

based concentrations. Similarly, the risk assessor can use the same equations to calculate alternate risk levels (i.e., other than a systemic hazard quotient of 0.1 and lifetime cancer risk of 10^{-6}) to be the basis for screening.

SUMMARY

The process by which contaminants and exposure routes are selected in quantitative risk assessment can be made less effort-intensive by two simple changes. First, high-effort steps should be postponed until later in the selection process, because performing these operations on trivial contaminants and exposure routes is pointless. Second, changing from a relative concentration toxicity screen to an absolute risk-based concentration screen improves the risk assessor's ability to focus on dominant contaminants and exposure routes at an earlier stage.

REFERENCES

EPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors". OSWER Directive 9285.6-03, Office of Emergency and Remedial Response, March 25, 1991.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, December, 1989. EPA/540/1-89/002.

For additional information, call (215) 597-6682.

Approved by: _____

Thomas C. Voltaggio, Director
Hazardous Waste Management Division

Table 1. Summary of existing EPA guidance on selecting contaminants of concern (EPA, 1989, chapter 5)
Section 5.1: Combining data from site investigations
1. Determine if methods are appropriate
2. Evaluate quantitation limits
3. Determine if qualifiers are appropriate
4. Determine if significant blank contamination exists
5. Determine if special analyses for tentatively identified compounds are needed
6. Compare site samples to background
Section 5.9: Further reduction in the number of chemicals (optional)
7. Consult with RPM
8. Document rationale for eliminating chemicals
9. Examine historical information
10. Consider exceptional toxicity, mobility, persistence, or bioaccumulation
11. Consider special exposure routes
12. Consider special treatability problems
13. Determine if contaminants exceed ARARs
14. Group chemicals by class, evaluate toxicity equivalence
15. Evaluate frequency of detection
16. Evaluate essentiality
17. Use a concentration toxicity screen

Table 2. EPA Region III guidance on selecting contaminants and exposure routes of concern
A. Data quality evaluation
1. Determine if methods are appropriate
2. Determine if qualifiers are appropriate
3. Determine if significant blank contamination exists
4. Determine if special analyses for tentatively identified compounds are needed
B. Reduce data set using risk-based concentration screen
5. Consult with RPM
6. Use risk-based concentration table to screen contaminants and exposure routes of concern
7. Document rationale for eliminating chemicals and exposure routes
C. Consider re-including eliminated chemicals and routes, based on:
8. Historical information
9. Exceptional toxicity, mobility, persistence, or bioaccumulation
10. Special exposure routes
11. Special treatability problems
12. ARARs exceedance
13. Toxicity equivalence of chemical class (*e.g.*, CDD/CDFs, PAHs)
D. Make further specific reductions in data set (optional)
14. Evaluate essentiality
15. Evaluate frequency of detection
16. Compare site samples to background

Appendix I:
EPA Region III Risk-Based Screening Table
Background Information

General: Separate carcinogenic and non-carcinogenic risk-based concentrations were calculated for each compound for each pathway. The concentration in the table is the lower of the two, rounded to two significant figures. The following terms and values were used in the calculations:

VARIABLE	UNITS	VALUE	LABEL
1-General:			
Carcinogenic potency slope oral	kg-d/mg	*	CPSo
Carcinogenic potency slope inhaled	kg-d/mg	*	CPSi
Reference dose oral	mg/kg/d	*	RfDo
Reference dose inhaled	mg/kg/d	*	RfDi
Target cancer risk	unitless	1.00e-06	TR
Target hazard quotient	unitless	0.1	THQ
Body weight, adult	kg	70	BWa
Body weight, age 1-6	kg	15	BWc
Averaging time carcinogens	d	25550	ATc
Averaging time non-carcinogens	d	ED x 365	ATn
Inhalation, adult	m3/d	20	IRAa
Inhalation, child	m3/d	12	IRAc
Inhalation factor, age adjusted	m3-y/kg-d	11.66	IFAadj
Tap water ingestion, adult	L/d	2	IRWa
Tap water ingestion, child	L/d	1	IRWc
Tap water ingestion factor, age adjusted	L-y/kg-d	1.09	IFWadj
Fish ingestion	g/d	54	IRF
Soil ingestion, adult	mg/d	100	IRSa
Soil ingestion, child	mg/d	200	IRSc
Soil ingestion factor, age adjusted	mg-y/kg-d	114.29	IFSadj
2-Residential			
Exposure frequency, residential	d/y	350	EFr
Exposure duration, residential	y	30	EDtot

VARIABLE	UNITS	VALUE	LABEL
Exposure duration, age 1-6	y	6	EDc
Volatilization factor	L/m3	0.5	VF
3-Occupational			
Exposure frequency, occupational	d/y	250	EFo
Exposure duration, occupational	y	25	EDo
* = Contaminant-specific toxicity parameters			

The priority among sources of toxicological constants was as follows: (1) IRIS, (2) HEAST, (3) HEAST alternative method, (4) ECAO-Cincinnati, (5) withdrawn from IRIS, (6) withdrawn from HEAST, and (7) other EPA documents. Each source was used only if numbers from higher-priority sources were unavailable.

Algorithms:

1. Age-adjusted factors: Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors. These factors approximated the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age-adjusted factor for soil was obtained from RAGS IB; the others were developed by analogy.

a. Air inhalation ([m^3· y]/[kg· d]):

$$IFAadj = \frac{EDc \cdot IRAc}{BWc} + \frac{(EDtot - EDc) \cdot IRAa}{BWa}$$

b. Tap water ingestion ([L· y]/[kg· d]):

$$IFWadj = \frac{EDc \cdot IRWc}{BWc} + \frac{(EDtot - EDc) \cdot IRWa}{BWa}$$

c. Soil ingestion ([mg· y]/[kg· d]):

$$IFSadj = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

2. Residential water use ($\mu g/L$). Volatilization terms were calculated only for compounds with "***" in the "VOC" column. Compounds having a Henry's Law constant greater than 10^{-5} were considered volatile. The list may be incomplete, but is unlikely to include false positives. The equations and the volatilization factor (VF, above) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. Inhaled potency slopes were substituted for unavailable oral potency slopes only for volatile compounds; inhaled RfDs were substituted for unavailable oral RfDs for both volatile and non-volatile compounds.

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc \cdot 1000\frac{\mu g}{mg}}{EFr \cdot ([VF \cdot IFAadj \cdot CPSi] + [IFWadj \cdot CPSo])}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot BWa \cdot ATn \cdot 1000\frac{\mu g}{mg}}{EFr \cdot EDtot \cdot \left(\frac{VF \cdot IRAa}{RfDi} + \frac{IRWa}{RfDo}\right)}$$

3. Air ($\mu g/m^3$). Oral potency slopes and references were used where inhalation values were not available.

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc \cdot 1000\frac{\mu g}{mg}}{EFr \cdot IFAadj \cdot CPSi}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot RfDi \cdot BWa \cdot ATn \cdot 1000\frac{\mu g}{mg}}{EFr \cdot EDtot \cdot IRAa}$$

4. Fish (mg/kg):

a. Carcinogens: Calculations were based on adult exposure.

$$\frac{TR \cdot BWa \cdot ATc}{EFr \cdot EDtot \cdot \frac{IRF}{1000\frac{g}{kg}} \cdot CPSo}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFr \cdot EDtot \cdot \frac{IRF}{1000\frac{g}{kg}}}$$

5. Soil commercial/industrial (mg/kg): The default exposure assumption that only 50% of incidental soil ingestion occurs at work has been omitted. Calculations were based on adult occupational exposure.

a. Carcinogens:

$$\frac{TR \cdot BWa \cdot ATc}{EFo \cdot EDo \cdot \frac{IRSa}{10^6 \frac{mg}{kg}} \cdot CPSo}$$

b. Non-carcinogens:

$$\frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFo \cdot EDo \cdot \frac{IRSa}{10^6 \frac{mg}{kg}}}$$

6. Soil residential (mg/kg):

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc}{EFr \cdot \frac{IFSadj}{10^6 \frac{mg}{kg}} \cdot CPSo}$$

b. Non-carcinogens: Calculations were based on childhood exposure only.

$$\frac{THQ \cdot RfDo \cdot BWc \cdot ATn}{EFr \cdot EDc \cdot \frac{IRSc}{10^6 \frac{mg}{kg}}}$$

EPA Region III COC Screening Table: R.L. Smith (18-Mar-94)

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST c=EPA-ECAO o=Other EPA documents *F=final D=draft P=proposed T=tentative | c=carcinogen n=noncarcinogen*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	MCL mg/L	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Acephate	30560191	4.00E-03 i		8.70E-03 i				7.7 c	0.72 c	0.36 c	330 c	31 n
Acetaldehyde	75070		2.57E-03 i		7.70E-03 i			9.4 n	0.81 c			
Acetochlor	34256821	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Acetone	67641	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
Acetone cyanohydrin	75865	7.00E-02 h	2.86E-03 h					260 n	1 n	9.5 n	7200 n	550 n
Acetonitrile	75078	6.00E-03 i	1.43E-02 h					22 n	5.2 n	0.81 n	610 n	47 n
Acetophenone	98862	1.00E-01 i	5.71E-06 w			...		0.0042 n	0.0021 n	14 n	10000 n	780 n
Acifluorfen	62476599	1.30E-02 i						47 n	4.7 n	1.8 n	1300 n	100 n
Acrolein	107028	2.00E-02 h	5.71E-06 i					73 n	0.0021 n	2.7 n	2000 n	160 n
Acrylamide	79061	2.00E-04 i		4.50E+00 i	4.55E+00 i			0.015 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Acrylic acid	79107	8.00E-02 i	8.57E-05 i					290 n	0.031 n	11 n	8200 n	630 n
Acrylonitrile	107131		5.71E-04 i	5.40E-01 i	2.38E-01 i			0.12 c	0.026 c	0.0058 c	5.3 c	1.2 c
Alachlor	15972608	1.00E-02 i		8.00E-02 h			0.002 F	0.84 c	0.078 c	0.039 c	36 c	8 c
Alar	1596845	1.50E-01 i						550 n	55 n	20 n	15000 n	1200 n
Aldicarb	116063	1.00E-03 i					0.007 D	3.7 n	0.37 n	0.14 n	100 n	7.8 n
Aldicarb sulfone	1646884	1.00E-03 i					0.007 D	3.7 n	0.37 n	0.14 n	100 n	7.8 n
Aldrin	309002	3.00E-05 i		1.70E+01 i	1.71E+01 i			0.004 c	0.00037 c	0.00019 c	0.17 c	0.0038 c
Ally	74223646	2.50E-01 i						910 n	91 n	34 n	26000 n	2000 n
Allyl alcohol	107186	5.00E-03 i						18 n	1.8 n	0.68 n	510 n	39 n
Allyl chloride	107051	5.00E-02 w	2.86E-04 i					180 n	0.1 n	6.8 n	5100 n	390 n
Aluminum	7429905	2.90E+00 o						11000 n	1100 n	390 n	300000 n	23000 n
Aluminum phosphide	20859738	4.00E-04 i						1.5 n	0.15 n	0.054 n	41 n	3.1 n
Amdro	67485294	3.00E-04 i						1.1 n	0.11 n	0.041 n	31 n	2.3 n
Ametryn	834128	9.00E-03 i						33 n	3.3 n	1.2 n	920 n	70 n
m-Aminophenol	591275	7.00E-02 h						260 n	26 n	9.5 n	7200 n	550 n
4-Aminopyridine	504245	2.00E-05 h						0.073 n	0.0073 n	0.0027 n	2 n	0.16 n
Amitraz	33089611	2.50E-03 i						9.1 n	0.91 n	0.34 n	260 n	20 n
Ammonia	7664417		2.86E-02 i					100 n	10 n			
Ammonium sulfamate	7773060	2.00E-01 i						730 n	73 n	27 n	20000 n	1600 n
Aniline	62533		2.86E-04 i	5.70E-03 i				1 n	0.1 n	0.55 c	500 c	110 c
Antimony and compounds	7440360	4.00E-04 i					0.006 F	1.5 n	0.15 n	0.054 n	41 n	3.1 n
Antimony pentoxide	1314609	5.00E-04 h						1.8 n	0.18 n	0.068 n	51 n	3.9 n
Antimony potassium tartrate	304610	9.00E-04 h						3.3 n	0.33 n	0.12 n	92 n	7 n
Antimony tetroxide	1332316	4.00E-04 h						1.5 n	0.15 n	0.054 n	41 n	3.1 n
Antimony trioxide	1309644	4.00E-04 h						1.5 n	0.15 n	0.054 n	41 n	3.1 n
Apollo	74115245	1.30E-02 i						47 n	4.7 n	1.8 n	1300 n	100 n
Aramite	140578	5.00E-02 h		2.50E-02 i	2.49E-02 i			2.7 c	0.25 c	0.13 c	110 c	26 c
Arsenic	7440382	3.00E-04 i					0.05 *	1.1 n	0.11 n	0.041 n	31 n	2.3 n
Arsenic (carcinogen)	744032	3.00E-04		1.75E+00 i	1.51E+01 i		0.05 *	0.038 c	0.00041 c	0.0018 c	1.6 c	0.37 c

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO o=Other EPA documents *F=final D=draft P=proposed T=tentative (c=carcinogen n=noncarcinogen*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	MCL mg/L	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Assure	76578148	9.00E-03 i						33 n	3.3 n	1.2 n	920 n	70 n
Asulam	3337711	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Atrazine	1912249	3.50E-02 i		2.22E-01 h			0.003 F	0.3 c	0.028 c	0.014 c	13 c	2.9 c
Avermectin B1	65195553	4.00E-04 i						1.5 n	0.15 n	0.054 n	41 n	3.1 n
Azobenzene	103333			1.10E-01 i	1.08E-01 i			0.61 c	0.058 c	0.029 c	26 c	5.8 c
Barium and compounds	7440393	7.00E-02 i	1.43E-04 h				2 F	260 n	0.052 n	9.5 n	7200 n	550 n
Baygon	114261	4.00E-03 i						15 n	1.5 n	0.54 n	410 n	31 n
Bayleton	43121433	3.00E-02 i						110 n	11 n	4.1 n	3100 n	230 n
Baythroid	68359375	2.50E-02 i						91 n	9.1 n	3.4 n	2600 n	200 n
Benefin	1861401	3.00E-01 i						1100 n	110 n	41 n	31000 n	2300 n
Benomyl	17804352	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Bentazon	25057890	2.50E-03 i						9.1 n	0.91 n	0.34 n	260 n	20 n
Benzaldehyde	100527	1.00E-01 i				***		61 n	37 n	14 n	10000 n	780 n
Benzene	71432		1.43E-04 a	2.90E-02 i	2.90E-02 i	***	0.005 F	0.087 n	0.052 n	0.11 c	99 c	22 c
Benzidine	92875	3.00E-03 i		2.30E+02 i	2.35E+02 i			0.00029 c	0.00003 c	0.00001 c	0.012 c	0.0028 c
Benzoic acid	65850	4.00E+00 i						15000 n	1500 n	540 n	410000 n	31000 n
Benzotrichloride	98077			1.30E+01 i				0.0052 c	0.00048 c	0.00024 c	0.22 c	0.049 c
Benzyl alcohol	100516	3.00E-01 h						1100 n	110 n	41 n	31000 n	2300 n
Benzyl chloride	100447			1.70E-01 i		***		0.062 c	0.037 c	0.019 c	17 c	3.8 c
Beryllium and compounds	7440417	5.00E-03 i		4.30E+00 i	8.40E+00 i		0.004 F	0.016 c	0.00075 c	0.00073 c	0.67 c	0.15 c
Bidrin	141662	1.00E-04 i						0.37 n	0.037 n	0.014 n	10 n	0.78 n
Biphenthrin (Talstar)	82657043	1.50E-02 i						55 n	5.5 n	2 n	1500 n	120 n
1,1-Biphenyl	92524	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Bis(2-chloroethyl)ether	111444			1.10E+00 i	1.16E+00 i	***		0.0092 c	0.0054 c	0.0029 c	2.6 c	0.58 c
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 i		7.00E-02 h	3.50E-02 h	***		0.26 c	0.18 c	0.045 c	41 c	9.1 c
Bis(chloromethyl)ether	542881			2.20E+02 i	2.17E+02 i	***		0.00005 c	0.00003 c	0.00001 c	0.013 c	0.0029 c
Bis(2-chloro-1-methylethyl)ether				7.00E-02 w	7.00E-02 w			0.96 c	0.089 c	0.045 c	41 c	9.1 c
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 i		1.40E-02 i			0.006 F	4.8 c	0.45 c	0.23 c	200 c	46 c
Bisphenol A	80057	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Boron (and borates)	7440428	9.00E-02 i	5.71E-03 h					330 n	2.1 n	12 n	9200 n	700 n
Boron trifluoride	7637072		2.00E-04 h					0.73 n	0.073 n			
Bromodichloromethane	75274	2.00E-02 i		6.20E-02 i		***	0.1 T	0.17 c	0.1 c	0.051 c	46 c	10 c
Bromoethene	593602				1.10E-01 h	***		0.096 c	0.057 c			
Bromoform (tribromomethane)	75252	2.00E-02 i		7.90E-03 i	3.85E-03 i	***	0.1 T	2.4 c	1.6 c	0.4 c	360 c	81 c
Bromomethane	74839	1.40E-03 i	1.43E-03 i			***		0.87 n	0.52 n	0.19 n	140 n	11 n
4-Bromophenyl phenyl ether	101553	5.80E-02 o						210 n	21 n	7.8 n	5900 n	450 n
Bromophos	2104963	5.00E-03 h						18 n	1.8 n	0.68 n	510 n	39 n
Bromoxynil	1689845	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Bromoxynil octanoate	1689992	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n

EPA Region III COC Screening Table: R.L. Smith (18-Mar-94)

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	MCL mg/L	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
1,3-Butadiene	106990				9.80E-01 i	***		0.011 c	0.0064 c			
1-Butanol	71363	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
Butyl benzyl phthalate	85687	2.00E-01 i					0.1 P	730 n	73 n	27 n	20000 n	1600 n
Butylate	2008415	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
sec-Butylbenzene	135988	1.00E-02 e				***	0.002 F	6.1 n	3.7 n	1.4 n	1000 n	78 n
tert-Butylbenzene	104518	1.00E-02 e				***	0.002 F	6.1 n	3.7 n	1.4 n	1000 n	78 n
Butylphthalyl butylglycolate	85701	1.00E+00 i						3700 n	370 n	140 n	100000 n	7800 n
Cacodylic acid	75605	3.00E-03 h						11 n	1.1 n	0.41 n	310 n	23 n
Cadmium and compounds	7440439	5.00E-04 i			6.30E+00 i		0.005 F	1.8 n	0.00099 c	0.068 n	51 n	1.9 n
Caprolactam	105602	5.00E-01 i						1800 n	180 n	68 n	51000 n	3900 n
Captafol	2425061	2.00E-03 i		8.60E-03 h				7.3 n	0.73 c	0.27 n	200 n	16 n
Captan	133062	1.30E-01 i		3.50E-03 h				19 c	1.8 c	0.9 c	820 c	180 c
Carbaryl	63252	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
Carbazole	86748			2.00E-02 h				3.4 c	0.31 c	0.16 c	140 c	32 c
Carbofuran	1563662	5.00E-03 i					0.04 F	18 n	1.8 n	0.68 n	510 n	39 n
Carbon disulfide	75150	1.00E-01 i	2.86E-03 h			***		2.1 n	1 n	14 n	10000 n	780 n
Carbon tetrachloride	56235	7.00E-04 i	5.71E-04 e	1.30E-01 i	5.25E-02 i	***	0.005 F	0.16 c	0.12 c	0.024 c	22 c	4.9 c
Carbosulfan	55285148	1.00E-02 i						37 n	3.7 n	1.4 n	1000 n	78 n
Carboxin	5234684	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
Chloral	75876	2.00E-03 i						7.3 n	0.73 n	0.27 n	200 n	16 n
Chloramben	133904	1.50E-02 i						55 n	5.5 n	2 n	1500 n	120 n
Chloranil	118752			4.03E-01 h				0.17 c	0.016 c	0.0078 c	7.1 c	1.6 c
Chlordane	57749	6.00E-05 i		1.30E+00 i	1.29E+00 i		0.002 F	0.052 c	0.0049 c	0.0024 c	2.2 c	0.47 n
Chlorimuron-ethyl	90982324	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Chlorine dioxide	10049044		5.71E-05 i					0.21 n	0.021 n			
Chloroacetaldehyde	107200	6.90E-03 o						25 n	2.5 n	0.93 n	710 n	54 n
Chloroacetic acid	79118	2.00E-03 h						7.3 n	0.73 n	0.27 n	200 n	16 n
2-Chloroacetophenone	532274		8.57E-06 i					0.031 n	0.0031 n			
4-Chloroaniline	106478	4.00E-03 i						15 n	1.5 n	0.54 n	410 n	31 n
Chlorobenzene	108907	2.00E-02 i	5.71E-03 h			***	0.1 F	3.9 n	2.1 n	2.7 n	2000 n	160 n
Chlorobenzilate	510156	2.00E-02 i		2.70E-01 h	2.70E-01 h			0.25 c	0.023 c	0.012 c	11 c	2.4 c
p-Chlorobenzoic acid	74113	2.00E-01 h						730 n	73 n	27 n	20000 n	1600 n
4-Chlorobenzotrifluoride	98566	2.00E-02 h						73 n	7.3 n	2.7 n	2000 n	160 n
2-Chloro-1,3-butadiene	126998	2.00E-02 h	2.00E-03 h			***		1.4 n	0.73 n	2.7 n	2000 n	160 n
1-Chlorobutane	109693	4.00E-01 h				***		240 n	150 n	54 n	41000 n	3100 n
Chlorodifluoromethane	75456		1.43e+01 i			***	0.002 F	8700 n	5200 n			
Chloroethane	75003	2.00E-02 e	2.86E+00 i			***		71 n	1000 n	2.7 n	2000 n	160 n
2-Chloroethyl vinyl ether	110758	2.50E-02 o				***		15 n	9.1 n	3.4 n	2600 n	200 n
Chlorofo[illegible]	67663	1.00E-02 i		6.10E-03 i	8.05E-02 i	***	0.1 T	0.15 c	0.078 c	0.52 c	470 c	78 n

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Chloromethane	74873			1.30E-02 h	6.30E-03 h	***		1.4 c	0.99 c	0.24 c	220 c	49 c
4-Chloro-2,2-methylaniline hydrochloride	3165933			4.60E-01 h				0.15 c	0.014 c	0.0069 c	6.2 c	1.4 c
4-Chloro-2-methylaniline	95692			5.80E-01 h				0.12 c	0.011 c	0.0054 c	4.9 c	1.1 c
beta-Chloronaphthalene	91587	8.00E-02 i						290 n	29 n	11 n	8200 n	630 n
o-Chloronitrobenzene	88733			2.50E-02 h		***		0.42 c	0.25 c	0.13 c	110 c	26 c
p-Chloronitrobenzene	121733			1.80E-02 h		***		0.59 c	0.35 c	0.18 c	160 c	35 c
2-Chlorophenol	95578	5.00E-03 i						18 n	1.8 n	0.68 n	510 n	39 n
2-Chloropropane	75296		2.86E-02 h			***		17 n	10 n			
Chlorothalonil	1897456	1.50E-02 i		1.10E-02 h				6.1 c	0.57 c	0.29 c	260 c	58 c
o-Chlorotoluene	95498	2.00E-02 i				***		12 n	7.3 n	2.7 n	2000 n	160 n
Chlorpropham	101213	2.00E-01 i						730 n	73 n	27 n	20000 n	1600 n
Chlorpyrifos	2921882	3.00E-03 i						11 n	1.1 n	0.41 n	310 n	23 n
Chlorpyrifos-methyl	5598130	1.00E-02 h						37 n	3.7 n	1.4 n	1000 n	78 n
Chlorsulfuron	64902723	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Chlorthiophos	60238564	8.00E-04 h						2.9 n	0.29 n	0.11 n	82 n	6.3 n
Chromium III and compounds	16065831	1.00E+00 i	5.71E-07 w				0.1 F	3700 n	0.00021 n	140 n	100000 n	7800 n
Chromium VI and compounds	7440473	5.00E-03 i			4.20E+01 i		0.1 F	18 n	0.00015 c	0.68 n	510 n	39 n
Coal tar	8001589				2.20E+00 w				0.0028 c			
Coke Oven Emissions	8007452				2.17E+00 i				0.0029 c			
Copper and compounds	7440508	3.71E-02 h						140 n	14 n	5 n	3800 n	290 n
Crotonaldehyde	123739	1.00E-02 w		1.90E+00 h	1.90E+00 w			0.035 c	0.0033 c	0.0017 c	1.5 c	0.34 c
Cumene	98828	4.00E-02 i	2.57E-03 h					150 n	0.94 n	5.4 n	4100 n	310 n
Cyanides:							0.2 P					
Barium cyanide	542621	1.00E-01 h						370 n	37 n	14 n	10000 n	780 n
Calcium cyanide	592018	4.00E-02 i						150 n	15 n	5.4 n	4100 n	310 n
Copper cyanide	544923	5.00E-03 i						18 n	1.8 n	0.68 n	510 n	39 n
Cyanazine	21725462	2.00E-03 h		8.40E-01 h				0.08 c	0.0075 c	0.0038 c	3.4 c	0.76 c
Cyanogen	460195	4.00E-02 i						150 n	15 n	5.4 n	4100 n	310 n
Cyanogen bromide	506683	9.00E-02 i						330 n	33 n	12 n	9200 n	700 n
Cyanogen chloride	506774	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Free cyanide	57125	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Hydrogen cyanide	74908	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Potassium cyanide	151508	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Potassium silver cyanide	506616	2.00E-01 i						730 n	73 n	27 n	20000 n	1600 n
Silver cyanide	506649	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
Sodium cyanide	143339	4.00E-02 i						150 n	15 n	5.4 n	4100 n	310 n
Zinc cyanide	557211	5.00E-02 i						180 n	18 n	6.8 n	5100 n	390 n
Cyclohexanone	108941	5.00E+00 i				***		3000 n	1800 n	680 n	510000 n	39000 n
Cyclohexlamine	108918	2.00E-01 i						730 n	73 n	27 n	20000 n	1600 n

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Cyhalothrin/Karate	68085858	5.00E-03 i						18 n	1.8 n	0.68 n	510 n	39 n
Cypermethrin	52315078	1.00E-02 i						37 n	3.7 n	1.4 n	1000 n	78 n
Cyromazine	66215278	7.50E-03 i						27 n	2.7 n	1 n	770 n	59 n
Dacthal	1861321	5.00E-01 i						1800 n	180 n	68 n	51000 n	3900 n
Dalapon	75990	3.00E-02 i					0.2 F	110 n	11 n	4.1 n	3100 n	230 n
Danitol	39515418	5.00E-04 w						1.8 n	0.18 n	0.068 n	51 n	3.9 n
DDD	72548			2.40E-01 i				0.28 c	0.026 c	0.013 c	12 c	2.7 c
DDE	72559			3.40E-01 i				0.2 c	0.018 c	0.0093 c	8.4 c	1.9 c
DDT	50293	5.00E-04 i		3.40E-01 i	3.40E-01 i			0.2 c	0.018 c	0.0093 c	8.4 c	1.9 c
Decabromodiphenyl ether	1163195	1.00E-02 i				***		6.1 n	3.7 n	1.4 n	1000 n	78 n
Demeton	8065483	4.00E-05 i						0.15 n	0.015 n	0.0054 n	4.1 n	0.31 n
Diallate	2303164			6.10E-02 h		***		0.17 c	0.1 c	0.052 c	47 c	10 c
Diazinon	333415	9.00E-04 h						3.3 n	0.33 n	0.12 n	92 n	7 n
1,4-Dibromobenzene	106376	1.00E-02 i				***		6.1 n	3.7 n	1.4 n	1000 n	78 n
Dibromochloromethane	124481	2.00E-02 i		8.40E-02 i		***	0.1 F	0.13 c	0.075 c	0.038 c	34 c	7.6 c
1,2-Dibromo-3-chloropropane	96128		5.71E-05 i	1.40E+00 h	6.90E-07 h	***	0.0002 F	0.035 n	0.021 n	0.0023 c	2 c	0.46 c
1,2-Dibromoethane	106934		5.71E-05 h	8.50E+01 i	7.70E-01 i	***	0.00005 F	0.00075 c	0.0081 c	0.00004 c	0.034 c	0.0075 c
Dibutyl phthalate	84742	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
Dicamba	1918009	3.00E-02 i						110 n	11 n	4.1 n	3100 n	230 n
1,2-Dichlorobenzene	95501	9.00E-02 i	5.71E-02 h			***	0.6 F	37 n	21 n	12 n	9200 n	700 n
1,3-Dichlorobenzene	541731	8.90E-02 o				***	0.6 F	54 n	32 n	12 n	9100 n	700 n
1,4-Dichlorobenzene	106467		2.29E-01 i	2.40E-02 h		***	0.075 F	0.44 c	0.26 c	0.13 c	120 c	27 c
3,3'-Dichlorobenzidine	91941			4.50E-01 i				0.15 c	0.014 c	0.007 c	6.4 c	1.4 c
1,4-Dichloro-2-butene	764410				9.30E+00 h	***		0.0011 c	0.00067 c			
Dichlorodifluoromethane	75718	2.00E-01 i	5.71E-02 h			***		39 n	21 n	27 n	20000 n	1600 n
1,1-Dichloroethane	75343	1.00E-01 h	1.43E-01 h			***		81 n	52 n	14 n	10000 n	780 n
1,2-Dichloroethane (EDC)	107062		2.86E-03 e	9.10E-02 i	9.10E-02 i	***	0.005 F	0.12 c	0.069 c	0.035 c	31 c	7 c
1,1-Dichloroethylene	75354	9.00E-03 i		6.00E-01 i	1.75E-01 i	***	0.007 F	0.044 c	0.036 c	0.0053 c	4.8 c	1.1 c
1,2-Dichloroethylene (cis)	156592	1.00E-02 h				***	0.07 F	6.1 n	3.7 n	1.4 n	1000 n	78 n
1,2-Dichloroethylene (trans)	156605	2.00E-02 i				***	0.1 F	12 n	7.3 n	2.7 n	2000 n	160 n
1,2-Dichloroethylene (mixture)	540590	9.00E-03 h				***		5.5 n	3.3 n	1.2 n	920 n	70 n
2,4-Dichlorophenol	120832	3.00E-03 i						11 n	1.1 n	0.41 n	310 n	23 n
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 i				***	0.07 F	6.1 n	3.7 n	1.4 n	1000 n	78 n
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 i						29 n	2.9 n	1.1 n	820 n	63 n
1,2-Dichloropropane	78875		1.14E-03 i	6.80E-02 h		***	0.005 F	0.16 c	0.092 c	0.046 c	42 c	9.4 c
2,3-Dichloropropanol	616239	3.00E-03 i						11 n	1.1 n	0.41 n	310 n	23 n
1,3-Dichloropropene	542756	3.00E-04 i	5.71E-03 i	1.80E-01 h	1.30E-01 h	***		0.077 c	0.048 c	0.018 c	16 c	2.1 n
Dichlorvos	62737	5.00e-04 i		2.90E-01 i				0.23 c	0.022 c	0.011 c	9.9 c	2.2 c
Dicofol	115322			[illegible]0E-01 w				0.15 c	0.014 c	0.0072 c	6.5 c	1.5 c

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Dicyclopentadiene	77736	3.00E-02 h	5.71E-05 h			***		0.042 n	0.021 n	4.1 n	3100 n	230 n
Dieldrin	60571	5.00E-05 i		1.60E+01 i	1.61E+01 i			0.0042 c	0.00039 c	0.0002 c	0.18 c	0.04 c
Diesel emissions			1.43E-03 i					5.2 n	0.52 n			
Diethyl phthalate	84662	8.00E-01 i						2900 n	290 n	110 n	82000 n	6300 n
Diethylene glycol, monobutyl ether	112345		5.71E-03 h					21 n	2.1 n			
Diethylene glycol, monoethyl ether	111900	2.00E+00 h						7300 n	730 n	270 n	200000 n	16000 n
Diethylforamide	617845	1.10E-02 h						40 n	4 n	1.5 n	1100 n	86 n
Di(2-ethylhexyl)adipate	103231	6.00E-01 i		1.20E-03 i			0.4 F	56 c	5.2 c	2.6 c	2400 c	530 c
Diethylstilbestrol	56531			4.70E+03 h				0.00001 c	1E-06 c	7E-07 c	0.00061 c	0.00014 c
Difenzoquat (Avenge)	43222486	8.00E-02 i						290 n	29 n	11 n	8200 n	630 n
Diflubenzuron	35367385	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 i						290 n	29 n	11 n	8200 n	630 n
Dimethipin	55290647	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Dimethoate	60515	2.00E-04 i						0.73 n	0.073 n	0.027 n	20 n	1.6 n
3,3'-Dimethoxybenzidine	119904			1.40E-02 h				4.8 c	0.45 c	0.23 c	200 c	46 c
Dimethyl phthalate	131113	1.00E+01 h						37000 n	3700 n	1400 n	1000000 n	78000 n
Dimethyl terephthalate	120616	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
Dimethylamine	124403		5.71E-06 w					0.021 n	0.0021 n			
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 h				0.12 c	0.011 c	0.0054 c	4.9 c	1.1 c
2,4-Dimethylaniline	95681			7.50E-01 h				0.09 c	0.0083 c	0.0042 c	3.8 c	0.85 c
N-N-Dimethylaniline	121697	2.00E-03 i						7.3 n	0.73 n	0.27 n	200 n	16 n
3,3'-Dimethylbenzidine	119937			9.20E+00 h				0.0073 c	0.00068 c	0.00034 c	0.31 c	0.069 c
N,N-Dimethylformamide	68122	1.00E-01 h	8.57E-03 i					370 n	3.1 n	14 n	10000 n	780 n
1,1-Dimethylhydrazine	57147			2.60E+00 h	3.50E+00 h			0.026 c	0.0018 c	0.0012 c	1.1 c	0.25 c
1,2-Dimethylhydrazine	540738			3.70E+01 w	3.70E+01 w			0.0018 c	0.00017 c	0.00009 c	0.077 c	0.017 c
2,4-Dimethylphenol	105679	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
2,6-Dimethylphenol	576261	6.00E-04 i						2.2 n	0.22 n	0.081 n	61 n	4.7 n
3,4-Dimethylphenol	95658	1.00E-03 i						3.7 n	0.37 n	0.14 n	100 n	7.8 n
1,2-Dinitrobenzene	528290	4.00E-04 h						1.5 n	0.15 n	0.054 n	41 n	3.1 n
1,3-Dinitrobenzene	99650	1.00E-04 i						0.37 n	0.037 n	0.014 n	10 n	0.78 n
1,4-Dinitrobenzene	100254	4.00E-04 h						1.5 n	0.15 n	0.054 n	41 n	3.1 n
4,6-Dinitro-o-cyclohexyl phenol	131895	2.00E-03 i						7.3 n	0.73 n	0.27 n	200 n	16 n
2,4-Dinitrophenol	51285	2.00E-03 i						7.3 n	0.73 n	0.27 n	200 n	16 n
Dinitrotoluene mixture				6.80E-01 i				0.099 c	0.0092 c	0.0046 c	4.2 c	0.94 c
2,4-Dinitrotoluene	121142	2.00E-03 i						7.3 n	0.73 n	0.27 n	200 n	16 n
2,6-Dinitrotoluene	606202	1.00E-03 h						3.7 n	0.37 n	0.14 n	100 n	7.8 n
Dinoseb	88857	1.00E-03 i					0.007 F	3.7 n	0.37 n	0.14 n	100 n	7.8 n
di-n-Octyl phthalate	117840	2.00E-02 h						73 n	7.3 n	2.7 n	2000 n	160 n
1,4-Dioxane	123911			1.10E-02 i				6.1 c	0.57 c	0.29 c	260 c	58 c

EPA Region III COC Screening Table: R.L. [illegible] (18-Mar-94)

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST c=EPA-ECAO o=Other EPA documents F=final D=draft P=proposed T=tentative / c=carcinogen n=noncarcinogen

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	MCL mg/L	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Diphenamid	957517	3.00E-02 i						110 n	11 n	4.1 n	3100 n	230 n
Diphenylamine	122394	2.50E-02 i						91 n	9.1 n	3.4 n	2600 n	200 n
1,2-Diphenylhydrazine	122667			8.00E-01 i	7.70E-01 i			0.084 c	0.0081 c	0.0039 c	3.6 c	0.8 c
Diquat	85007	2.20E-03 i					0.02 F	8 n	0.8 n	0.3 n	220 n	17 n
Direct black 38	1937377			8.60E+00 h				0.0078 c	0.00073 c	0.00037 c	0.33 c	0.074 c
Direct blue 6	2602462			8.10E+00 h				0.0083 c	0.00077 c	0.00039 c	0.35 c	0.079 c
Direct brown 95	16071866			9.30E+00 h				0.0072 c	0.00067 c	0.00034 c	0.31 c	0.069 c
Disulfoton	298044	4.00E-05 i						0.15 n	0.015 n	0.0054 n	4.1 n	0.31 n
1,4-Dithiane	505293	1.00E-02 i						37 n	3.7 n	1.4 n	1000 n	78 n
Diuron	330541	2.00E-03 i						7.3 n	0.73 n	0.27 n	200 n	16 n
Dodine	2439103	4.00E-03 i						15 n	1.5 n	0.54 n	410 n	31 n
Endosulfan	115297	6.00E-03 h						22 n	2.2 n	0.81 n	610 n	47 n
Endothall	145733	2.00E-02 i					0.1 F	73 n	7.3 n	2.7 n	2000 n	160 n
Endrin	72208	3.00E-04 i					0.002 F	1.1 n	0.11 n	0.041 n	31 n	2.3 n
Epichlorohydrin	106898	2.00E-03 h	2.86E-04 i	9.90E-03 i	4.20E-03 i			6.8 c	0.1 n	0.27 n	200 n	16 n
1,2-Epoxybutane	106887		5.71E-03 i					21 n	2.1 n			
Ethephon (2-chloroethyl phosphonic acid)	16672870	5.00E-03 i						18 n	1.8 n	0.68 n	510 n	39 n
Ethion	563122	5.00E-04 i						1.8 n	0.18 n	0.068 n	51 n	3.9 n
2-Ethoxyethanol acetate	111159	3.00E-01 h						1100 n	110 n	41 n	31000 n	2300 n
2-Ethoxyethanol	110805	4.00E-01 h	5.71E-02 i					1500 n	21 n	54 n	41000 n	3100 n
Ethyl acrylate	140885			4.80E-02 h				1.4 c	0.13 c	0.066 c	60 c	13 c
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 i						91 n	9.1 n	3.4 n	2600 n	200 n
Ethyl ether	60297	2.00E-01 i				...		120 n	73 n	27 n	20000 n	1600 n
Ethyl methacrylate	97632	9.00E-02 h						330 n	33 n	12 n	9200 n	700 n
Ethyl acetate	141786	9.00E-01 i						3300 n	330 n	120 n	92000 n	7000 n
Ethylbenzene	100414	1.00E-01 i	2.86E-01 i			...	0.7 F	130 n	100 n	14 n	10000 n	780 n
Ethylene cyanohydrin	109784	3.00E-01 h						1100 n	110 n	41 n	31000 n	2300 n
Ethylene diamine	107153	2.00E-02 h						73 n	7.3 n	2.7 n	2000 n	160 n
Ethylene glycol	107211	2.00E+00 i						7300 n	730 n	270 n	200000 n	16000 n
Ethylene glycol, monobutyl ether	111762		5.71E-03 h					21 n	2.1 n			
Ethylene oxide	75218			1.02E+00 h	3.50E-01 h			0.066 c	0.018 c	0.0031 c	2.8 c	0.63 c
Ethylene thiourea (ETU)	96457	8.00E-05 i		6.00E-01 h				0.11 c	0.01 c	0.0053 c	4.8 c	0.63 n
Ethyl p-nitrophenyl phenylphosphorothioate	2104645	1.00E-05 i						0.037 n	0.0037 n	0.0014 n	1 n	0.078 n
Ethylnitrosourea	759739			1.40E+02 w				0.00048 c	0.00005 c	0.00002 c	0.02 c	0.0046 c
Ethylphthalyl ethyl glycolate	84720	3.00E+00 i						11000 n	1100 n	410 n	310000 n	23000 n
Express	10120	8.00E-03 i						29 n	2.9 n	1.1 n	820 n	63 n
Fenamiphos	22224926	2.50E-04 i						0.91 n	0.091 n	0.034 n	26 n	2 n
Fluometuron	2164172	1.30E-02 i						[illegible]	4.7 n	1.8 n	1300 n	100 n
Fluoride	7782414	6.00E-02 i						220 n	22 n	8.1 n	6100 n	470 n

Sources: i=IRIS h=HEAST

Contaminant
Methyl acrylate
2-Methylaniline hydroc
2-Methylaniline
Methyl chlorocarbonate
4-(2-Methyl-4-chlor
2-Methyl-4-chlorophe
2-(2-Methyl-14-chlo
Methylcyclohexane
Methylene bromide
Methylene chloride
4,4'-Methylene bis(2-c
4,4'-Methylenebisbenze
4,4'-Methylene bis(N,N
4,4'-Methylenediphenyl
Methyl ethyl ketone
Methyl hydrazine
Methyl isobutyl ketone
Methyl methacrylate
2-Methyl-5-nitroanili
Methyl parathion
2-Methylphenol (o-cre
3-Methylphenol (m-cr
4-Methylphenol (p-cre
Methyl styrene (mixture)
Methyl styrene (alpha)
Methyl tertbutyl ether (M
Metolaclor (Dual)
Metribuzin
Mirex
Molinate
Molybdenum
Monochloramine
Naled
Napropamide
Nickel refinery dust
Nickel (soluble salts)
Nickel subsulfide
Nitrapyrin
Nitrate

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO o=Other EPA documents F=final D=draft P=proposed T=tentative [c=carcinogen n=noncarcinogen

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	MCL mg/L	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Fluoridone	59756604	8.00E-02 i						290 n	29 n	11 n	8200 n	630 n
Flurprimidol	56425913	2.00E-02 i						73 n	7.3 n	2.7 n	2000 n	160 n
Flutolanil	66332965	6.00E-02 i						220 n	22 n	8.1 n	6100 n	470 n
Fluvalinate	69409945	1.00E-02 i						37 n	3.7 n	1.4 n	1000 n	78 n
Folpet	133073	1.00E-01 i		3.50E-03 i				19 c	1.8 c	0.9 c	820 c	180 c
Fomesafen	72178020			1.90E-01 i				0.35 c	0.033 c	0.017 c	15 c	3.4 c
Fonofos	944229	2.00E-03 i						7.3 n	0.73 n	0.27 n	200 n	16 n
Formaldehyde	50000	2.00E-01 i			4.55E-02 i			730 n	0.14 c	27 n	20000 n	1600 n
Formic Acid	64186	2.00E+00 h						7300 n	730 n	270 n	200000 n	16000 n
Fosetyl-al	39148248	3.00E+00 i						11000 n	1100 n	410 n	310000 n	23000 n
Furan	110009	1.00E-03 i						3.7 n	0.37 n	0.14 n	100 n	7.8 n
Furazolidone	67458			3.80E+00 h				0.018 c	0.0016 c	0.00083 c	0.75 c	0.17 c
Furfural	98011	3.00E-03 i	1.43E-02 h					11 n	5.2 n	0.41 n	310 n	23 n
Furium	531828			5.00E+01 h				0.0013 c	0.00013 c	0.00006 c	0.057 c	0.011 c
Furmecyclox	60568050			3.00E-02 i				2.2 c	0.21 c	0.11 c	95 c	21 c
Glufosinate-ammonium	77182822	4.00E-04 i						1.5 n	0.15 n	0.054 n	41 n	3.1 n
Glycidaldehyde	765344	4.00E-04 i	2.86E-04 h					1.5 n	0.1 n	0.054 n	41 n	3.1 n
Glyphosate	1071836	1.00E-01 i					0.7 F	370 n	37 n	14 n	10000 n	780 n
Haloxyfop-methyl	69806402	5.00E-05 i						0.18 n	0.018 n	0.0068 n	5.1 n	0.39 n
Harmony	79277273	1.30E-02 i						47 n	4.7 n	1.8 n	1300 n	100 n
HCH (alpha)	319846			6.30E+00 i	6.30E+00 i			0.011 c	0.00099 c	0.0005 c	0.45 c	0.1 c
HCH (beta)	319857			1.80E+00 i	1.80E+00 i			0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
HCH (gamma) Lindane	58899	3.00E-04 i		1.30E+00 h			0.0002 F	0.052 c	0.0048 c	0.0024 c	2.2 c	0.49 c
HCH-technical	608731			1.80E+00 i	1.79E+00 i			0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
Heptachlor	76448	5.00E-04 i		4.50E+00 i	4.55E+00 i ***		0.0004 F	0.0023 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Heptachlor epoxide	1024573	1.30E-05 i		9.10E+00 i	9.10E+00 i ***		0.0002 F	0.0012 c	0.00069 c	0.00035 c	0.31 c	0.07 c
Hexabromobenzene	87821	2.00E-03 i			***			1.2 n	0.73 n	0.27 n	200 n	16 n
Hexachlorobenzene	118741	8.00E-04 i		1.60E+00 i	1.61E+00 i ***		0.001 F	0.0066 c	0.0039 c	0.002 c	1.8 c	0.4 c
Hexachlorobutadiene	87683	2.00E-04 h		7.80E-02 i	7.70E-02 i ***			0.12 n	0.073 n	0.027 n	20 n	1.6 n
Hexachlorocyclopentadiene	77474	7.00E-03 i	2.00E-05 h		***		0.05 F	0.015 n	0.0073 n	0.95 n	720 n	55 n
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 i	4.55E+03 i			0.00001 c	1E-06 c	5E-07 c	0.00046 c	0.0001 c
Hexachloroethane	67721	1.00E-03 i		1.40E-02 i	1.40E-02 i ***			0.61 n	0.37 n	0.14 n	100 n	7.8 n
Hexachlorophene	70304	3.00E-04 i						1.1 n	0.11 n	0.041 n	31 n	2.3 n
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 i		1.10E-01 i				0.61 c	0.057 c	0.029 c	26 c	5.8 c
n-Hexane	110543	6.00E-02 h	5.71E-02 i		***			35 n	21 n	8.1 n	6100 n	470 n
Hexazinone	51235042	3.30E-02 i						120 n	12 n	4.5 n	3400 n	260 n
Hydrazine, hydrazine sulfate	302012			3.00E+00 i	1.71E+01 i			0.022 c	0.00037 c	0.0011 c	0.95 c	0.21 c
Hydrogen chloride	7647010		2.00E-03 i					7.3 n	0.73 n			
Hydrogen sulfide	7783064	3.00E-03 i	2.57E-04 i					11 n	0.094 n	0.41 n	310 n	23 n

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO o=Other EPA documents

F=final D=draft P=proposed T=tentative | c=carcinogen n=noncarcinogen

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	MCL mg/L	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
1,2,4-Trichlorobenzene	120821	1.00E-02 i	2.57E-03 h			***	0.07 F	1.8 n	0.94 n	1.4 n	1000 n	78 n
1,1,1-Trichloroethane	71556	9.00E-02 w	2.86E-01 w			***	0.2 F	130 n	100 n	12 n	9200 n	700 n
1,1,2-Trichloroethane	79005	4.00E-03 i		5.70E-02 i	5.60E-02 i	***	0.005 F	0.19 c	0.11 c	0.055 c	50 c	11 c
Trichloroethylene (TCE)	79016	6.00E-03 a		1.10E-02 w	6.00E-03 a	***	0.005 F	1.6 c	1 c	0.29 o	260 c	47 n
Trichlorofluoromethane	75694	3.00E-01 i	2.00E-01 h			***		130 n	73 n	41 n	31000 n	2300 n
2,4,5-Trichlorophenol	95954	1.00E-01 i						370 n	37 n	14 n	10000 n	780 n
2,4,6-Trichlorophenol	88062			1.10E-02 i	1.09E-02 i			6.1 c	0.57 c	0.29 c	260 c	58 c
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 i					0.05 F	37 n	3.7 n	1.4 n	1000 n	78 n
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 i						29 n	2.9 n	1.1 n	820 n	63 n
1,1,2-Trichloropropane	598776	5.00E-03 i				***		3 n	1.8 n	0.68 n	510 n	39 n
1,2,3-Trichloropropane	96184	6.00E-03 i				***		3.7 n	2.2 n	0.81 n	610 n	47 n
1,2,3-TCP as carcinogen	96184			2.70E+00 a		***		0.0039 c	0.0023 c	0.0012 c	1.1 c	0.24 c
1,2,3-Trichloropropene	96195	5.00E-03 h				***		3 n	1.8 n	0.68 n	510 n	39 n
1,1,2-Trichloro-1,2,2-trifluoroethane	76131	3.00E+01 i	8.57E+00 h			***		5900 n	3100 n	4100 n	1000000 n	230000 n
Tridiphane	58138082	3.00E-03 i						11 n	1.1 n	0.41 n	310 n	23 n
Triethylamine	121448		2.00E-03 i					7.3 n	0.73 n			
Trifluralin	1582098	7.50E-03 i		7.70E-03 i				8.7 c	0.81 c	0.41 c	370 c	59 n
1,2,4-Trimethylbenzene	95636	5.00e-04 a				***	0.002 F	0.3 n	0.18 n	0.068 n	51 n	3.9 n
1,3,5-Trimethylbenzene	108678	4.00e-04 a				***	0.002 F	0.24 n	0.15 n	0.054 n	41 n	3.1 n
Trimethyl phosphate	512561			3.70E-02 h				1.8 c	0.17 c	0.085 c	77 c	17 c
1,3,5-Trinitrobenzene	99354	5.00E-05 i						0.18 n	0.018 n	0.0068 n	5.1 n	0.39 n
Trinitrophenylmethylnitramine	479458	1.00E-02 h						37 n	3.7 n	1.4 n	1000 n	78 n
2,4,6-Trinitrotoluene	118967	5.00E-04 i		3.00E-02 i				1.8 n	0.18 n	0.068 n	51 n	3.9 n
Uranium (soluble salts)	7440611	3.00E-03 i						11 n	1.1 n	0.41 n	310 n	23 n
Vanadium	7440622	7.00E-03 h						26 n	2.6 n	0.95 n	720 n	55 n
Vanadium pentoxide	1314621	9.00E-03 i						33 n	3.3 n	1.2 n	920 n	70 n
Vanadium sulfate	36907423	2.00E-02 h						73 n	7.3 n	2.7 n	2000 n	160 n
Vernam	1929777	1.00E-03 i						3.7 n	0.37 n	0.14 n	100 n	7.8 n
Vinclozolin	50471448	2.50E-02 i						91 n	9.1 n	3.4 n	2600 n	200 n
Vinyl acetate	108054	1.00E+00 h	5.71E-02 i					3700 n	21 n	140 n	100000 n	7800 n
Vinyl bromide	593602		8.57E-04 i			***		0.52 n	0.31 n			
Vinyl chloride	75014			1.90E+00 h	3.00E-01 h	***	0.002 F	0.019 c	0.021 c	0.0017 c	1.5 c	0.34 c
Warfarin	81812	3.00E-04 i						1.1 n	0.11 n	0.041 n	31 n	2.3 n
m-Xylene	108323	2.00E+00 h	2.00E-01 w			***	10 F	140 n	73 n	270 n	200000 n	16000 n
o-Xylene	95476	2.00E+00 h	2.00E-01 w			***	10 F	140 n	73 n	270 n	200000 n	16000 n
p-Xylene	106423		8.57E-02 w			***	10 F	52 n	31 n			
Xylene (mixed)	1330207	2.00E+00 i				***	10 F	1200 n	730 n	270 n	200000 n	16000 n
Zinc	7440666	3.00E-01 i						1100 n	110 n	41 n	31000 n	2300 n
Zinc phosp	1314847	3.00E-04 i						1.1 n	0.11 n	0.041 n	31 n	2.3 n

=carcinogen n=noncarcinogen

	Industrial soil mg/kg	Residential soil mg/kg
g		
5.4 n	4100 n	310 n
1.8 n	1300 n	100 n
34 n	26000 n	2000 n
5.4 n	4100 n	310 n
41 n	31000 n	2300 n
3.3 c	3000 c	670 c
2 n	1500 n	120 n
14 n	10000 n	780 n
6.8 n	5100 n	390 n
018 c	0.16 c	0.035 c
.27 n	200 n	16 n
001 n	0.01 n	0.00078 n
.27 n	200 n	16 n
2.7 n	2000 n	160 n
27 n	20000 n	1600 n
2.7 n	2000 n	160 n
14 n	10000 n	780 n
68 n	51000 n	3900 n
0027 n	2 n	0.16 n
4.1 n	3100 n	230 n
0.68 n	510 n	39 n
0.68 n	510 n	39 n
.012 n	9.2 n	0.7 n
4.1 n	3100 n	230 n
0041 n	31 n	2.3 n
0.041 n	31 n	2.3 n
0041 n	3.1 n	0.23 n
0041 n	3.1 n	0.23 n
8.1 n	6100 n	470 n
0.014 n	10 n	0.78 n
.0068 n	5.1 n	0.39 n
68 n	51000 n	3900 n
0.14 n	100 n	7.8 n
3.4 n	2600 n	200 n
0.68 n	510 n	39 n
0.27 n	200 n	16 n
0.14 n	100 n	7.8 n
0.069 c	62 c	14 c
140 n	100000 n	7800 n

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO o=Other EPA documents *F=final D=draft P=proposed T=tentative /c=carcinogen n=noncarcinogen*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg•d/mg	CPSi kg•d/mg	VOC	MCL mg/L	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Zineb	12122677	5.00E-02 *i*						180 *n*	18 *n*	6.8 *n*	5100 *n*	390 *n*

APPENDIX R-4

DERIVATION OF ESSENTIAL NUTRIENT SCREENING CONCENTRATION USED FOR SELECTION OF HUMAN HEALTH CHEMICALS OF POTENTIAL CONCERN

DERIVATION OF SURFACE SOIL AND GROUNDWATER SCREENING CONCENTRATIONS FOR CPC SELECTION

Certain inorganics (calcium, iron, magnesium, potassium, and sodium) that are present as naturally occurring constituents in soil and groundwater, are required in limited intakes to maintain normal human physiological functions, and are therefore considered essential nutrients. The Risk Assessment Guidance for Superfund (RAGS), Volume I, Part A, regarding the treatment of essential nutrients in selection of Contaminants of Potential Concern (CPC), states that essential nutrients need not be quantitatively evaluated in a public health risk assessment if they are 1) present at low concentrations (only slightly above background) and 2) toxic only at doses much higher than those which might be related to exposure at the site (USEPA, 1989). In this report, "only slightly above background" is interpreted to mean that the arithmetic mean of the site concentrations is less than two times the arithmetic mean of the background concentrations. The focus of this section of the document is the technical approach for determining that an analyte is "toxic only at doses higher than those associated with exposures at the site" and a mechanism for making that determination by employing soil and groundwater screening concentrations. The screening concentrations are used to streamline the process and to eliminate the need to calculate essential nutrient doses as part of CPC selection at every site. If the maximum concentration of an essential nutrient does not exceed the appropriate screening concentration shown below, the essential nutrient is considered non-toxic. Essential nutrients are not retained as CPCs if they are detected at concentrations that are either consistent with background or do not exceed the screening concentrations.

Currently, no published essential nutrient screening concentrations for use in risk assessment CPC selection are available. Therefore, ABB-ES has derived surface soil and groundwater screening concentrations of essential nutrients that, when contacted in accordance with the exposure assumptions described below, are not expected to result in adverse health effects. The screening concentrations for groundwater and surface soil are presented in Table R-4.1. The essential nutrient concentrations in surface soil and groundwater are to be compared directly to the nutrient screening concentrations for the purposes of CPC selection.

Table R-4.1
Essential Nutrient Screening Concentrations for Surface Soil and Groundwater

Essential Nutrient	Surface Soil Screening Concentration (mg/kg)	Groundwater Screening Concentration (μg/L)
Calcium	1,000,000 [1]	1,055,398
Iron	47,824	13,267
Magnesium	460,468	118,807
Potassium	1,000,000 [1]	297,016
Sodium	1,000,000 [1]	396,022

[1] Actual calculated screening concentration is greater than 1,000,000 mg/kg (Table R-4.5), indicating that this essential nutrient would not be present at toxic levels in surface soil.

As described below, screening concentrations for surface soil and groundwater represent conservative screening concentrations for other media. These surface soil and groundwater screening concentrations are used to screen sediment and surface water, respectively.

DOCUMENTATION OF SURFACE SOIL AND GROUNDWATER SCREENING CONCENTRATIONS

The essential nutrient toxicity screening concentrations were derived in two steps: first, a "non-toxic" dose was identified for each essential nutrient; second, the soil and groundwater concentrations associated with the "non-toxic" doses were calculated using standard residential exposure assumptions. The details of the derivation of the screening values are presented below.

Identification of non-toxic doses

The identification of doses which are not toxic is often accomplished by identifying Reference Doses (RfDs) which are published by USEPA. These RfDs represent doses, including a margin of safety, to which even sensitive subpopulations could be exposed for a lifetime without adverse non-carcinogenic effects. Because no RfDs for calcium, iron, magnesium, potassium, or sodium are available in the Integrated Risk Information System (IRIS) (USEPA, 1994a) or the Health Effects Assessment Summary Tables (HEAST) (USEPA, 1994b), other published non-toxic doses were sought out. Recommended Dietary Allowances (RDAs) prepared by the Food and Nutrition Board (FNB) of the National Research Council (NRC, 1989) have been selected here to represent non-toxic doses.

RDAs are defined by the FNB as "the levels of intake of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy persons." It is assumed here, that since the RDA represents a requirement for good nutrition, that it also represents a dose which is non-toxic. Although some essential nutrients (arsenic for example) have been classified as carcinogens, none of the five nutrients discussed here have been classified as carcinogens. The available RDA data for calcium, iron, magnesium, potassium and sodium are presented in Table R-4.2. From this data set, RDAs for children were preferentially selected to coincide with the child exposure scenario. RDAs were converted from units of mg/day to units of mg/kg/day by dividing the RDA by the child resident body weight of 15 kg (USEPA, 1991). Dermal RDAs were developed by adjusting the oral RDA to compensate for the oral absorption efficiency in a manner similar to that presented in Appendix A of RAGS, Volume I, Part A (USEPA, 1989), and described in the human health risk assessment methodology of this document.

Table R-4.2

Recommended Dietary Allowances [1]

Nutrient	RDA	Age (years)	Oral Absorption (%)	Typical dietary intake (mg/day)	Toxicity Threshold (mg/day)	Oral RDA (mg/kg/day) [2]	Dermal RDA (mg/kg/day) [3]
Calcium	800 (mg/day)	1-10	40	743 (average of all ages)	NA	53.3	21.2
	1200 (mg/day)	11-24		1179	NA		
	800 (mg/day)	>24		743 (average of all ages); 530 (women ages 35-50)	>2500		
Iron	10 (mg/day)	1-20	10-15	10-15	25-75 (NOAEL); 3000 (lethal)	0.67	0.067
	15 (mg/day)	>20		10-15	25-75 (NOAEL); 14000 (lethal)		
Magnesium	6 (mg/kg/day)	1-15	50	193 (age 1-5)	NA	6	3
	4.5 (mg/kg/day)	>15		207-329	NA		
Potassium	15-20 (mg/kg/day)	1-10	90	1500	NA	15	13.5
	1600-2000 (mg/day)	>20		2500	18000 (hyperkalemia)		
Sodium	300 (mg/day)	2-5	90 [4]	NA	NA	20	18
	500 (mg/day)	Adult		1800-5000	2400 (intake not to be exceeded)		

Notes:
[1] All data from NRC (1989).
[2] Adjusted oral RDA calculated by dividing the RDA (mg/kg) by the bodyweight of a child ages 1-6 (15 kg) (USEPA, 1991); RDAs provided in mg/kg/day
were not modified.
[3] Adjusted dermal RDA calculated by multiplying the oral RDA by the oral absorption efficiency (USEPA, 1989).
[4] Oral absorption data not available; value for potassium used as a surrogate based on physio-chemical similarities.

Calculation of screening concentrations

Risk-based screening concentrations for essential nutrients were derived by estimating concentrations in soil and groundwater that correspond to the RDAs for a residential exposure scenario. When the dose is equal to the RDA, the hazard quotient for the situation would equal one. Risk calculation spreadsheets have been used to assist in the calculation of the screening concentrations. When the concentration of an essential nutrient and the associated hazard quotient are known, only a simple calculation is needed to identify the concentration associated with a hazard quotient of one. An arbitrary nutrient concentration has been entered into risk spreadsheets to derive associated hazard quotient values as shown in Tables R-4.3 and R-4.4. Once that information was available, the equality shown below was used to calculate screening soil concentration with the target hazard quotient equal to one.

$$\frac{\textit{Baseline Soil Concentration}}{\textit{Baseline Hazard Quotient}} = \frac{\textit{Screening Soil Concentration}}{\textit{Target Hazard Quotient}}$$

Screening groundwater concentrations were calculated in a similar manner. The surface soil and groundwater risk assessment spreadsheets used to calculate the hazard quotients for each essential nutrient are based on the same methodology that was used to develop risk estimates for surface soil and groundwater in this report. The baseline soil concentration is arbitrary and is used only to establish a baseline hazard quotient to solve the equality.

To derive screening concentrations that would be protective to the majority of the exposed population, the exposure assumptions for the most sensitive receptor evaluated in this report (e.g, a child resident) were used. For groundwater, screening concentrations were based on ingestion of groundwater as drinking water. For surface soil, screening concentrations were based on ingestion of surface soil and dermal contact with surface soil. Child resident exposure to surface soil and groundwater used as drinking water is usually greater than or equal to oral and dermal exposure to media treated as soil and groundwater, respectively, for exposure assessment. Therefore, screening values for surface soil represent conservative screening values for sediment, and screening values for groundwater used as drinking water represent conservative screening values for surface water. The exposure parameters for the child resident are presented the accompanying surface soil and groundwater screening concentration spreadsheets (Tables R-4.3 and R-4.4, respectively).

The calculated essential nutrient screening concentrations for surface soil and groundwater are presented in Table R-4.5. These values represent the concentrations of individual essential nutrients in media that, if contacted in accordance with the exposure parameters used to derive the screening concentration, would theoretically result in the receptor receiving their recommended dietary allowance of an essential nutrient solely from the contacted media. For some nutrients, the calculated screening concentrations exceed one million mg/kg (i.e., 100%). Such concentrations indicate that no concentration of nutrient in the particular media would result in an intake that exceeds

the RDA, given the exposure assumptions on which the screening value is based. Because these screening concentrations do not take into account the additivity of exposures between media (and other dietary intakes, including food), a receptor exposed to essential nutrients that are present in multiple media at the screening concentrations would, in essence, be receiving more than their recommended dietary allowance of nutrient. However, data provided in Table R-4.2 indicate that the toxicity threshold for most essential nutrients is several times greater than the RDA; the RDA is not a toxicity threshold value. Therefore, these screening concentrations do not represent concentrations which, if exceeded, would necessarily result in deleterious effects.

Table R-4.5

Theoretical Essential Nutrient Screening Concentrations for Surface Soil and Groundwater

Essential Nutrient	Surface Soil Screening Concentration (mg/kg) [1]	Groundwater Screening Concentration (μg/L) [2]
Calcium	4,070,824 [3]	1,055,398
Iron	47,824	13,267
Magnesium	460,468	118,807
Potassium	1,160,864 [3]	297,016
Sodium	1,547,819 [3]	396,022

Notes:

[1] Surface soil screening concentrations calculated as described in text, using RDAs presented in Table R-4.2 and the exposure parameters and risk calculations presented in Table R-4.3.

[2] Groundwater screening concentrations calculated as described in text, using RDAs presented in Table R-4.2 and the exposure parameters and risk calculations presented in Table R-4.4.

[3] The calculation of a screening concentration larger than 1,000,000 mg/kg indicates that no concentration results in an intake greater than the RDA, given the standard exposure parameters.

References

National Research Council (NRC). (1989) "Recommended Dietary Allowances, Tenth Edition". National Research Council Subcommittee on the Tenth Edition of the RDAs, Food and Nutrition Board Commission on Life Sciences. National Academy of Sciences. National Academy Press, Washington, D.C.

USEPA (1989) "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A)". U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C., December. EPA/540/1-89/002.

USEPA (1991) "Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors". OSWER Directive 9285.6-03.

USEPA (1994a). Integrated Risk Information System (IRIS). Online. Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH.

USEPA (1994b). "Health Effects Assessment Summary Tables: FY-1994 Annual". U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C., March, 1994. EPA 540-R-94-020.

APPENDIX R-5

DOCUMENTATION FOR BACKGROUND DATA SETS USED IN BASELINE RISK ASSESSMENT

This appendix contains the documentation of the background data sets which have been used as part of the selection of chemicals of potential concern (CPC) in both the human health risk assessment and the ecological risk assessment. For each of the four media evaluated (surface soil, surface water, sediment and groundwater), two tables are presented. The first table identifies the samples which are included in the background data set for that medium. The second table presents, in summary form, the data which is included in the data set as well as documenting the derivation of the "background screening levels" which have been used in the CPC selection process. Consistent with the U.S. EPA Region IV guidance, the background screening level is two times the arithmetic mean of the background data (U.S. EPA Region IV, "Region IV Risk Assessment Guidance", March 20, 1991).

Background sampling locations for soil, surface water and sediment are identified in the attached Figure 2-6. The background sampling locations for groundwater are identified in the attached Figure 2-3.

TABLE R-5.1 SAMPLE LIST FOR THE FINAL SURFACE SOIL BACKGROUND DATA SET.

Sample ID	Orig Samp ID	Collect Date	Number of Occurrences
01S00301	JXSB04001	06/06/1993	165
01S00401	JXSB04201	06/02/1993	165
01S00501	JXSB04601	06/02/1993	165
01S00701	JXSB05601	06/03/1993	165
01S00801	JXSB06401	06/03/1993	165
01S00901	JXSB07401	06/03/1993	164
01S01001	JXSB08301	06/03/1993	165
01S01101	JXSB05701	07/14/1993	165
01S01201	JXSB06501	07/14/1993	165
01S01301	JXSB06801	07/09/1993	165
01S01301D	JXSB06801DUP	07/09/1993	165
JXS04003	JXS04003	10/13/1994	18
JXS05003	JXS05003	10/13/1994	18
JXS06404	JXS06404	10/13/1994	18

Note: Bechtel radiological background data will be added to this data set in the next revision of this document (Bechtel Environmental, Inc., "NAS JACKSONVILLE RADIOLOGICAL BACKGROUND", January 6, 1995).

Table R-5.2
Identification of Background Screening Concentration
Surface Soil OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection [1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations [2]	Background Screening Concentration [3]
Semivolatiles (µg/kg)					
Acetone	6/10	3 - 11	10 - 12.5	6.7	NA
Anthracene	1/10	37 - 37	340 - 420	37	NA
Benzo(a)Anthracene	2/10	27 - 250	340 - 420	139	NA
Benzo(a)Pyrene	3/10	29 - 150	340 - 420	71	NA
Benzo(b)Fluoranthene	3/10	26 - 330	340 - 420	140	NA
Benzo(g,h,i)Perylene	3/10	43 - 80	340 - 420	57.3	NA
Benzo(k)Fluoranthene	3/10	20 - 100	340 - 420	49.3	NA
Carbazole	1/10	46 - 46	340 - 420	46	NA
Chrysene	3/10	24 - 350	340 - 420	138	NA
Di-n-Butylphthalate	1/10	355* - 355*	340 - 420	355	NA
Dibenz(a,h)Anthracene	2/10	18 - 31	340 - 420	24.5	NA
Fluoranthene	3/10	20 - 390	340 - 420	147	NA
Indeno(1,2,3-cd)Pyrene	3/10	41 - 88	340 - 420	57	NA
Phenanthrene	1/10	36 - 36	340 - 420	36	NA
Phenol	1/10	19 - 19	340 - 420	19	NA
Pyrene	3/10	28 - 430	340 - 420	163	NA
bis(2-Ethylhexyl)Phthalate	1/10	18 - 18	340 - 420	18	NA
Pesticides/PCBs (µg/kg)					
4,4-DDD	1/10	2.7 - 2.7	3.4 - 15	2.7	NA
4,4-DDE	4/10	1.8 - 12	3.4 - 15	4.6	NA
4,4-DDT	3/10	2.2 - 18	3.4 - 15	8.2	NA
Aroclor-1260	1/10	26 - 26	26 - 150	26	NA
Dieldrin	2/10	0.43 - 97	3.4 - 15	48.7	NA
alpha-Chlordane	1/10	0.25 - 0.25	1.8 - 7.5	0.25	NA
gamma-Chlordane	2/10	0.37 - 0.81	1.8 - 7.5	0.59	NA
Dioxins (µg/kg)					
1,2,3,4,6,7,8-HpCDD	1/3	0.0614 - 0.0614	0.00634 - 0.0826	0.0614	NA
OCDD	2/3	0.211 - 0.517	0.0148 - 0.227	0.364	NA
Inorganics (mg/kg)					
Aluminum	10/10	31.8 - 1,710	3.3 - 7.55	670	1,340
Arsenic	7/10	0.29 - 0.6	0.21 - 0.37	0.4	0.8
Barium	10/10	1.1 - 12.7	0.08 - 0.46	5.6	11.2
Calcium	10/10	48.2 - 6,200	1.45 - 7.5	1,180	2,360
Chromium	7/10	1.5 - 4.6	0.06 - 2.3	3.3	6.6
Copper	3/10	1.7 - 5.2	0.28 - 1.1	2.9	5.8

Table R-5.2 (Continued)
Identification of Background Screening Concentration
Surface Soil OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection [1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations [2]	Background Screening Concentration [3]
inorganics (mg/kg)					
Cyanide	3/7	0.18 - 0.22	0.06 - 1.2	0.2	0.4
Iron	10/10	124 - 928	1.1 - 2.3	426	852
Lead	10/10	1.2 - 26.6	0.21 - 1.6	7.2	14.4
Magnesium	9/10	15.9 - 154	3 - 6.8	49.9	99.8
Manganese	10/10	1.4 - 37.4	0.1 - 0.46	9	18
Nickel	5/10	2.8* - 14.7	2.15 - 3.3	5.5	11
Sodium	8/10	103 - 221	2.3 - 41	144	288
Thallium	1/10	0.21 - 0.21	0.21 - 0.26	0.21	0.42
Vanadium	8/9	0.58 - 4.6	0.38 - 0.91	1.9	3.8
Zinc	8/10	3.8 - 16.1	0.48 - 0.975	7.6	15.2
Radioisotopes (pci/g)					
Actinium-228	10/10	0.652 - 1.46	NR	1	2
Bismuth-210	4/10	1.4 - 2.58	NR	1.9	3.8
Bismuth-214	10/10	0.437 - 1.02	NR	0.71	1.42
Cesium-137	8/10	0.0301 - 0.527	NR	0.14	0.28
Lead-212	10/10	0.325 - 0.923	NR	0.63	1.26
Lead-214	10/10	0.412 - 0.991	NR	0.67	1.34
Potassium-40	10/10	0.8 - 4.335*	NR	2.6	5.2
Radium-223	4/10	0.709 - 1.56	NR	1.1	2.2
Radium-224	7/10	0.82* - 2.14	NR	1.5	3.0
Radium-228	10/10	0.652 - 1.46	NR	1	2
Thallium-208	10/10	0.175 - 0.529	NR	0.33	0.66
Thorium-231	5/10	0.069* - 0.145	NR	0.12	0.24
Thorium-232	9/10	0.724 - 1.46	NR	1.1	2.2
Thorium-234	2/10	0.595* - 4.24	NR	2.4	4.8
Uranium-234	2/10	2.23 - 2.38	NR	2.3	4.6
Uranium-238	2/10	2.23 - 2.38	NR	2.3	4.6

See notes at end of table.

Table R-5.2 (Continued)
Identification of Background Screening Concentration
Surface Soil OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection [1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations [2]	Background Screening Concentration [3]

[1] Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed. The samples analyzed are identified in Table R-5.1.
[2] The average of detected concentrations is the mean of all samples in which the analyte was detected. It does not include those samples in which the analyte was not detected.
[3] Two times the mean for inorganic analytes.

Notes: NA = not applicable.
μg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
NA = not applicable.
NR = not reported.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethylene.
DDT = dichlorodiphenyltrichloroethane.
OCDD = octachlorodibenzo-p-dioxin.
HpCDD = heptachlorodibenzo-p-dioxin.

TABLE R-5.3 SAMPLE LIST FOR THE FINAL SURFACE WATER BACKGROUND DATASET.

The "Old Sample ID" is the original identifier which is used throughout the RI report. The "Sample ID" is an identifier used only for risk assessment purposes only. "Number of Occurrences" indicates the number of records(parameters) in the data set for a given sample.

Sample ID	Old Samp ID	Collect Date	Number of Occurrences
01W05201	JXSW05901	09/09/1993	161
01W05301	JXSW06001	09/09/1993	161
01W05401	JXSW06101	09/08/1993	161
01W05501	JXSW06201	09/08/1993	161
01X05201	JXSW05901	09/09/1993	23
01X05301	JXSW06001	09/09/1993	23
01X05401	JXSW06101	09/08/1993	23
01X05501	JXSW06201	09/08/1993	23

Table R-5.4
Identification of Background Screening Concentrations
Surface Water at OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection [1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations[2]	Background Screening Concentration[3]
Inorganics (µg/l)					
Arsenic	3/4	0.7 - 2.9	0.8 - 0.8	1.6	3.2
Barium	4/4	29.2 - 70.2	1 - 1	41.5	83
Calcium	4/4	7,320 - 34,200	22 - 22	19,555	39,110
Copper	4/4	2.1 - 7.1	1.1 - 1.1	3.8	7.6
Cyanide	3/4	0.6 - 3.1	0.9 - 0.9	1.5	3
Iron	4/4	362 - 1,920	7.2 - 7.2	1,218	2,436
Lead	4/4	0.8 - 8.7	0.5 - 0.5	3.3	6.6
Magnesium	4/4	1,800 - 5,090	15.4 - 15.4	3,063	6,126
Manganese	4/4	6.1 - 28.9	0.8 - 0.8	19.8	39.6
Potassium	4/4	453 - 1,530	337 - 337	896	1,792
Sodium	4/4	7,770 - 14,400	15.9 - 15.9	10,435	20,870
Vanadium	4/4	2 - 3.4	1.8 - 1.8	2.8	5.6
Zinc	4/4	14.8 - 38.7	0.9 - 0.9	23.2	46.4
Radioisotope (pci/l)					
Bismuth-214	1/4	11.2 - 11.2	NR	11.2	22.4
Thorium-234	1/4	158 - 158	NR	158	316
Dissolved Inorganics (µg/l)					
Diss. Aluminum	4/4	32.5 - 301	7.6 - 7.6	211	422
Diss. Arsenic	4/4	0.9 - 2.7	0.8 - 0.8	1.5	3.0
Diss. Barium	4/4	28.8 - 48.1	1 - 1	35.3	70.6
Diss. Cadmium	1/4	0.73 - 0.73	0.7 - 0.7	0.73	1.46
Diss. Calcium	4/4	7,050 - 32,500	22 - 22	19,013	38,026
Diss. Copper	3/4	1.6 - 6.2	1.1 - 1.1	3.1	6.2
Diss. Iron	4/4	232 - 1,090	7.2 - 7.2	601	1,202
Diss. Lead	2/4	0.9 - 1.5	0.5 - 0.5	1.2	2.4
Diss. Magnesium	4/4	1,780 - 4,930	15.4 - 15.4	3,013	6,026
Diss. Manganese	4/4	6.8 - 29.2	0.8 - 0.8	17.8	35.6
Diss. Potassium	4/4	615 - 1,430	337 - 337	940	1,880
Diss. Sodium	4/4	7,760 - 14,300	15.9 - 15.9	10,410	20,820
Diss. Vanadium	1/4	4.3 - 4.3	1.8 - 1.8	4.3	8.6
Diss. Zinc	4/4	14.5 - 21.1	0.9 - 0.9	17.8	35.6

See notes at end of table.

Table R-5.4 (Continued)
Identification of Background Screening Concentrations
Surface Water at OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

[1] Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed. The samples analyzed are identified in Table R-5.3.
[2] The average of detected concentrations is the mean of all samples in which the analyte was detected. It does not include those samples in which the analyte was not detected.
[3] Two times the mean for inorganic analytes.

Note: μg/l = micrograms per liter.

TABLE R-5.5 SAMPLE LIST FOR THE FINAL SEDIMENT BACKGROUND DATA SET.

Sample ID	Old Samp ID	Collect Date	Number of Occurrences
01D05701	JXSD05801	09/07/1993	164
01D05801	JXSD05901	09/09/1993	164
01D05901	JXSD06001	09/09/1993	164
01D06101	JXSD06201	09/08/1993	164

Table R-5.6
Identification of Background Screening Concentrations
Sediment at OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection[1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations[2]	Background Screening Concentration[3]
Volatiles (µg/kg)					
2-Butanone	1/4	8 - 8	10 - 14	8	NA
Acetone	3/4	24 - 35	10 - 14	28.7	NA
Semivolatiles (µg/kg)					
Anthracene	1/4	84 - 84	450 - 470	84	NA
Benzo(a)Anthracene	1/4	470 - 470	450 - 470	470	NA
Benzo(a)Pyrene	1/4	480 - 480	450 - 470	480	NA
Benzo(b)Fluoranthene	1/4	540 - 540	450 - 470	540	NA
Benzo(g,h,i)Perylene	1/4	90 - 90	450 - 470	90	NA
Benzo(k)Fluoranthene	1/4	370 - 370	450 - 470	370	NA
Chrysene	1/4	540 - 540	450 - 470	540	NA
Dibenz(a,h)Anthracene	1/4	80 - 80	450 - 470	80	NA
Fluoranthene	1/4	1,300 - 1,300	450 - 470	1,300	NA
Indeno(1,2,3-cd)Pyrene	1/4	180 - 180	450 - 470	180	NA
Phenanthrene	1/4	590 - 590	450 - 470	590	NA
Pyrene	1/4	1,100 - 1,100	450 - 470	1,100	NA
Pesticides/PCBs (µg/kg)					
4,4-DDD	1/4	51 - 51	4.2 - 22	51	NA
4,4-DDE	2/4	3.1 - 170	4.2 - 22	86.6	NA
Inorganics (mg/kg)					
Aluminum	4/4	239 - 1,220	1.9 - 5.7	595	1,190
Antimony	1/4	4.6 - 4.6	3.2 - 4.5	4.6	9.2
Arsenic	3/4	0.2 - 0.97	0.2 - 0.74	0.63	1.26
Barium	4/4	2.2 - 9.6	0.25 - 0.38	4.9	9.8
Beryllium	1/4	0.24 - 0.24	0.1 - 0.15	0.24	0.48
Cadmium	1/4	0.3 - 0.3	0.18 - 0.87	0.3	0.6
Calcium	4/4	124 - 8,660	5.6 - 47.2	3,234	6,468
Chromium	3/4	0.73 - 2.9	0.62 - 0.84	1.9	3.8
Cobalt	1/4	1.9 - 1.9	0.87 - 1.6	1.9	3.8
Copper	3/4	2.6 - 4.2	0.28 - 0.59	3.5	7
Cyanide	3/4	0.06 - 0.11	0.11 - 0.22	0.08	0.16
Iron	4/4	560 - 2,290	1.4 - 2.2	1,150	2,300
Lead	4/4	2 - 12.3	0.13 - 0.18	7.2	14.4
Magnesium	4/4	25.2 - 110	3.9 - 5.7	65.5	131
Manganese	4/4	1.5 - 4.9	0.2 - 0.26	3.4	6.8
Mercury	1/4	0.05 - 0.05	0.02 - 0.03	0.05	0.1

See notes at end of table.

Table R-5.6 (Continued)
Identification of Background Screening Concentrations
Sediment at OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection[1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations[2]	Background Screening Concentration[3]
Inorganics (mg/kg)					
Nickel	3/4	2.9 - 3.4	1.9 - 3.2	3.1	6.2
Potassium	1/4	109 - 109	85.8 - 111	109	218
Selenium	1/4	0.21 - 0.21	0.18 - 0.43	0.21	0.42
Sodium	3/4	239 - 260	4 - 4.8	249	498
Thallium	1/4	0.19 - 0.19	0.19 - 1.8	0.19	0.38
Vanadium	3/4	0.77 - 4.6	0.46 - 0.64	2.6	5.2
Zinc	4/4	2.6 - 18.8	0.23 - 0.51	9.2	18.4
Total Petroleum Hydrocarbons (mg/kg)					
Total Petroleum Hydrocarbons	4/4	22.5 - 51.6	4.4 - 5.4	33.3	NA
Radioisotope (pci/g)					
Actinium-228	4/4	0.64 - 0.887	NR	0.8	1.6
Bismuth-212	2/4	1.06 - 1.34	NR	1.2	2.4
Bismuth-214	4/4	0.418 - 0.668	NR	0.54	1.08
Cesium-137	2/4	0.0953 - 0.14	NR	0.12	0.24
Lead-212	4/4	0.378 - 0.816	NR	0.52	1.04
Lead-214	1/4	0.447 - 0.447	NR	0.45	0.90
Potassium-40	1/4	3.66 - 3.66	NR	3.7	7.4
Thallium-208	4/4	0.188 - 0.286	NR	0.24	0.48
Uranium-235	1/4	0.125 - 0.125	NR	0.13	0.26

[1] Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed. The samples analyzed are identified in Table R-5.5.
[2] The average of detected concentrations is the mean of all samples in which the analyte was defected. It does not include those samples in which the analyte was not detected.
[3] Two times the mean for inorganic analytes.

Notes: NA = not applicable.
DDE = dichlorodiphenyldichloroethylene.
DDD = dichlorodiphenyldichloroethane
$\mu g/\ell$ = micrograms per liter.

TABLE R-5.7 SAMPLE LIST FOR THE FINAL GROUNDWATER BACKGROUND DATA SET.

Please note that for risk assessment purposes, only unfiltered groundwater samples were used to characterize background conditions. Unfiltered samples are identified below with "Sample ID" which begins with "01G....., while filtered samples are identified with "Sample ID" which begins with "01H.....".

Sample ID	Old Samp ID	Collect Date	Number of Occurrences
01G10301	JXMW03601	07/28/1993	160
01G10401	JXMW03801	08/04/1993	160
01G10501	JXMW04001	07/28/1993	160
01G10601	JXMW04201	07/27/1993	159
01G10701	JXMW04401	08/02/1993	11
01G10702	JXMW04401	08/03/1993	149
01G10801	JXMW04601	07/28/1993	160
01G10901	JXMW04801	07/28/1993	160
01G11001	JXMW05001	07/28/1993	160
01G11101	JXMW05301	07/27/1993	160
01G11201	JXMW05601	08/02/1993	160
01G11201D	JXMW05601DUP	08/02/1993	160
01G11301	JXMW05901	07/27/1993	160
01G11401	JXMW06401	08/02/1993	160
01G11501	JXMW06901	08/02/1993	11
01G11501D	JXMW06901DUP	08/02/1993	11
01G11502	JXMW06901	08/03/1993	149
01G11502D	JXMW06901DUP	08/03/1993	149
01G11601	JXMW07401	08/02/1993	160
01G11801	JXMW08101	07/28/1993	160
01G11901	JXMW08301	07/29/1993	160
01G12701	JXMW03701	08/04/1993	160
01G12801	JXMW03901	07/28/1993	160
01G12901	JXMW04101	07/27/1993	159
01G13001	JXMW04301	08/02/1993	11
01G13002	JXMW04301	08/03/1993	149
01G13101	JXMW04501	07/27/1993	160
01G13101D	JXMW04501DUP	07/27/1993	160
01G13201	JXMW04701	07/28/1993	160
01G13301	JXMW04901	07/28/1993	160
01G13501	JXMW05201	07/27/1993	160
01G13601	JXMW05401	07/28/1993	160
01G13601D	JXMW05401DUP	07/28/1993	160
01G13701	JXMW05501	08/02/1993	160
01G13801	JXMW05701	08/02/1993	160
01G13901	JXMW05801	07/27/1993	160
01G14001	JXMW06001	08/02/1993	160
01G14201	JXMW06201	07/29/1993	160
01G14301	JXMW06301	08/02/1993	160
01G14401	JXMW06501	08/02/1993	160
01G14501	JXMW06601	07/26/1993	160
01G14701	JXMW06801	08/02/1993	11

01G14702	JXMW06801	08/03/1993	149
01G14801	JXMW07001	07/29/1993	160
01G14901	JXMW07101	07/29/1993	160
01G14901D	JXMW07101DUP	07/29/1993	160
01G15001	JXMW07201	07/29/1993	160
01G15101	JXMW07301	08/02/1993	160
01G15201	JXMW07501	08/02/1993	160
01G15401	JXMW07701	07/29/1993	160
01G15601	JXMW08001	07/28/1993	160
01G15701	JXMW08201	07/29/1993	160
01H10301	JXMW03601	07/28/1993	23
01H10401	JXMW03801	08/04/1993	23
01H10501	JXMW04001	07/28/1993	23
01H10601	JXMW04201	07/27/1993	23
01H10702	JXMW04401	08/03/1993	23
01H10801	JXMW04601	07/28/1993	23
01H10901	JXMW04801	07/28/1993	23
01H11001	JXMW05001	07/28/1993	23
01H11101	JXMW05301	07/27/1993	23
01H11201	JXMW05601	08/02/1993	23
01H11201D	JXMW05601DUP	08/02/1993	23
01H11301	JXMW05901	07/27/1993	23
01H11401	JXMW06401	08/02/1993	23
01H11502	JXMW06901	08/03/1993	23
01H11502D	JXMW06901DUP	08/03/1993	23
01H11601	JXMW07401	08/02/1993	23
01H11801	JXMW08101	07/28/1993	23
01H11901	JXMW08301	07/29/1993	23
01H12701	JXMW03701	08/04/1993	23
01H12801	JXMW03901	07/28/1993	23
01H12901	JXMW04101	07/27/1993	23
01H13002	JXMW04301	08/03/1993	23
01H13101	JXMW04501	07/27/1993	23
01H13101D	JXMW04501DUP	07/27/1993	23
01H13201	JXMW04701	07/28/1993	23
01H13301	JXMW04901	07/28/1993	23
01H13501	JXMW05201	07/27/1993	23
01H13601	JXMW05401	07/28/1993	23
01H13601D	JXMW05401DUP	07/28/1993	23
01H13701	JXMW05501	08/02/1993	23
01H13801	JXMW05701	08/02/1993	23
01H13901	JXMW05801	07/27/1993	23
01H14001	JXMW06001	08/02/1993	23
01H14201	JXMW06201	07/29/1993	23
01H14301	JXMW06301	08/02/1993	23
01H14401	JXMW06501	08/02/1993	23
01H14501	JXMW06601	07/26/1993	23
01H14702	JXMW06801	08/03/1993	23
01H14801	JXMW07001	07/29/1993	23
01H14901	JXMW07101	07/29/1993	23
01H14901D	JXMW07101DUP	07/29/1993	23
01H15001	JXMW07201	07/29/1993	23
01H15101	JXMW07301	08/02/1993	23
01H15201	JXMW07501	08/02/1993	23

01H15401	JXMW07701	07/29/1993	23
01H15601	JXMW08001	07/28/1993	23
01H15701	JXMW08201	07/29/1993	23

Table R-5.8
Identification of Background Screening Concentrations
Unfiltered Groundwater at OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection [1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations[2]	Background Screening Concentration[3]
Volatiles (µg/l)					
Carbon Disulfide	5/42	1 - 7	10 - 10	3	NA
Chloroform	1/42	2 - 2	10 - 10	2	NA
Chloromethane	2/42	1 - 3	10 - 10	2	NA
Xylene (total)	1/42	1 - 1	10 - 10	1	NA
Semivolatiles (µg/l)					
Diethylphthalate	1/42	3 - 3	10 - 10	3	NA
Phenol	1/42	1 - 1	10 - 10	1	NA
bis(2-Ethylhexyl)Phthalate	18/42	0.6 - 64	10 - 10	6.1	NA
Pesticides/PCBs (µg/l)					
4,4'-DDE	1/42	0.006 - 0.006	0.1 - 0.1	0.01	NA
Dieldrin	1/42	[4] 0.016 - [4] 0.016	0.1 - 0.1	0.02	NA
Inorganics (µg/l)					
Aluminum	42/42	146 - 451,000	7.6 - 22.4	73,659	147,318
Antimony	2/40	20.2 - [4] 22.7	2.9 - 17.4	21.5	43
Arsenic	34/42	[4] 1.05 - 14.2	0.8 - 2.9	6.6	13.2
Barium	42/42	19.3 - 3,160	1 - 1.5	308	616
Beryllium	30/42	[4] 0.335 - 30	0.4 - 0.5	4.1	8.2
Cadmium	12/42	0.78 - 8.8	0.7 - 3.4	4.1	8.2
Calcium	42/42	2,300 - 163,000	22 - 184	29,533	59,066
Chromium	36/42	[4] 2.35 - 542	2.4 - 2.8	104	208
Cobalt	26/42	3.5 - 57.8	3.4 - 5.2	11.3	22.6
Copper	30/42	3.2 - 78.5	1.1 - 2.3	20.2	40.4
Cyanide	4/42	1.8 - 2.5	0.9 - 1.71	2.2	4.4
Iron	42/42	255 - 187,000	5.4 - 7.2	34,146	68,292
Lead	36/42	0.5 - 136	0.5 - 0.69	22.9	45.8
Magnesium	42/42	3,340 - 36,700	15.4 - 22.2	9,658	19,316
Manganese	42/42	7.4 - 1,240	0.8 - 1	102	204
Mercury	18/42	0.14 - 2.1	0.1 - 0.12	0.49	0.98
Nickel	21/42	9.6 - 174	7.5 - 12.6	37.4	74.8
Potassium	41/42	902 - 17,700	337 - 435	4,519	9,038
Selenium	9/42	[4] 0.56 - 47.9	0.7 - 1.7	6.9	13.8
Silver	2/42	4.2 - [4] 5.1	1.8 - 4.2	4.7	9.4
Sodium	42/42	790 - 29,000	15.9 - 17.9	12,313	24,626
Vanadium	37/42	[4] 2.625 - [4] 728.5	1.8 - 2.5	147	294

See notes at end of table.

Table R-5.8 (Continued)
Identification of Background Screening Concentrations
Unfiltered Groundwater at OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detection [1]	Range of Detected Concentrations	Range of Reporting Limits	Mean of Detected Concentrations[2]	Background Screening Concentration[3]
Inorganics (µg/l)					
Zinc	42/42	6.6 - 261	0.9 - 2	86.6	173.2
Radioisotope (µg/l)					
Actinium-228	2/42	[4]11.7 - 21.8	NR	16.8	33.6
Bismuth-214	3/42	[4]5.3 - 11.6	NR	7.5	15
Lead-214	3/42	[4]6.7 - 18.1	NR	13.3	26.6
Potassium-40	3/42	60.1 - 138	NR	92.6	185.6
Radium-224	6/42	[4]54.5 - 105	NR	88.4	176.8
Thallium-208	3/42	[4]3.7 - 7.3	NR	5.7	11.4
Dissolved Inorganics (µg/l)					
Diss. Aluminum	34/42	8 - 74,200	7.6 - 22.4	8,905	NA
Diss. Antimony	9/42	12.8 - [4]30.05	12.7 - 17.4	19.6	NA
Diss. Arsenic	16/42	[4]0.6 - 6.6	0.8 - 2.9	3.2	NA
Diss. Barium	42/42	[4]9.9 - [4]250	1 - 1.5	64.1	NA
Diss. Beryllium	10/42	[4]0.43 - 3.2	0.4 - 0.5	1.3	NA
Diss. Cadmium	4/42	1 - 6.2	0.7 - 3.4	3.7	NA
Diss. Calcium	42/42	1,130 - [4]99,300	22 - 184	23,232	NA
Diss. Chromium	16/42	2.5 - 75.8	2.4 - 2.8	23.7	NA
Diss. Cobalt	8/42	[4]2.75 - [4]6.4	3.4 - 5.2	4.8	NA
Diss. Copper	22/42	1.1 - 12.7	1.1 - 2.3	5.3	NA
Diss. Iron	41/42	11.8 - [4]27,800	5.4 - 7.2	4,509	NA
Diss. Lead	21/42	0.6 - 18.9	0.5 - 0.69	4.1	NA
Diss. Magnesium	42/42	1,030 - [4]15,800	15.4 - 22.2	4,773	NA
Diss. Manganese	41/42	[4]2.65 - 134	0.8 - 1	35.4	NA
Diss. Mercury	1/42	0.1 - 0.1	0.1 - 0.12	0.1	NA
Diss. Nickel	4/42	[4]10.3 - 19.5	7.5 - 12.6	13.2	NA
Diss. Potassium	42/42	585 - [4]5,770	337 - 435	1,912	NA
Diss. Selenium	2/42	1.2 - 4.1	0.7 - 1.7	2.7	NA
Diss. Sodium	42/42	2,070 - 31,200	15.9 - 17.9	12,410	NA
Diss. Thallium	1/42	1 - 1	0.7 - 0.89	1	NA
Diss. Vanadium	24/42	[4]2.625 - [4]105.55	1.8 - 2.5	25.6	NA
Diss. Zinc	39/42	6.2 - 134	0.9 - 2	35.1	NA

See notes at end of table.

Table R-5.8 (Continued)
Identification of Background Screening Concentrations
Unfiltered Groundwater at OU 1

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

[1] Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed. The samples analyzed are identified in Table R-5.7.
[2] The mean of detected concentrations is the mean of all samples in which the analyte was detected. It does not include those samples in which the analyte was not detected.
[3] Two times the mean for inorganic analytes.
[4] Value is the average of a sample and its duplicate.

Notes: NA = not applicable.
DDE = dichlorodiphenyldichloroethylene.
$\mu g/\ell$ = micrograms per liter.

APPENDIX R-6

HUMAN HEALTH EXPOSURE PARAMETERS

Table R-6.1
Exposure Parameters for Soil Ingestion and Inhalation
Resident (Adult and Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 1-6)	Adult Value	Units	Source
Soil Concentration	CS	Chemical Specific	Chemical Specific	Chemical Specific	
Air Concentration	CA	Chemical Specific	Chemical Specific	mg/m^3	Calculated
Soil Ingestion Rate	IR	200	100	mg/day	[2]
Fraction Ingested	FI	100%	100%	unitless	Assumption
Exposure Frequency	EF	350	350	days/year	[2]
Exposure Duration	ED	6	24	years	[2]
Exposure Time [1]	ET	16	16	hours/day	Assumption
Averaging Time	AT				
Cancer		70	70	years	[2]
Non-cancer		6	24	years	[2]
Inhalation Rate	IR	0.833	0.833	m^3/hour	[2]
Body Weight	BW	15	70	kg	[2]
Particulate Emission Factor	PEF	4.97×10^7	4.97×10^7	m^3/kg	[3]

Notes:

[1] Exposure Time is a parameter used only in the inhalation of particulate dust scenario.
[2] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".
[3] See the Derivation of Particulate Emission Factor appendix of this document.

Table R-6.2
Exposure Parameters for Dermal Exposure to Soil
Resident (Adult and Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 1-6)	Adult Value	Units	Source
Soil Concentration	CS	Chemical Specific	Chemical Specific	Chemical Specific	
Dose Absorbed per Unit Area per Event	DA_{event}	Chemical Specific	Chemical Specific	mg/cm^2-event	Calculated per [1]
Adherence Factor (Soil-to-Skin)	AF	1.0	1.0	mg/cm^2-event	[1]
Absorption Fraction	ABS_d	Chemical Specific	Chemical Specific	unitless	[5]
Surface Area (hands, arms, head, neck, legs, feet)	SA	Not Applicable	5,750	cm^2	[1]
Age-Specific Surface Area	SA_i	Age-Specific	Not Applicable	cm^2	[3]
Exposure Frequency	EF	350	350	days/year	[2]
Exposure Duration	ED	Not Applicable	24	years	[2]
Age-Specific Exposure Duration	ED_i	Age-Specific	Not Applicable	years	[3]
Averaging Time	AT				
Cancer		70	70	years	[2]
Non-cancer		6	24	years	[2]
Body Weight	BW	Not Applicable	70	kg	[2]
Age-Specific Body Weight	BW_i	Age-Specific	Not Applicable	kg	[3]
Age-Weighted Surface Area	$SA_{soil/adj}$	766	Not applicable	cm^2-year/kg	[4]

Notes:

[1] USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992. See also 1992 Dermal Guidance Summary appendix of this document.

[2] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".

[3] To account for the changing body weights, skin surface areas, and exposure duration of a child age 1 through 6, 50th percentile values for each age are used to calculate for every year, then are averaged. See USEPA Exposure Factors Handbook, EPA\600\8-89\043, May 1989; See also 1992 Dermal Guidance Summary appendix of this document.

[4] In estimating the dermally absorbed dose for children age 1 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from the surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per [1]. Thus, $T = SA_i \times ED_i / BW_i$ where i is the age of the child.

[5] USEPA, 1992h. USEPA Region IV Memo, February 10, 1992.

Table R-6.3
Exposure Parameters for Soil Ingestion and Inhalation
Transient (Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 6-16)	Units	Source
Soil Concentration	CS	Chemical Specific	Chemical Specific	
Air Concentration	CA	Chemical Specific	mg/m^3	Calculated
Soil Ingestion Rate	IR	100	mg/day	[2]
Fraction Ingested	FI	50%	unitless	Assumption
Exposure Frequency	EF	100	days/year	Assumption, [3]
Exposure Duration	ED	11	years	Assumption, [2]
Exposure Time [1]	ET	4	hours/day	Assumption
Averaging Time	AT			
Cancer		70	years	[2]
Non-cancer		11	years	[2]
Inhalation Rate	IR	0.833	m^3/hour	[2]
Body Weight	BW	40	kg	[2]
Particulate Emission Factor	PEF	4.97×10^7	m^3/kg	[4]

Notes:

[1] Exposure Time is a parameter used only in the inhalation of particulate dust scenario.
[2] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".
[3] Exposure Frequency = 2 days/week x 50 weeks/year = 100 days/year.
[4] See the Derivation of Particulate Emission Factor appendix of this document.

Table R-6.4
Exposure Parameters for Dermal Exposure to Soil
Transient (Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 6-16)	Units	Source
Soil Concentration	CS	Chemical Specific	Chemical Specific	
Dose Absorbed per Unit Area per Event	DA_{event}	Chemical Specific	mg/cm^2-event	Calculated per [1]
Adherence Factor (Soil-to-Skin)	AF	1.0	mg/cm^2-event	[1]
Absorption Fraction	ABS_d	Chemical Specific	unitless	[2]
Age-Specific Surface Area	SA_i	Age-Specific	cm^2	[3]
Exposure Frequency	EF	100	days/year	Assumption, [4]
Age-Specific Exposure Duration	ED_i	Age-Specific	years	[3]
Averaging Time	AT			
Cancer		70	years	[5]
Non-cancer		11	years	[5]
Age-Specific Body Weight	BW_i	Age-Specific	kg	[3]
Age-Weighted Surface Area	$SA_{soil/adj}$	1,136	cm^2-year/kg	[6]

Notes:

[1] USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992.

[2] USEPA, 1992. USEPA Region IV Memo, February 10, 1992.

[3] To account for the changing body weights, skin surface areas, and exposure duration of a child age 6 through 16, 50th percentile values for each age are used to calculate for every year, then are averaged. See USEPA Exposure Factors Handbook, EPA\600\8-89\043, May 1989; See also 1992 Dermal Guidance Summary appendix of this document.

[4] Exposure Frequency = 2 days/week x 50 weeks/year = 100 days/year.

[5] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".

[6] In estimating the dermally absorbed dose for children age 6 through 16, the time-weighted, bodyweight normalized surface area exposed is calculated from the surface area, exposure duration, and body weight for each of 16 age periods, age 6 through 16, per [1]. Thus, $T = SA_i \times ED_i / BW_i$ where i is the age of the child.

Table R-6.5
Exposure Parameters for Ingestion of and Dermal Contact with Surface Water Resident Wader (Adult and Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 1-6)	Adult Value	Units	Source
Concentration Water	CW	Chemical Specific	Chemical Specific	ug/liter	
Ingestion Rate	IR	0.1	0.1	liters/day	[1]
Dose Absorbed per Event	DA_{event}	Chemical Specific	Chemical Specific	mg/cm^2-event	Calculated per [7]
Surface Area (hands, legs, feet)	SA	Not Applicable	1,971	cm^2	[2]
Age-Specific Surface Area	SA_i	Age-Specific	Not Applicable	cm^2	[3]
Age-Weighted Surface Area	$SA_{aw/adj}$	766	Not Applicable	cm^2-yr/kg	[4]
Diffusion Depth per Event	PC_{event}	Chemical Specific	Chemical Specific	cm/event	Calculated per [7]
Event Frequency	EV	1	1	event/day	[2]
Exposure Frequency	EF	100	100	days/year	Assumption, [5]
Exposure Duration	ED	6	24	years	Assumption
Age-Specific Exposure Duration	ED_i	Age-Specific	Not Applicable	years	[3]
Exposure Time	ET	2	2	hours/day	Assumption
Averaging Time	AT				
Cancer		70	70	years	[6]
Non-cancer		6	24	years	Assumption
Body Weight	BW	15	70	kg	[6]
Age-Specific Body Weight	BW_i	Age-Specific	Not Applicable	kg	[3]

Notes:

[1] Surface Water Ingestion Rate is 0.1 liters/day (2 hours/day x 50 ml/hour x 0.001 l/ml) and represents an ingestion rate for swimming (USEPA, 1989. Exposure Factors Handbook).

[2] USEPA, 1989. Exposure Factors Handbook; EPA/600/8-89/043.

[3] To account for the changing body weights, skin surface areas, and exposure duration of a child age 1 through 6, 50th percentile values for each age are used to calculate for every year, then are averaged. See USEPA Exposure Factors Handbook, EPA\600\8-89\043, May 1989; See also 1992 Dermal Guidance Summary appendix of this document.

[4] In estimating the dermally absorbed dose for children age 1 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from the surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per [7]. Thus, $T = SA_i \times ED_i / BW_i$ where i is the age of the child.

[5] Exposure Frequency = 2 days/week x 50 weeks/year = 100 days/year.

[6] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".

[7] USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992. See also 1992 Dermal Guidance Summary appendix in this document.

Table R-6.6
Exposure Parameters for Ingestion of and Dermal Contact with Surface Water Transient Wader (Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 6-16)	Units	Source
Concentration Water	CW	Chemical Specific	ug/liter	
Ingestion Rate	IR	0.1	liters/day	[1]
Dose Absorbed per Event	DA_{event}	Chemical Specific	mg/cm^2-event	Calculated per [6]
Age-Specific Surface Area (hands, legs, feet)	SA_i	Age-Specific	cm^2	[2]
Age-Weighted Surface Area	$SA_{aw/adj}$	1,136	cm^2-yr/kg	[3]
Diffusion Depth per Event	PC_{event}	Chemical Specific	cm/event	Calculated per [6]
Event Frequency	EV	1	event/day	Assumption
Exposure Frequency	EF	100	days/year	Assumption, [4]
Exposure Duration	ED	11	years	Assumption
Age-Specific Exposure Duration	ED_i	Age-Specific	years	[2]
Exposure Time	ET	2.0	hours/day	Assumption
Averaging Time	AT			
Cancer		70	years	[5]
Non-cancer		11	years	Assumption
Body Weight	BW	40	kg	[5]
Age-Specific Body Weight	BW_i	Age-Specific	kg	[2]

Notes:

[1] Surface Water Ingestion Rate is 0.1 liters/day (2 hours/day x 50 ml/hour x 0.001 l/ml) and represents an ingestion rate for swimming (USEPA, 1989. Exposure Factors Handbook).

[2] To account for the changing body weights, skin surface areas, and exposure duration of a child age 6 through 16, 50th percentile values for each age are used to calculate for every year, then are averaged. See USEPA *Exposure Factors Handbook*, EPA\600\8-89\043, May 1989; See also 1992 Dermal Guidance Summary appendix of this document.

[3] In estimating the dermally absorbed dose for children age 6 through 16, the time-weighted, bodyweight normalized surface area exposed is calculated from the surface area, exposure duration, and body weight for each of 16 age periods, age 6 through 16, per [6]. Thus, $T = SA_i \times ED_i / BW_i$ where i is the age of the child.

[4] Exposure Frequency = 2 days/week x 50 weeks/year = 100 days/year.

[5] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".

[6] USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992. See also 1992 Dermal Guidance Summary appendix in this document.

Table R-6.7
Exposure Parameters for Ingestion of and Dermal Contact with Sediment
Resident Wader (Adult and Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 1-6)	Adult Value	Units	Source
Concentration Sediment	CS	Chemical Specific	Chemical Specific	Chemical Specific	
Ingestion Rate	IR	200	100	mg/day	[1], [2]
Fraction Ingested	FI	100%	100%	unitless	Assumption
Adherence Factor	AF	1	1	mg/cm^2-event	[3], [4]
Dose Absorbed per Event	DA_{event}	Chemical Specific	Chemical Specific	mg/cm^2-event	Calculated per [4]
Absorption Fraction	ABS_d	Chemical Specific	Chemical Specific	unitless	[6]
Surface Area (hands, legs, feet)	SA	Age-Specific	1,971	cm^2	[7]
Age-Specific Surface Area	SA_i	Age-Specific	Not Applicable	cm^2	[5]
Age-Weighted Surface Area	$SA_{soil/adj}$	766	Not Applicable	cm^2-yr/kg	[8]
Exposure Frequency	EF	100	100	days/year	Assumption, [9]
Exposure Duration	ED	6	24	years	Assumption
Age-Specific Exposure Duration	ED_i	Age-Specific	Not Applicable	years	[5]
Averaging Time	AT				
Cancer		70	70	years	[2]
Non-cancer		6	24	years	Assumption
Body Weight	BW	15	70	kg	[2]
Age-Specific Body Weight	BW_i	Age-Specific	Not Applicable	kg	[5]

Notes:

[1] The soil ingestion rate taken from the Standard Default Exposure Factors guidance is used here as a conservative estimate of sediment ingestion rate.
[2] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".
[3] The soil adherence rate taken from the Dermal Exposure assessment guidance (upper bound estimate) is used here to estimate sediment adherence rate.
[4] USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992; See also 1992 Dermal Guidance Summary appendix in this document.
[5] To account for the changing body weights, skin surface areas, and exposure duration of a child age 1 through 6, 50th percentile values for each age are used to calculate for every year, then are averaged. See USEPA Exposure Factors Handbook, EPA\600\8-89\043, May 1989; See also 1992 Dermal Guidance Summary appendix of this document.
[6] USEPA, 1992. USEPA Region IV Guidance Memo, February 10, 1992.
[7] USEPA, 1989. Exposure Factors Handbook; EPA/600/8-89/043.
[8] In estimating the dermally absorbed dose for children age 1 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from the surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per [4]. Thus, $T = SA \times ED_i / BW_i$ where i is the age of the child.
[9] Exposure Frequency = 2 days/week x 50 weeks/year = 100 days/year.

Table R-6.8
Exposure Parameters for Ingestion of and Dermal Contact with Sediment Transient Wader (Child)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Child Value (Age 6-16)	Units	Source
Concentration Sediment	CS	Chemical Specific	Chemical Specific	
Ingestion Rate	IR	100	mg/day	[1], [2]
Fraction Ingested	FI	50%	unitless	Assumption
Adherence Factor	AF	1	mg/cm^2-event	[3], [4]
Dose Absorbed per Event	DA_{event}	Chemical Specific	mg/cm^2-event	Calculated per [4]
Absorption Fraction	ABS_d	Chemical Specific	unitless	[5]
Age-Specific Surface Area (hands, legs, feet)	SA_i	Age-Specific	cm^2	[6]
Age-Weighted Surface Area	$SA_{soil/adj}$	1,136	cm^2-yr/kg	[7]
Exposure Frequency	EF	100	days/year	Assumption [8]
Exposure Duration	ED	11	years	Assumption
Age-Specific Exposure Duration	ED_i	Age-Specific	years	[6]
Averaging Time	AT			
Cancer		70	years	[2]
Non-cancer		11	years	Assumption
Body Weight	BW	40	kg	[2]
Age-Specific Body Weight	BW_i	Age-Specific	kg	[6]

See notes at end of table.

Notes:

[1] The soil ingestion rate taken from the Standard Default Exposure Factors guidance is used here as a conservative estimate of sediment ingestion rate.

[2] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".

[3] The soil adherence rate taken from the Dermal Exposure assessment guidance (upper bound estimate) is used here to estimate sediment adherence rate.

[4] USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992; See also 1992 Dermal Guidance Summary appendix in this document.

[5] USEPA, 1992. USEPA Region IV Guidance Memo, February 10, 1992.

[6] To account for the changing body weights, skin surface areas, and exposure duration of a child age 6 through 16, 50th percentile values for each age are used to calculate for every year, then are averaged. See USEPA Exposure Factors Handbook, EPA\600\8-89\043, May 1989; See also 1992 Dermal Guidance Summary appendix of this document.

[7] In estimating the dermally absorbed dose for children age 6 through 16, the time-weighted, bodyweight normalized surface area exposed is calculated from the surface area, exposure duration, and body weight for each of 16 age periods, age 6 through 16, per [4]. Thus, $T = SA_i \times ED_i / BW_i$ where i is the age of the child.

[8] Exposure Frequency = 2 days/week x 50 weeks/year = 100 days/year.

Table R-6.9
Exposure Parameters for Groundwater Ingestion
Resident (Adult)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Adult Value	Units	Source
Concentration Water	IR_{water}	Chemical specific	ug/liter	
Ingestion Rate	IR	2	liters/day	[1]
Body Weight	BW	70	kg	[1]
Exposure Frequency	EF	350	days/year	[1]
Exposure Duration	ED	30	years	[1]
Averaging Time				
Cancer	AT	70	years	[1]
Non-cancer	AT	30	years	[1]

Notes:

[1] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".

Note: Inhalation of Volatiles from groundwater while showering is described in the Calculation of Air Concentrations Using the Shower Model appendix in this document. See also Table R-6.10.

Table R-6.10
Inhalation Exposure Parameters for Groundwater Showering Resident (Adult)

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Parameter	Symbol	Adult Value	Units	Source
Concentration Shower Air [3]	CA	Chemical specific	ug/m^3	Modeled [1]
Exposure Time Shower	ET	0.2	hours/day	[2]
Exposure Frequency	EF	350	days/year	[2]
Exposure Duration	ED	30	years	[2]
Averaging Time				
Cancer	AT	70	years	[2]
Non-cancer	AT	30	years	[2]

Notes:

[1] Calculated via model by Foster and Chrostowski, Air Pollution Control Association Annual Meeting, 1987. See also the Calculation of Air Concentrations Using the Shower Model appendix in this document.

[2] USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors".

APPENDIX R-7

DERIVATION OF PARTICULATE EMISSION

INTRODUCTION

This evaluation has been conducted to estimate levels of site contaminants that would occur in ambient air as a result of wind erosion at Naval Air Station (NAS) Jacksonville. To estimate atmospheric concentrations of fugitive air contaminants, a three step modelling process was conducted. In the first step, respirable particle-phase emission rates are calculated. In the second, contaminant emission rates on a unit area basis are calculated. In the third phase, downwind ambient concentrations are estimated using air dispersion modeling. Each of these steps are discussed below. This modeling has been conducted for a theoretical site with characteristics similar to those of NAS Jacksonville. The ambient air PM10 concentration associated with the modelled scenario is approximately $17\mu g/m^3$ (see Step 3). Calculations for the theoretical site are shown in the attached tables (Table 1).

STEP 1: ESTIMATION OF PM10 EMISSIONS FROM WIND EROSION

Emission rates for particle-phase contaminants were estimated using equations developed by the USEPA for wind erosion by Cowherd et al. (1985). Airborne respirable particulate matter is defined as particles with an aerodynamic diameter less than or equal to 10 μm and is denoted with the symbol PM_{10}. Ambient air concentrations were then estimated using air dispersion modeling.

The equations presented in Cowherd et al. (1985) are intended to provide a methodology for rapid assessment of the inhalation exposure to respirable particulate emissions from surface contamination sites under emergency situations. Consequently, the models are based on a number of simplifying assumptions and yield <u>order-of-magnitude</u> estimates of atmospheric concentrations. The results of this quantitative assessment of potential inhalation exposure at this site should be reviewed with this fact in mind.

For estimating emissions from wind erosion for surface areas not completely covered by vegetation, two emission factor equations have been developed by Cowherd et al. (1985). Selection of the appropriate equation depends on whether the contaminated site's surface material is classified as having a "limited reservoir" or an "unlimited reservoir" of erodible surface particles. The critical feature of "unlimited" erosion potential is that contaminated soil is entrained at a lower wind velocity than for the "limited" case. Surface soils containing a high percentage of silts and lacking either vegetation or large non-erodible elements are assumed to contain an unlimited reservoir of surface erodible particles. This is based on the aggregate size distribution of surface particles, which is best determined with a sieve size analysis. In the absence of such an analysis at NAS Jacksonville, an unlimited reservoir was assumed. The application of the unlimited reservoir model to this site represents a conservative case as the surface soils are unlikely to contain a large percentage of silts because of the geological age of the soils (i.e., the majority of the silts have already been eroded).

A conservative estimate of the PM_{10} emission rate (E_{10}) for the contaminated surface with "unlimited" erosion potential was calculated using an emission factor derived by Gillette (1981) based on field measurements of highly erodible soil. The following equation was used:

$$E_{10} = 1x10^{-5}\ (1-V)\ \left(\frac{[u]}{u_t}\right)^3 F(x)$$

where:

E_{10}	= PM_{10} emission factor for wind erosion (g/m^2-sec)
$1x10^{-5}$	= empirical constant (g/m^2-sec)
V	= fraction of the contaminated surface area with continuous vegetative cover
[u]	= mean annual wind speed (m/s)
u_t	= threshold value of wind speed at 7 m (m/s)
F(x)	= function to estimate unlimited erosion
x	= dimensionless ratio = 0.886 u_t/[u].

and:

$$u_t = \frac{1}{0.4}\ x\ \ln\frac{z}{z_0}\ x\ u^*$$

where:

u^*	= friction velocity
z	= height above surface (m)
z_0	= roughness height (m)

For values of x greater then 2:

$$F(x) = 0.18\ (8\ x^3 + 12\ x)\ e^{-x^2}$$

All parameters in the above equation were calculated from site-specific data where possible. The values used in estimating the emission factor for wind erosion are given in Step 1 of Table 1. The PM_{10} emission rate estimated for the wind erosion of the excavation scenario can be found in Step 2 of the table.

STEP 2. ESTIMATION OF CONTAMINANT EMISSION RATES

Contaminant-specific emission rates were estimated from (1) the PM_{10} emission rates, (2) the hypothetical mass fraction of each contaminant in surface soil, and (3) the exposed surface area of the contaminated soil. Contaminant emission rates of respirable particles were determined using the following equation:

$$Q_{10} = 1 \times f \times E_{10} \times A$$

where:

- Q_{10} = contaminant emission rate as PM_{10} (ug/sec)
- f = mass fraction of contaminant in PM_{10} emissions (mg contaminant/kg PM_{10})
- E_{10} = PM_{10} emission rate (g PM_{10}/m^2-sec)
- A = contaminated surface area (m^2)
- 1 = conversion factor (1000 ug contaminant/mg contaminant)*(kg PM_{10}/1000 g PM_{10})

The values for f were estimated by assuming that the mass fraction of the contaminant in the inhalable particles emitted (PM_{10}) is equal to the mass fraction of the contaminant in the soil. The surface area available for wind erosion was assumed to be the area of the site (see Assumption column from Step 2). The value of Q_{10} calculated for each scenario can be found in Step 3 of the table.

STEP 3. AIRBORNE CONTAMINANT CONCENTRATION

Air dispersion modeling is used to predict off-site contaminant air concentrations based on the PM_{10} emission rate. Many different forms of dispersion models exist for a variety of applications. For this situation, the box model was selected because it is most appropriate to use when receptors are less than 100 meters from the edge of an area source. The model overpredicts concentrations by a factor of approximately four to six when compared with the Gaussian dispersion model, ISCST, for the "downwind distances" to exposure points of interest in this assessment (McCarthy and Burbank, 1990). The box model is a good screening model for a public health risk assessment because the concentrations estimated with the box model are protective of public health. If no risk is indicated using box model concentrations, the potential for adverse impacts to public health are considered negligible.

The box model is a basic analytical and physical model representing diffusion and convection from an area source. The box encloses the area source and is bounded by the ground as its base and the mixing height (H) of the mean vertical displacement of emissions, which is a function of atmospheric stability and downwind distance to the point of exposure. Within the box, mixing is assumed to be complete. The box has a width (W) equal to the width of the area source and the box is aligned so that its length lies in the direction of the wind, which passes through its end with a constant velocity (U). The ventilation rate, defined as the volume of air passing through the box, is equal to U x H x W. The downwind mixing height (H) of the box is determined from the following equation presented by Pasquill (1975) for neutral stability:

$$X = 6.25 \times z_0 \left[\left(\frac{H}{z_0}\right) \ln\left(\frac{H}{z_0}\right) - 1.58 \left(\frac{H}{z_0}\right) + 1.58 \right]$$

where:

- X = downwind distance from the leading edge of the area source to the receptor (m)
- H = downwind mixing height (m)
- z_0 = roughness height (m)

The roughness height, z_0, was selected to be 0.02 meters based on the roughness height of grassland provided by Cowherd et al. (1985). This roughness height provides a more conservative estimate of emissions than assuming non-vegetated conditions. The downwind distance to the receptor is measured to the closest exposure points for potentially exposed populations. For the purposes of this evaluation, a distance of 1 meter was assumed (the receptor is at the source). The ambient 24-hour contaminant concentration (C_{10}) was estimated by the following box model equation:

$$C_{10} = \frac{Q_{10} \times a}{U \times H \times W}$$

where:

- C_{10} = concentration of contaminant at distance X (ug/m^3)
- Q_{10} = particle-phase emission rate from wind erosion (ug/sec)
- a = fraction of 24 hours during which emissions occur
- U = average wind speed (m/sec)
- H = downwind mixing height (m)
- W = width of area perpendicular to wind (m)

The input values for this equation are shown in Step 3 in Table 1. This results in a conservative estimate of the 24-hour average concentration of contaminants to which an individual may be exposed to at the contaminant source on days in which wind erosion occurs. This concentration, the downwind contaminant concentration resulting from wind erosion, per unit of contaminant soil concentration (C_{10}) is multiplied by the concentration of each human health contaminant of potential concern (HHCPC) to obtain downwind contaminant concentrations. The estimated airborne contaminant concentrations resulting from wind erosion for the HHCPCs in the exposure scenario are presented in tabular form in Step 3 of Table 1.

The particulate emission factor (PEF) relates the contaminant concentration in soil with the concentration of respirable particles (PM_{10}) in the air due to fugitive dust emissions from surface contamination. The PEF is site-specific and independent of the type of contaminants present at the site. The PEF is calculated by dividing the soil contaminant concentration (ug/kg) by the concentration in the air (ug/m^3) to give the PEF (m^3/kg). This PEF is applied to chemical-specific soil concentrations to estimate dust-related chemical concentrations in air for the risk calculation spreadsheets.

This PEF is associated with a PM_{10} concentration of roughly 17 μg/m^3.

REFERENCES

Cowherd, C., G.E. Muleski, P.J. Englehart, and D.A. Gillette (1985). "Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites," prepared for USEPA Office of Health and Environmental Assessment, Washington, D.C.; EPA/600/8-85/002.

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McCarthy, S.M., and B. Burbank (1990). "Assessment of Fenceline Air Concentrations Associated with Construction Activities at Sites with Contaminated Soils," presented at American Waste Management Association - New England Section Conference, Wakefield, MA, February, 1990.

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FUGDUST6	17-May-95

PARTICULATE CONCENTRATIONS FROM WIND EROSION – CALCULATION OF PARTICULATE EMISSIONS FACTOR

NAS Jacksonville
Jacksonville, Florida

PURPOSE:
TO CALCULATE THE CONCENTRATIONS OF PM 10 EMISSIONS FOR CHEMICALS
WHEN EMISSIONS ARE FROM UNLIMITED WIND EROSION USING THE BOX MODEL
FOR AIR DISPERSION

STEPS LISTED IN THIS LOTUS SPREADSHEET
(1) CALCULATE PM10 EMISSION RATE FROM WIND EROSION (COWHERD, 1985)
(2) CALCULATE CONTAMINANT EMISSION RATE
(3) CALCULATE AIRBORNE CONTAMINANT CONCENTRATIONS

SOURCES:

Cowherd, 1985. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites.
Pasquill, 1975. The Dispersion of Materials in the Atmospheric Boundary Layer – The Basis for Generalization.
USEPA, 1988. Supplement B to Compilation of Air Pollutant Emissions Factors, Volume I: Stationary Point and Area Sources.

STEP 1: CALCULATE PM 10 EMISSIONS FROM WIND EROSION

UNLIMITED EROSION POTENTIAL

$E10 = 1.0E-5\ (1-V)\ ([u]/ut)^3\ F(x)$ — Cowherd, Eqn 4-4

where:

E10 = PM10 emission factor (g/m^2-s)
1.0E-5 = empirical constant
V = fraction of the contaminated surface area with continuous vegetative cover
[u] = mean annual wind speed (m/s) (Cowherd, Table 4-1)
ut = threshold value of wind speed at 7 m (m/s)
F(x) = function plotted in Cowherd, Fig. 4-3
x = dimentionless ratio = 0.886 ut/[u]

$ut = (1/0.4)\ ln(z/zo)\ u^*$ — Cowherd Eqn. 4-3

where:

z = height above surface (m)
zo = roughness height (m)
u* = friction velocity (m/s)

for x > 2:

$F(x) = 18\ (8x^3 + 12x)\ exp\ (-x^2)$ — Cowherd, Appendix B

VARIABLE	VALUE	UNITS	SOURCE
z	7.00	m	Cowherd
zo	0.02	m	Cowherd, Figure 3-6
u*	0.63	m/s	assumption
ut	9.14	m/s	calculated here
[u]	3.8	m/s	Cowherd, Table 4-1, Jacksonville, FloridaBoston, MA
x	2.13		calculated here
F(x)	0.20		calculated here or Cowherd, Figure 4-3
V	0.6	fraction	assumption based on site visit
E10	5.68E-08	g/m^2-s	calculated here

STEP 2: CALCULATE CONTAMINANT EMISSION RATE

$Q10 = f \times E10 \times A$ Cowherd Eqn.

where:

Q10 = contaminant emission rate (μg contaminant/s)

f = fraction of PM 10 with contaminant (mg contaminant/kg PM10)
(assumed to equal soil concentration in mg contaminant/kg soil)

E10 = PM 10 emission rate (g PM 10 /m²–s)

A = area (m²)

1 = conversion (1000 μg contaminant/ mg contaminant) * (kg PM 10 / 1000 g PM 10)

At f = 1 mg contaminant / kg PM10:

Area = 33600.00 m^2

ACTIVITY	E10 (g/m²–s)	Q10 (μg/s)	ASSUMPTION
Wind Erosion	5.68E–08	1.91E–03	

STEP 3: CALCULATE AIRBORNE CONTAMINANT CONCENTRATION

BOX MODEL

$$C10 = \frac{Q10 \times a}{\text{Ventilation Rate}}$$

$$= \frac{Q10 \times a}{U \times H \times W}$$

where:

C10 = airborne contaminant concentration (µg/m³)

Q10 = contaminant emission rate (µg/s)

U = wind speed (same as [u] from Step 2) (m/s)

W = width of area perpendicular to wind (m)

H = downwind mixing height (m)

a = fraction of 24 hours during which activity occurs

H is calculated in an iterative fashion based on the desired value of X from the following equation:

$$X = 6.25\,(zo)\,[(H/zo)\ln(H/zo) - 1.58\,(H/zo) + 1.58]$$ Pasquill, 1975

where:

X = downwind distance from leading edge of area source to receptor (m)

H = downwind mixing height (m)

zo = roughness height (same as in Step 2) (m)

zo (m)	H (m)	X (m)
0.02	0.276	1.00

At f = 1 mg contaminant / kg PM10:

ACTIVITY	Q10 (µg/s)	a	U (m/sec)	H (m)	W (m)	C10 (µg/m³ per mg/kg)
Wind Erosion	1.91E-03	1.00	2.45	0.276	140	2.02E-05

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CHEMICAL	SOIL CONCENTRATION (mg/kg)	C10 WIND EROSION (µg/m³)	PEF m^3/kg
	5	1.01E-04	4.96E+07
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	
		0.00E+00	

APPENDIX R-8

CALCULATION OF AIR CONCENTRATIONS USING THE SHOWER MODEL

INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES) calculated air concentrations of volatile organic compounds (VOCs) in groundwater that could volatilize during a shower. After reviewing the literature, the model selected by ABB-ES to predict indoor (bathroom) concentrations is that presented by Foster and Chrostowski (1987). This theoretical approach is based on the experimental work of Andelman (1985). Andelman measured air concentrations of trichloroethylene and chloroform in a bench scale shower assembly. Foster and Chrostowski (1987) developed a model from these experimental data. ABB-ES modified the input parameters from the bench scale design to be representative of a typical bathroom.

CALCULATIONS

The equation used to calculate air concentrations in the bathroom is shown below:

$$C_{(voc)} = \frac{S}{R} \times (e^{RD_s} - 1) \times e^{-Rt}$$

where:

$C_{(voc)}$ = concentration of VOC in bathroom ($\mu g/m^3$)
S = VOC generation rate ($\mu g/m^3$-min)
R = air exchange rate (min^{-1})
D_s = duration of shower (min)
t = time at which concentration is being calculated (min)

R, the air exchange rate, is calculated as the volumetric flow rate through the bathroom (m^3/min) divided by the volume of the bathroom (m^3). S, the VOC source generation rate, is calculated based on the concentration of the contaminant in the water, emission of compound from a droplet, flow rate of water, and volume of room for dilution. S is calculated from the following series of equations:

$$S = \frac{C_{wd} \times FR}{SV}$$

where:

C_{wd} = concentration in water droplet ($\mu g/\ell$)
FR = flow rate in shower (l/min)
SV = shower volume (m^3)

C_{wd} is calculated as follows:

$$C_{wd} = C_{wo} \times [1 - e^{(\frac{-K_{al} \times t_s}{60 \times d})}]$$

where:

C_{wo} = concentration in groundwater ($\mu g/\ell$)
K_{al} = temperature correction of the mass transfer coefficient, Kl (cm/hr)

ts = shower water droplet free-fall time (sec)
d = droplet diameter (mm)

K_{al} is calculated according to:

$$K_{al} = K_L \times [\frac{T_1 \times u_s}{T_s \times u_1}]^{-0.5}$$

where:

K_L = mass-transfer coefficient (cm/hr)
T_1 = reference temperature (K)
u_s = viscosity of water at reference temperature (cp)
T_s = temperature of shower water (K)
u_1 = viscosity of water at shower temperature (cp)

K_L is calculated according to:

$$K_L(voc) = \frac{1}{\frac{1}{k_l(voc)} + \frac{RT}{H \times k_g(voc)}}$$

where:

k_l(voc) = chemical-specific liquid mass-transfer coefficient (cm/hr)
k_g(voc) = chemical-specific gas mass-transfer coefficient (cm/hr)
RT = molecular gas constant (R) x temperature (T) (atm-m^3/mole)
H = Henry's Law Constant (atm-m^3/mole)

The input values of k_l and k_g are based on the mass transfer coefficients of CO_2 and water. They are calculated for the particular compound of interest according to the following equations:

$$k_l(voc) = k_l(CO_2) \times [\frac{44}{MW(voc)}]^{0.5}$$

$$k_g(voc) = k_g(H_2O) \times [\frac{18}{MW(voc)}]^{0.5}$$

where:

$k_l(CO_2)$ = liquid mass-transfer coefficient for carbon dioxide (cm/hr)
$k_g(H_2O)$ = gas mass-transfer coefficient for water (cm/hr)
MW(voc) = molecular weight of VOC

ASSUMPTIONS

Several assumptions were made to complete this modeling effort. The primary assumptions involve the volume of the bathroom and the air exchange rate. A

bathroom volume of $12m^3$ was assumed. For the purposes of this model, it was also assumed that the air between the shower area and the rest of the bathroom was well mixed. The volumetric flow rate through the bathroom was assumed to be 0.4 m^3/min, which gives an effective air exchange rate of 1.8 air changes/hour. Few measurements have been done on ventilation rates in bathrooms. ABB-ES considers this value to be a conservative estimate given that most homes have air exchange rates of 0.5 - 2.0 changes/hour. Bathrooms may have higher ventilation rates than the entire house due to the effect of local exhaust fans, if present, or the opening of windows.

Another assumption is implicit in the use of Equation 1. This equation calculates VOC concentrations at time (t), which is assumed to equal the duration of shower use (D_S). Thus, the resulting concentrations represent maximum concentrations at the end of the shower. In reality, an individual would experience an integrated exposure that would gradually increase during shower usage and decrease again after the water was turned off. ABB-ES made the assumption that the peak concentrations would persist for the duration of exposure. This is a conservative assumption that is protective of public health.

REFERENCES

Andelman, J.B., 1985. "Inhalation Exposure in the Home to Volatile Organic Contaminants in Drinking Water"; *Sci. Total Environ.*; Vol. 47, pp. 443-460.

Foster, S.A. and P.C. Chrostowski, 1987. "Inhalation Exposures to Volatile Organic Contaminants in the Shower"; paper presented at the 80th Annual Meeting of the Air Pollution Control Association; New York, New York; June 1987.

APPENDIX R-9

SUMMARY OF 1992 DERMAL GUIDANCE

DEVELOPMENT OF DOSE RESPONSE VALUES FOR USE IN DERMAL RISK CALCULATIONS

As required by USEPA Region IV guidance risks associated with calculated absorbed doses (most commonly for soil and water dermal contact) be evaluated using Reference Doses (RfDs) and Cancer Slope Factors (CSFs) which are specific to absorbed doses. Most oral RfDs and CSFs are based on administered dose rather than the absorbed dose (trichloroethylene's CSF is a notable exception). It is therefore necessary to adjust toxicity values which are based on administered dose so that they can be used for evaluation of absorbed doses. For dermal exposures, we adjust the toxicity values as follows:

$$RfD_{adjusted} = RfD_{oral} \times ABSEFF_{oral}$$

$$CSF_{adjusted} = CSF_{oral} / ABSEFF_{oral}$$

where: $ABSEFF_{oral}$ is the absorption efficiency in the study that is the basis of the oral toxicity value.

If there is no information available on oral absorption efficiency, the conservative default value of 5% can be used, but was not needed for this assessment.

ABSORBED DOSE CALCULATION - DERMAL EXPOSURE TO WATER

The absorbed dose is calculated per the USEPA *Dermal Exposure Assessment: Principles and Applications*, Interim Report, January 1992. The permeability constant approach is used for dermal exposures to contaminants in water.

The **steady state approach for inorganics** is used here. The dose absorbed per unit area per event is:

$$DA_{event} = K_{pw}\ C_w\ t_{event}\ CF_1\ CF_2$$

where:

DA_{event}	=	Dose absorbed per unit area per event (mg/cm^2-event)
K_{pw}	=	Permeability constant from water (cm/hr)
C_w	=	Concentration of chemical in water (ug/liter)
t_{event}	=	Duration of a single event (hr/event)
CF_1	=	Units conversion factor (liter/ 10^3 cm^3)
CF_2	=	Units conversion factor (mg/ 10^3 ug)

The **"unsteady-state approach for organics"** is used here. The dose absorbed per unit area per event is:

$$DA_{event} = 2\ K_p\ C_w\ CF_3\ CF_4\ (6\ \tau\ t_{event}\ /\ \pi)^{0.5}$$
Where $t < t^*$

and

$$DA_{event} = K_p\ C_w\ CF_5\ CF_6\ ((t_{event}/(1 + B)) + 2\ \tau\ ((1 + 3\ B)\ /\ (1 + B))$$
Where $t > t^*$

where:

K_p	=	Permeability constant from water (cm/hr)
C_w	=	Concentration of chemical in water (ug/liter)
τ	=	l_{sc}^2 / 6 D_{sc} (hr)
l_{sc}	=	Thickness of stratum corneum (10 um)
D_{sc}	=	Stratum corneum diffusion coefficient (cm^2/hr)
t_{event}	=	Duration of a single event (hr/event)
π	=	Pi (dimensionless)
t^*	=	Time to reach steady state (hr)
B	=	Octanol water partition coefficient divided by 10^4 (dimensionless)
CF_3	=	Units conversion factor (mg/10^3 ug)
CF_4	=	Units conversion factor (liter/10^3 cm^3)
CF_5	=	Units conversion factor (mg/10^3 ug)
CF_6	=	Units conversion factor (liter/10^3 cm^3)

For a given compound, the values for B, K_p τ, and t^* can be found in Table 5-8 of the dermal guidance document (USEPA, 1992).

Once the dose per event (DA_{event}) is calculated, the dermally absorbed dose (DAD) for use in risk calculations can be derived as follows:

Dermally absorbed dose for use in risk calculations is derived generally (for adults who are no longer growing) as follows:

$$DAD_{adult} = DA_{event}\ EV\ EF\ ED\ SA\ /\ BW\ AT$$

For children, to account for changing surface areas and bodyweights, the dermally absorbed dose is calculated as follows:

$$DAD_{child} = (DA_{event}\ EV\ EF\ /\ AT)\ \sum^{n}_{i=m}\ (SA_i\ ED_i\ /\ BW_i)$$

where:

EV	=	Event frequency (events/day)
EF	=	Exposure frequency (days/year)
AT	=	Averaging time (days). For noncarcinogenic effects, AT
	=	ED, and for carcinogenic effects AT = 70 years or 25,550 days.
SA_i	=	Surface area exposed at age i (cm^2)
ED_i	=	Exposure duration at age i (years)
BW_i	=	Bodyweight at age i (kg)

All of the calculations contained in this appendix are based on the data presented in Tables R-8.1 through R-8.3.

For bathing and swimming, USEPA recommends that whole body surface area be used to represent skin surface area available for contact with water. For adults, using 50th and 95th percentile whole body SA values, the default SA values are 20,000 cm^2 and 23,000 cm^2. For children, the default values for each age group would be equal to the 50th percentile and 95th percentile whole body SA values. Estimated bodyweights are the average of the 50 th percentile female and male weights. These values are shown below.

Values of

$$\sum_{i=m}^{n} (SA_i \; ED_i \; / \; BW_i)$$

for commonly used age ranges as calculated in Table R-8.4 are presented in Table R-8.1.

For wading, it is assumed that the entire surface area of the feet, lower legs, and hands is exposed to the surface water during the entire exposure event. This assumption is for shallow water situations. The per cent of total body surface area represented by the feet, lower legs and hands has been approximated as shown in Table R-8.5. Averaging surface areas over the 6 childhood years yields the following: hands represent 5.5% of total body surface area, lower leg represents 12.8% of total body surface area, and the feet represent 7% of total body surface area. Therefore, the feet, lower legs and hands represent approximately 25% of total body surface area for children ages 1 through 6. This value is the same value which USEPA identifies as the per cent of total body surface area which is available for soil contact (USEPA, 1992). This value, 25% of total body surface area is used here to represent surface area available for waders of all ages.

ABSORBED DOSE CALCULATION - DERMAL EXPOSURE TO SOIL

The absorbed dose is calculated per the USEPA *Dermal Exposure Assessment: Principles and Applications*, Interim Report, January 1992. The calculation of the estimated dermally absorbed dose per unit area per event is:

$$DA_{event} = C_{soil} \; AF \; ABS \; CF$$

where:

DA_{event}	=	Dose absorbed per unit area per event (mg/cm^2-event)
C_{soil}	=	Contaminant concentration in soil (mg/kg)
AF	=	Adherence factor of soil to skin (mg/cm^2-event)
ABS	=	Absorption fraction (dimensionless)
CF	=	Units conversion factor (10^{-6} kg/mg)

Dermally absorbed dose for use in risk calculations is derived generally (for adults who are no longer growing) as follows:

$$DAD_{adult} = DA_{event} \; EF \; ED \; SA \; / \; BW \; AT$$

For children, to account for changing surface areas and bodyweights, the dermally absorbed dose is calculated as follows:

$$DAD_{child} = (DA_{event} \; EF \; / \; AT) \sum_{i=m}^{n} (SA_i \; ED_i \; / \; BW_i)$$

where:

EF	=	Exposure frequency (events/year)
AT	=	Averaging time (days). For noncarcinogenic effects, AT = ED, and for carcinogenic effects AT = 70 years or 25,550 days.
SA_i	=	Surface area exposed at age i (cm^2)
ED_i	=	Exposure duration at age i (years)

BW_i = Bodyweight at age i (kg)

For the typical case, USEPA recommends SA for head and hands only and for the "reasonable worst case," the SA of the head, hands, forearms, and lower legs as the SA available for contact with soil. USEPA simplifies these assumptions by saying that 25% of the total body surface area would be available for soil contact. For adults, using 50th and 95th percentile whole body SA values, the default SA values are 5000 cm^2 and 5800 cm^2. For children, the default values for each age group would be equal to 25% of the 50th percentile and 95th percentile whole body SA values. Estimated bodyweights are the average of the 50th percentile female and male weights. These values are shown in the spreadsheet which follows.

Values of

$$\sum_{i=m}^{n} (SA_i \; ED_i \; / \; BW_i)$$

for commonly used age ranges as calculated in Table R-8.6 are as follows:

REFERENCES

USEPA, 1989. Exposure Factors Handbook, Final Report, EPA/600/8-89/043.

USEPA, 1992. Dermal exposure Assessment: Principles and Applications, Interim Report, EPA/600/8-91/011B, January 1992.

Table R−9.1 − Exposure parameters for dermal contact with water

SURFACE AREA AVAILABLE FOR WATER CONTACT

AGE	BATHING AND SWIMMING 50%ILE WHOLE BODY SA (1)	BATHING AND SWIMMING 95%ILE WHOLE BODY SA (1)	WADING 25% x 50%ILE BODY SA	25% x 95%ILE BODY SA	50%ILE (2) BODYWEIGHT	50%ILE (2) BODYWEIGHT	EST 50%ILE BODYWEIGHT AVG OF M/F	95%ILE BODYWEIGHT	SWIMMER (EDi X SAi)/BW AVG CASE WATER AVG	SWIMMER (EDi X SAi)/BW RME WATER RME	WADER (EDi X SAi)/BW AVG CASE WATER AVG	WADER (EDi X SAi)/BW RME WATER RME
	CM SQ AVG	CM SQ RME	CM SQ AVG	CM SQ RME	KG MALE	KG FEMALE	KG	KG	CM SQ −YR/KG	CM SQ −YR/KG	CM SQ −YR/KG	CM SQ −YR/KG
1 < 2 (3)	5398	6104	1350	1526	11.5	10.5	11		490.7	554.9	122.7	138.7
2 < 3	6030	6820	1508	1705	13.4	12.6	13		463.8	524.6	116.0	131.2
3 < 4	6640	7640	1660	1910	15.3	14.6	14.95		444.1	511.0	111.0	127.8
4 < 5	7310	8450	1828	2113	17.4	16.4	16.9		432.5	500.0	108.1	125.0
5 < 6	7930	9180	1983	2295	19.3	18.8	19.05		416.3	481.9	104.1	120.5
6 < 7	8660	10600	2165	2650	21.9	21	21.45		403.7	494.2	100.9	123.5
7 < 8	9360	11100	2340	2775	24.4	23.5	23.95		390.8	463.5	97.7	115.9
8 < 9	10000	12400	2500	3100	27.3	27.3	27.3		366.3	454.2	91.6	113.6
9 < 10	10700	12900	2675	3225	29.7	29.6	29.65		360.9	435.1	90.2	108.8
10 < 11	11800	14800	2950	3700	34.5	34.3	34.4		343.0	430.2	85.8	107.6
11 < 12	12300	16000	3075	4000	36.4	40	38.2		322.0	418.8	80.5	104.7
12 < 13	13400	17600	3350	4400	42.1	45.2	43.65		307.0	403.2	76.7	100.8
13 < 14	14700	18100	3675	4525	47.7	48.6	48.15		305.3	375.9	76.3	94.0
14 < 15	16100	19100	4025	4775	55.5	52.8	54.15		297.3	352.7	74.3	88.2
15 < 16	17000	20200	4250	5050	60.2	53.9	57.05		298.0	354.1	74.5	88.5
16 < 17	17600	21600	4400	5400	63.6	55.3	59.45		296.0	363.3	74.0	90.8
17 < 18	18000	20900	4500	5225	65.7	58.3	62		290.3	337.1	72.6	84.3
18 < 75	20000	23000	5000	5750	75.9	61.5	70		285.7	328.6	71.4	82.1
						CHILD	6 YRS	AGE 1 < 7 SUM	2651.3	3066.6	662.8	766.7
						CHILD	6 YRS	AGE 2 < 8 SUM	2551.4	2975.2	637.8	743.8
						OLDER CHILD	11 YRS	AGE 6 < 17 SUM	3690.4	4545.3	922.6	1136.3
						CHILD/ADULT	30 yrs	age 1 < 31	9508.4	10952.3	2377.1	2738.1
						ADULT	24 yrs	AGE 18 < 42 SU	6857.1	7885.7	1714.3	1971.4

(1)Table 4B−3 of Exposure Factors Handbook, USEPA, 1989, EPA/600/8−89/043
(2)Table 5A−3 Of Exposure Factors Handbook, USEPA 1989, EPA/600/8−89/043
(3) SAs based on equation SA = K X BW^2/3. K calculated from age 2<3 data.
Equation from Appendix 4A of Exposure Factors Handbook, USEPA 1989, EPA/600/8−89/043

Table R-9 urface area exposed to surface water for waders

Age	Mean % of whole body SA (1) Hands	(2) Lower Legs	(1) Feet	95 %ile Whole body SA (3) sq cm
1<2	5.68	12.8	6.27	6104
2<3	5.3	12.8	7.07	6820
3<4	6.07	12.8	7.21	7640
4<5	5.7	12.8	7.29	8450
5<6	5.7	12.8	7.29	9180
6<7	4.71	12.8	6.9	10600
Mean (age 1 thru 6)	5.5	12.8	7.0	8132

	Hands	Lower Legs	Feet
Estimated average SA Ages 1 thru 6 (sq cm)	449.4	1040.9	569.7

Estimated SA for lower legs, hands, feet ages 1 thru 6 (sq cm): 2060

NOTE: area of lower legs, feet, hands is approximately 25% of whole body surface area (2060 sq cm/8132 sq cm)

(1) Table 4-3 of Exposure factors Handbook, USEPA 1989, EPA/600/8-89/043
(2) Table 4-2 of Exposure Factors Handbook, USEPA 1989, EPA/600/8-89/043
The percent of whole body surface area for the lower legs is taken from Table 4-2(adults) because no value for children is reported in Table 4-3.
(3) Table 4B-3 of Exposure Factors Handbook, USEPA 1989, EPA/600/8-89/043

Table R-9.3 – Exposure parameters for dermal contact with soil

AGE	50%ILE WHOLE BODY SA (1)	95%ILE WHOLE BODY SA (1)	AVAILABLE FOR SOIL CONTACT 25% x 50%ILE BODY SA	25% x 95%ILE BODY SA	50%ILE (2) BODY WEIGHT	50%ILE (2) BODY WEIGHT	EST 50%ILE BODY WEIGHT AVG OF M/F	95%ILE BODY WEIGHT	(EDI X SAI)/BWI AVG CASE SOIL AVG	(EDI X SAI)/BWI RME SOIL RME
	CM SQ AVG	CM SQ RME	CM SQ AVG	CM SQ RME	KG MALE	KG FEMALE	KG	KG	CM SQ-YR/KG	CM SQ-YR/KG
1 < 2 (3)	5398	6104	1350	1528	11.5	10.5	11		122.7	138.7
2 < 3	6030	6820	1508	1705	13.4	12.6	13		116.0	131.2
3 < 4	6640	7640	1660	1910	15.3	14.6	14.95		111.0	127.8
4 < 5	7310	8450	1828	2113	17.4	16.4	16.9		108.1	125.0
5 < 6	7930	9160	1983	2295	19.3	18.8	19.05		104.1	120.5
6 < 7	8660	10600	2165	2650	21.9	21	21.45		100.9	123.5
7 < 8	9360	11100	2340	2775	24.4	23.5	23.95		97.7	115.9
8 < 9	10000	12400	2500	3100	27.3	27.3	27.3		91.6	113.6
9 < 10	10700	12900	2675	3225	29.7	29.6	29.65		90.2	108.8
10 < 11	11800	14800	2950	3700	34.5	34.3	34.4		85.8	107.6
11 < 12	12300	16000	3075	4000	36.4	40	38.2		80.5	104.7
12 < 13	13400	17600	3350	4400	42.1	45.2	43.65		76.7	100.6
13 < 14	14700	18100	3675	4525	47.7	48.6	48.15		76.3	94.0
14 < 15	16100	19100	4025	4775	55.5	52.8	54.15		74.3	88.2
15 < 16	17000	20200	4250	5050	60.2	53.9	57.05		74.5	88.5
16 < 17	17600	21800	4400	5400	63.6	55.3	59.45		74.0	90.8
17 < 18	18000	20900	4500	5225	65.7	58.3	62		72.6	84.3
18 < 75	20000	23000	5000	5750	75.9	61.5	70		71.4	82.1
						CHILD	6 YRS	AGE 1 < 7 SUM	662.8	766.7
						CHILD	6 YRS	AGE 2 < 6 SUM	637.8	743.8
						OLDER CHILD	11 YRS	AGE 6 < 17 SUM	922.6	1136.3
						CHILD/ADULT	30 yrs	age 1 < 31	2377.1	2736.1
						ADULT	24 yrs	AGE 18 < 42 SUM	1714.3	1971.4

(1)Table 4B-3 of Exposure factors Handbook, USEPA 1989, EPA/600/8-89/043
(2)Table 5A-3 of exposure factors Handbook, USEPA 1989, EPA/600/8-89/043
(3) SAs based on equation SA = K X BW ^ 2/3. K calculated from age 2<3 data.
Equation from Appendix 4A of Exposure Factors Handbook, USEPA 1989, EPA/600/8-89/043

Table R-9.4
Summary of age-adjusted, bodyweight-normalized surface areas exposed - bathing or swimming:

Age Range	Duration of Exposure to Water Bathing or Swimming	Sum of (area X duration/bodyweight) terms Average Case cm^2-yr/kg	Sum of (area X duration/bodyweight) terms RME cm^2-yr/kg
1 thru 6	6 yrs	2651.3	3066.6
2 thru 8	6 yrs	2551.4	2975.2
6 thru 16	11 yrs	3690.4	4545.3
1 thru 30	30 yrs	9508.4	10952.3
18 thru 41	24 yrs	6857.1	7885.7

Table R-9.5
Summary of age-adjusted, bodyweight-normalized surface areas exposed - wading

Age Range	Duration of Exposure to Water Wading	Sum of (area X duration/bodyweight) terms Average Case cm^2-yr/kg	Sum of (area X duration/bodyweight) terms RME cm^2-yr/kg
1 thru 6	6 yrs	662.8	766.7
2 thru 8	6 yrs	637.8	743.8
6 thru 16	11 yrs	922.6	1136.3
1 thru 30	30 yrs	2377.1	2738.1
18 thru 41	24 yrs	1714.3	1971.4

Table R-9.6
Summary of age-adjusted, bodyweight - normalized surface areas exposed - soil

Age Range	Duration of Exposure to Soil	Sum of (area X duration/bodyweight) terms Average Case cm^2-yr/kg	Sum of (area X duration/bodyweight) terms RME cm^2-yr/kg
1 thru 6	6 yrs	662.8	766.7
2 thru 8	6 yrs	637.8	743.8
6 thru 16	11 yrs	922.6	1136.3
1 thru 30	30 yrs	2377.1	2738.1
18 thru 41	24 yrs	1714.3	1971.4

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Traditional Chemical Parameters

Table R-10.1	Current Use - Direct Contact with and Incidental Ingestion of Surface Soil - North of Child Street - OU1 Child Transient
Table R-10.2	Current Use - Inhalation of Particulate Dust - Surface Soil- North of Child Street - OU1 Child Transient
Table R-10.3	Current Use - Direct Contact with and Incidental Ingestion of Surface Soil - South of Child Street - OU1 Child Transient
Table R-10.4	Current Use - Inhalation of Particulate Dust - Surface Soil- South of Child Street - OU1 Child Transient
Table R-10.5	Current Use - Ingestion of and Direct Contact with Surface Water - OU1 Child Transient - Wading
Table R-10.6	Current Use Ingestion of and Direct Contact with Surface Water - OU1 Adult and/or Child
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Table R-10.10	Future Use - Direct Contact with and Incidental Ingestion of Surface Soil - North of Child Street - OU1 Child Resident
Table R-10.11	Future Use - Inhalation of Particulate Dust - Surface Soil - North of Child Street OU1 Child Resident
Table R-10.12	Future Use - Direct Contact with and Incidental Ingestion of Surface Soil - South of Child Street - OU1 Adult Resident
Table R-10.13	Future Use - Inhalation of Particulate Dust - Surface Soil - South of Child Street - OU1 Adult Resident
Table R-10.14	Future Use - Direct Contact with and Incidental Ingestion of Surface Soil - South of Child Street - OU1 Child Resident
Table R-10.15	Future Use - Inhalation of Particulate Dust - Surface Soil - South of Child Street OU1 Child Resident
Table R-10.16	Future Use - Direct Contact with and Incidental Ingestion of Subsurface soil - OU1 Excavation Worker
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Table R-10.20	Future Use - Ingestion of and Direct Contact with Surface Water - OU1 Child Resident - Wading
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Table R-10.22	Future Use - Direct Contact with and Incidental Ingestion of Sediment - OU1 Adult Resident
Table R-10.23	Future Use - Direct Contact with and Incidental Ingestion of Sediment - OU1 Child Resident
Table R-10.24	Future Use - Ingestion of Groundwater as Drinking Water (Unfiltered Samples) - OU 1 Adult Resident

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Table R-10.26	Future use Concentration of Volatile Compounds Resulting from Showering Resident

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Table R-10.31	Future use - Ingestion of Groundwater as Drinking Water (Unfiltered Samples) - OU 1 Resident
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TABLE R - 10.1
CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical-specific	
INGESTION RATE	IR	100	mg/day	USEPA, 1991
FRACTION INGESTED	FI	50%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm^2-event	USEPA, 1992a
AGE-SPECIFIC SURFACE AREA	SA_i	age-specific	cm^2	USEPA, 1989
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
CONVERSION FACTOR	CF	1.00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	40	kg	USEPA, 1989
AGE-SPECIFIC BODY WEIGHT	BW_i	age-specific	kg	USEPA, 1989
EXPOSURE FREQUENCY	EF	100	days/year *	Assumption
EXPOSURE DURATION	ED	11	years	Assumption
AGE-SPECIFIC EXPOSURE DURATION	ED_i	age-specific	years	Assumption
AGE-WEIGHTED SURFACE AREA [1]	$SA_{soil/adj}$	1136	cm2-year/kg	Per USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2-event	Per USEPA, 1992a
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	11	years	USEPA, 1991

* Units for exposure frequency are in events/year in the calculation of the dermally absorbed dose.
[1] In estimating the dermally absorbed dose for children age 6 through 16, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and bodyweight for each of 11 age periods, age 6 through 16, per USEPA, 1992.
USEPA, 1989. Exposure Factors Handbook; EPA/600/8-89/043; May 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992 and Dermal Exposure Appendix of this document.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E-09 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

$$\text{INTAKE-DERMAL} = (DA_{event} \times EF / AT \times 365\ \text{days/year}) \times SA_{soil/adj}$$

Where:

$$SA_{soil/adj} = SUM\ (SA_i \times ED_i / BW_i)$$
$$DA_{event} = CS \times AF \times ABS_d \times CF$$

Note:
For noncarcinogenic effects AT = ED

TABLE R – 10.1, continued

CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET – OU 1

CHILD TRANSIENT

NAS Jacksonville

Jacksonville, Florida

ICTR55N	01-Jan-95

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	510	ug/kg	1.7E-07	ND		0.01	1.4E-07	ND		
Benzo(a)pyrene	O	485	ug/kg	1.7E-07	ND		0.01	1.4E-07	ND		
Benzo(b)fluoranthene	O	1000	ug/kg	3.4E-07	ND		0.01	2.8E-07	ND		
Benzo(k)fluoranthene	O	735	ug/kg	2.5E-07	ND		0.01	2.1E-07	ND		
Chrysene	O	520	ug/kg	1.8E-07	ND		0.01	1.5E-07	ND		
Dibenz(a,h)anthracene	O	237	ug/kg	8.1E-08	ND		0.01	6.7E-08	ND		
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	9.9E-08	ND		0.01	8.2E-08	ND		
PESTICIDES											
Aroclor 1260	O	400	ug/kg	1.4E-07	2.0E-05	6.8E-03	0.06	6.8E-07	1.8E-05	3.8E-02	4.5E-02
Heptachlor	O	42.1	ug/kg	1.4E-08	5.0E-04	2.9E-05	0.01	1.2E-08	2.5E-04	4.7E-05	7.6E-05
Heptachlor epoxide	O	46.5	ug/kg	1.6E-08	1.3E-05	1.2E-03	0.01	1.3E-08	6.4E-06	2.1E-03	3.3E-03
alpha-Chlordane	O	47	ug/kg	1.6E-08	6.0E-05	2.7E-04	0.01	1.3E-08	4.8E-05	2.8E-04	5.5E-04
gamma-Chlordane	O	113	ug/kg	3.9E-08	6.0E-05	6.4E-04	0.01	3.2E-08	4.8E-05	6.7E-04	1.3E-03
INORGANICS											
Arsenic	I	1.4	mg/kg	4.8E-07	3.0E-04	1.6E-03	0.001	4.0E-08	2.9E-04	1.3E-04	1.7E-03
Cadmium	I	23.8	mg/kg	8.2E-06	1.0E-03	8.2E-03	0.001	6.7E-07	1.0E-05	6.7E-02	7.5E-02
Cobalt	I	13.2	mg/kg	4.5E-06	1.8E-01	2.5E-05	0.001	3.7E-07	1.8E-02	2.1E-05	4.6E-05
Manganese	I	52.7	mg/kg	1.8E-05	1.4E-01	1.3E-04	0.001	1.5E-06	5.6E-03	2.7E-04	4.0E-04
					SUMMARY HAZARD INDEX	1.9E-02				1E-01	1E-01

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).

[2] Calculated from Oral RfDs.

ND = No data available

TABLE R – 10.1, continued

CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET – OU 1

CHILD TRANSIENT

NAS Jacksonville

Jacksonville, Florida

ICTRSSN	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,5] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	510	ug/kg	2.7E-08	7.3E-01	2.0E-08	0.01	2.3E-08	8.0E-01	1.8E-08	3.8E-08
Benzo(a)pyrene	O	485	ug/kg	2.6E-08	7.3E+00	1.9E-07	0.01	2.2E-08	8.0E+00	1.7E-07	3.6E-07
Benzo(b)fluoranthene	O	1000	ug/kg	5.4E-08	7.3E-01	3.9E-08	0.01	4.4E-08	8.0E-01	3.6E-08	7.5E-08
Benzo(k)fluoranthene	O	735	ug/kg	4.0E-08	7.3E-02	2.9E-09	0.01	3.3E-08	8.0E-02	2.6E-09	5.5E-09
Chrysene	O	520	ug/kg	2.8E-08	7.3E-03	2.0E-10	0.01	2.3E-08	8.0E-03	1.9E-10	3.9E-10
Dibenz(a,h)anthracene	O	237	ug/kg	1.3E-08	7.3E+00	9.3E-08	0.01	1.1E-08	8.0E+00	8.5E-08	1.8E-07
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	1.6E-08	7.3E-01	1.1E-08	0.01	1.3E-08	8.0E-01	1.0E-08	2.2E-08
PESTICIDES											
Aroclor-1260	O	400	ug/kg	2.2E-08	7.7E+00	1.7E-07	0.06	1.1E-07	8.6E+00	9.1E-07	1.1E-06
Heptachlor	O	42.1	ug/kg	2.3E-09	4.5E+00	1.0E-08	0.01	1.9E-09	9.2E+00	1.7E-08	2.7E-08
Heptachlor epoxide	O	46.5	ug/kg	2.5E-09	9.1E+00	2.3E-08	0.01	2.1E-09	1.9E+01	3.8E-08	6.1E-08
alpha-Chlordane	O	47	ug/kg	2.5E-09	1.3E+00	3.3E-09	0.01	2.1E-09	1.6E+00	3.4E-09	6.7E-09
gamma-Chlordane	O	113	ug/kg	6.1E-09	1.3E+00	7.9E-09	0.01	5.0E-09	1.6E+00	8.2E-09	1.6E-08
INORGANICS											
Arsenic	I	1.4	mg/kg	7.5E-08	1.8E+00	1.3E-07	0.001	6.2E-09	1.8E+00	1.1E-08	1.4E-07
SUMMARY CANCER RISK						7.0E-07				1E-06	2E-06

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).

[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993)

[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.

[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).

[5] Calculated from Oral CSFs.

ND = No data available

TABLE R - 10.2
CURRENT USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
SOIL CONCENTRATION	C	chemical specific	chemical specific	
PART. EMISSION FACTOR	PEF	4.97E+07	m^3/kg	Appendix
CONCENTRATION AIR	CA	chemical specific	mg/m^3	
INHALATION RATE	IR	0.833	$m^3/hour$	USEPA, 1991
BODY WEIGHT	BW	40	kg	USEPA, 1991
EXPOSURE TIME	ET	4	hours/day	Assumption
EXPOSURE FREQUENCY	EF	100	days/year	Assumption
EXPOSURE DURATION	ED	11	years	Assumption
CONVERSION FACTOR	CF	0.001	mg/ug	Organics only
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	11	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
PEF has been derived in the Appendix to this report, Derivation of Particulate Emissions Factor

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x INHALATION CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / INHALATION REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

Where:

CA = C x CF x (1/PEF)

Note:

For noncarcinogenic effects AT = ED

TABLE R - 10.2, continued
CURRENT USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION R/D (mg/kg-day)	HAZARD QUOTIENT
SEMIVOLATILES							
Benzo(a)anthracene	O	510	ug/kg	1.03E-08	2.3E-10	ND	
Benzo(a)pyrene	O	485	ug/kg	9.76E-09	2.2E-10	ND	
Benzo(b)fluoranthene	O	1000	ug/kg	2.01E-08	4.6E-10	ND	
Benzo(k)fluoranthene	O	735	ug/kg	1.48E-08	3.4E-10	ND	
Chrysene	O	520	ug/kg	1.05E-08	2.4E-10	ND	
Dibenz(a,h)anthracene	O	237	ug/kg	4.77E-09	1.1E-10	ND	
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	5.84E-09	1.3E-10	ND	
PESTICIDES							
Aroclor 1260	O	400	ug/kg	8.05E-09	1.8E-10	ND	
Heptachlor	O	42.1	ug/kg	8.47E-10	1.9E-11	ND	
Heptachlor epoxide	O	46.5	ug/kg	9.36E-10	2.1E-11	ND	
alpha-Chlordane	O	47	ug/kg	9.46E-10	2.2E-11	ND	
gamma-Chlordane	O	113	ug/kg	2.27E-09	5.2E-11	ND	
INORGANICS							
Arsenic	I	1.4	mg/kg	2.82E-08	6.4E-10	ND	
Cadmium	I	23.8	mg/kg	4.79E-07	1.1E-08	ND	
Cobalt	I	13.2	mg/kg	2.66E-07	6.1E-09	ND	
Manganese	I	52.7	mg/kg	1.06E-06	2.4E-08	ND	
SUMMARY HAZARD INDEX							0E+00

ND = No data available

TABLE R - 10.2, continued
CURRENT USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION CSF (mg/kg-day)^-1	CANCER RISK
SEMIVOLATILES							
Benzo(a)anthracene	O	510	ug/kg	1.03E-08	3.7E-11	ND	
Benzo(a)pyrene	O	485	ug/kg	9.76E-09	3.5E-11	ND	
Benzo(b)fluoranthene	O	1000	ug/kg	2.01E-08	7.2E-11	ND	
Benzo(k)fluoranthene	O	735	ug/kg	1.48E-08	5.3E-11	ND	
Chrysene	O	520	ug/kg	1.05E-08	3.8E-11	ND	
Dibenz(a,h)anthracene	O	237	ug/kg	4.77E-09	1.7E-11	ND	
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	5.84E-09	2.1E-11	ND	
PESTICIDES							
Aroclor-1260	O	400	ug/kg	8.05E-09	2.9E-11	ND	
Heptachlor	O	42.1	ug/kg	8.47E-10	3.0E-12	4.5E+00	1.4E-11
Heptachlor epoxide	O	46.5	ug/kg	9.36E-10	3.4E-12	9.1E+00	3.1E-11
alpha-Chlordane	O	47	ug/kg	9.46E-10	3.4E-12	1.3E+00	4.4E-12
gamma-Chlordane	O	113	ug/kg	2.27E-09	8.2E-12	1.3E+00	1.1E-11
INORGANICS							
Arsenic	I	1.4	mg/kg	2.82E-08	1.0E-10	5.0E+01	5.1E-09
Cadmium	I	23.8	mg/kg	4.79E-07	1.7E-09	ND	
						SUMMARY CANCER RISK	5E-09

TABLE R - 10.5
CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical-specific	
INGESTION RATE	IR	100	mg/day	USEPA, 1991
FRACTION INGESTED	FI	50%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm²-event	USEPA, 1992a
AGE-SPECIFIC SURFACE AREA	SA_i	age-specific	cm²	USEPA, 1989
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
CONVERSION FACTOR	CF	1.00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	40	kg	USEPA, 1989
AGE-SPECIFIC BODY WEIGHT	BW_i	age-specific	kg	USEPA, 1989
EXPOSURE FREQUENCY	EF	100	days/year *	Assumption
EXPOSURE DURATION	ED	11	years	Assumption
AGE-SPECIFIC EXPOSURE DURATION	ED_i	age-specific	years	Assumption
AGE-WEIGHTED SURFACE AREA [1]	$SA_{soil/adj}$	1136	cm2-year/kg	Per USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm²-event	Per USEPA, 1992a
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	11	years	USEPA, 1991

* Units for exposure frequency are in event/year in the calculation of the dermally absorbed dose.
[1] In estimating the dermally absorbed dose for children age 6 through 16, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and body weight for each of 11 age periods, age 6 through 16, per USEPA, 1992.
USEPA, 1989. Exposure Factors Handbook EPA/600/8-89/043; May 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992 and Dermal Exposure Appendix of this document.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E-09 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

$$\text{INTAKE-DERMAL} = (DA_{event} \times EF / AT \times 365\ \text{days/year}) \times SA_{soil/adj}$$

Where:

$$SA_{soil/adj} = SUM\ (SA_i \times ED_i / BW_i)$$
$$DA_{event} = CS \times AF \times ABS_d \times CF$$

Note:
For noncarcinogenic effects: AT = ED

TABLE R – 10.5, continued

ICTRS36	01-Jun-95

CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET – OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	416	ug/kg	2.2E-08	7.3E-01	1.6E-08	0.01	1.8E-08	8.0E-01	1.5E-08	3.1E-08
Benzo(a)pyrene	O	433	ug/kg	2.3E-08	7.3E+00	1.7E-07	0.01	1.9E-08	8.0E+00	1.5E-07	3.2E-07
Benzo(b)fluoranthene	O	407	ug/kg	2.2E-08	7.3E-01	1.6E-08	0.01	1.8E-08	8.0E-01	1.5E-08	3.1E-08
Benzo(k)fluoranthene	O	399	ug/kg	2.1E-08	7.3E-02	1.6E-09	0.01	1.8E-08	8.0E-02	1.4E-09	3.0E-09
Chrysene	O	424	ug/kg	2.3E-08	7.3E-03	1.7E-10	0.01	1.9E-08	8.0E-03	1.5E-10	3.2E-10
Dibenz(a,h)anthracene	O	160	ug/kg	8.6E-09	7.3E+00	6.3E-08	0.01	7.1E-09	8.0E+00	5.7E-08	1.2E-07
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	1.9E-08	7.3E-01	1.4E-08	0.01	1.6E-08	8.0E-01	1.3E-08	2.7E-08
PESTICIDES											
4,4-DDD	O	20	ug/kg	1.1E-09	2.4E-01	2.6E-10	0.01	8.9E-10	1.2E+00	1.1E-09	1.3E-09
4,4-DDE	O	45	ug/kg	2.4E-09	3.4E-01	8.2E-10	0.01	2.0E-09	1.7E+00	3.4E-09	4.2E-09
4,4-DDT	O	358	ug/kg	1.9E-08	3.4E-01	6.6E-09	0.01	1.6E-08	1.7E+00	2.7E-08	3.4E-08
Aroclor-1254	O	478	ug/kg	2.6E-08	7.7E+00	2.0E-07	0.01	2.1E-08	8.6E+00	1.8E-07	3.8E-07
Aroclor-1260	O	4403	ug/kg	2.4E-07	7.7E+00	1.8E-06	0.06	1.2E-06	8.6E+00	1.0E-05	1.2E-05
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDF	O	0			1.6E+05		0.03		3.2E+05		
HpCDFs (total)	O	0.00001	ug/kg	5.4E-16	1.6E+05	8.6E-11	0.03	1.3E-15	3.2E+05	4.3E-10	5.1E-10
HxCDFs (total)	O	0.0135	ug/kg	7.3E-13	1.6E+05	1.2E-07	0.03	1.8E-12	3.2E+05	5.8E-07	6.9E-07
OCDF	O	0.000002	ug/kg	1.1E-16	1.6E+05	1.7E-11	0.03	2.7E-16	3.2E+05	8.5E-11	1.0E-10
1,2,3,4,6,7,8-HpCDD	O	0			1.6E+05		0.03		3.2E+05		
HpCDDs (total)	O	0.0056	ug/kg	3.0E-13	1.6E+05	4.8E-08	0.03	7.5E-13	3.2E+05	2.4E-07	2.9E-07
OCDD	O	0.00067	ug/kg	3.6E-14	1.6E+05	5.8E-09	0.03	8.9E-14	3.2E+05	2.9E-08	3.4E-08
INORGANICS											
Arsenic	I	4.1	mg/kg	2.2E-07	1.8E+00	3.9E-07	0.001	1.8E-08	1.8E+00	3.3E-08	4.2E-07
Lead	I	250	mg/kg	1.3E-05	ND		0.001	1.1E-06	ND		
				SUMMARY CANCER RISK		2.9E-06				1E-05	1E-05

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993)
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.5, continued

CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET – OU 1

CHILD TRANSIENT

NAS Jacksonville

Jacksonville, Florida

ICTR556	01-Jun-95

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	416	ug/kg	1.4E-07	ND		0.01	1.2E-07	ND		
Benzo(a)pyrene	O	433	ug/kg	1.5E-07	ND		0.01	1.2E-07	ND		
Benzo(b)fluoranthene	O	407	ug/kg	1.4E-07	ND		0.01	1.2E-07	ND		
Benzo(k)fluoranthene	O	399	ug/kg	1.4E-07	ND		0.01	1.1E-07	ND		
Chrysene	O	424	ug/kg	1.5E-07	ND		0.01	1.2E-07	ND		
Dibenz(a,h)anthracene	O	160	ug/kg	5.5E-08	ND		0.01	4.5E-08	ND		
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	1.2E-07	ND		0.01	1.0E-07	ND		
PESTICIDES											
4,4'-DDD	O	20	ug/kg	6.8E-09	ND		0.01	5.7E-09	ND		
4,4'-DDE	O	45	ug/kg	1.5E-08	ND		0.01	1.3E-08	ND		
4,4'-DDT	O	358	ug/kg	1.2E-07	5.0E-04	2.5E-04	0.01	1.0E-07	1.0E-04	1.0E-03	1.3E-03
Aroclor 1254	O	478	ug/kg	1.6E-07	2.0E-05	8.2E-03	0.06	8.1E-07	1.8E-05	4.5E-02	5.3E-02
Aroclor 1260	O	4403	ug/kg	1.5E-06	2.0E-05	7.5E-02	0.06	7.5E-06	1.8E-05	4.2E-01	4.9E-01
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDF	O	0.325	ug/kg	1.1E-10	ND		0.03	2.8E-10	ND		
HpCDFs (total)	O	0.001	ug/kg	3.4E-13	ND		0.03	8.5E-13	ND		
HxCDFs (total)	O	0.135	ug/kg	4.6E-11	ND		0.03	1.1E-10	ND		
OCDF	O	0.002	ug/kg	6.8E-13	ND		0.03	1.7E-12	ND		
1,2,3,4,6,7,8-HpCDD	O	0.305	ug/kg	1.0E-10	ND		0.03	2.6E-10	ND		
HpCDDs (total)	O	0.56	ug/kg	1.9E-10	ND		0.03	4.8E-10	ND		
OCDD	O	0.67	ug/kg	2.3E-10	ND		0.03	5.7E-10	ND		
INORGANICS											
Antimony	I	7	mg/kg	2.4E-06	4.0E-04	6.0E-03	0.001	2.0E-07	4.0E-06	5.0E-02	5.6E-02
Arsenic	I	4.1	mg/kg	1.4E-06	3.0E-04	4.7E-03	0.001	1.2E-07	2.9E-04	3.9E-04	5.1E-03
Cadmium	I	20.9	mg/kg	7.2E-06	1.0E-03	7.2E-03	0.001	5.9E-07	1.0E-05	5.9E-02	6.6E-02
Chromium	I	70.8	mg/kg	2.4E-05	5.0E-03	4.8E-03	0.001	2.0E-06	5.5E-04	3.6E-03	8.5E-03
Cobalt	I	2.6	mg/kg	8.9E-07	1.8E-01	4.9E-06	0.001	7.4E-08	1.8E-02	4.1E-06	9.0E-06
Lead	I	250	mg/kg	8.6E-05	ND		0.001	7.1E-06	ND		
Manganese	I	77.5	mg/kg	2.7E-05	1.4E-01	1.9E-04	0.001	2.2E-06	5.6E-03	3.9E-04	5.8E-04
Nickel	I	36.6	mg/kg	1.3E-05	2.0E-02	6.3E-04	0.001	1.0E-06	1.0E-03	1.0E-03	1.7E-03
					SUMMARY HAZARD INDEX	1.1E-01				6E-01	7E-01

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).

[2] Calculated from Oral RfDs.

ND = No data available

TABLE R - 10.4
CURRENT USE INHALATION OF PARTICULATE DUST - SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
SOIL CONCENTRATION	C	chemical specific	chemical specific	
PART. EMISSION FACTOR	PEF	4.97E+07	m^3/kg	Appendix
CONCENTRATION AIR	CA	chemical specific	mg/m^3	
INHALATION RATE	IR	0.833	$m^3/hour$	USEPA, 1991
BODY WEIGHT	BW	40	kg	USEPA, 1991
EXPOSURE TIME	ET	4	hours/day	Assumption
EXPOSURE FREQUENCY	EF	100	days/year	Assumption
EXPOSURE DURATION	ED	11	years	Assumption
CONVERSION FACTOR	CF	0.001	mg/ug	Organics only
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	11	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
PEF has been derived in the Appendix to this report, Derivation of Particulate Emissions Factor

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x INHALATION CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / INHALATION REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

Where:

CA = C x CF x (1/PEF)

Note:

For noncarcinogenic effects AT = ED

TABLE R - 10.4, continued
CURRENT USE INHALATION OF PARTICULATE DUST - SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION CSF (mg/kg-day)^-1	CANCER RISK
SEMIVOLATILES							
Benzo(a)anthracene	O	416	ug/kg	8.37E-09	3.0E-11	ND	
Benzo(a)pyrene	O	433	ug/kg	8.71E-09	3.1E-11	ND	
Benzo(b)fluoranthene	O	407	ug/kg	8.19E-09	2.9E-11	ND	
Benzo(k)fluoranthene	O	399	ug/kg	8.03E-09	2.9E-11	ND	
Chrysene	O	424	ug/kg	8.53E-09	3.1E-11	ND	
Dibenz(a,h)anthracene	O	160	ug/kg	3.22E-09	1.2E-11	ND	
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	7.26E-09	2.6E-11	ND	
PESTICIDES							
4,4'-DDD	O	20	ug/kg	4.02E-10	1.4E-12	ND	
4,4'-DDE	O	45	ug/kg	9.05E-10	3.2E-12	ND	
4,4'-DDT	O	358	ug/kg	7.20E-09	2.6E-11	3.4E-01	8.8E-12
Aroclor-1254	O	478	ug/kg	9.62E-09	3.4E-11	ND	
Aroclor-1260	O	4403	ug/kg	8.86E-08	3.2E-10	ND	
DIOXINS/FURANS							
1,2,3,4,6,7,8-HpCDF	O	0.00325	ug/kg	6.54E-14	2.3E-16	1.5E+05	3.5E-11
HpCDFs (other)	O	0				1.5E+05	
HxCDFs (other)	O	0				1.5E+05	
OCDF	O	0.000002	ug/kg	4.02E-17	1.4E-19	1.5E+05	2.2E-14
1,2,3,4,6,7,8-HpCDD	O	0.00305	ug/kg	6.14E-14	2.2E-16	1.5E+05	3.3E-11
HpCDDs (other)	O	0				1.5E+05	
OCDD	O	0.00067	ug/kg	1.35E-14	4.8E-17	1.5E+05	7.3E-12
INORGANICS							
Arsenic	I	4.1	mg/kg	8.25E-08	3.0E-10	5.0E+01	1.5E-08
Cadmium	I	20.9	mg/kg	4.21E-07	1.5E-09	ND	
Chromium	I	70.8	mg/kg	1.42E-06	5.1E-09	4.1E+01	2.1E-07
Nickel	I	36.6	mg/kg	7.36E-07	2.6E-09	8.4E-01	2.2E-09
						SUMMARY CANCER RISK	2E-07

TABLE R - 10.4, continued
CURRENT USE INHALATION OF PARTICULATE DUST - SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION RfD (mg/kg-day)	HAZARD QUOTIENT
SEMIVOLATILES							
Benzo(a)anthracene	O	416	ug/kg	8.37E-09	1.9E-10	ND	
Benzo(a)pyrene	O	433	ug/kg	8.71E-09	2.0E-10	ND	
Benzo(b)fluoranthene	O	407	ug/kg	8.19E-09	1.9E-10	ND	
Benzo(k)fluoranthene	O	399	ug/kg	8.03E-09	1.8E-10	ND	
Chrysene	O	424	ug/kg	8.53E-09	1.9E-10	ND	
Dibenz(a,h)anthracene	O	160	ug/kg	3.22E-09	7.3E-11	ND	
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	7.26E-09	1.7E-10	ND	
PESTICIDES							
4,4'-DDD	O	20	ug/kg	4.02E-10	9.2E-12	ND	
4,4'-DDE	O	45	ug/kg	9.05E-10	2.1E-11	ND	
4,4'-DDT	O	358	ug/kg	7.20E-09	1.6E-10	ND	
Aroclor 1254	O	478	ug/kg	9.62E-09	2.2E-10	ND	
Aroclor 1260	O	4403	ug/kg	8.86E-08	2.0E-09	ND	
DIOXINS/FURANS							
1,2,3,4,6,7,8-HpCDF	O	0.325	ug/kg	6.54E-12	1.5E-13	ND	
HpCDFs (total)	O	0.001	ug/kg	2.01E-14	4.6E-16	ND	
HxCDFs (total)	O	0.135	ug/kg	2.72E-12	6.2E-14	ND	
OCDF	O	0.002	ug/kg	4.02E-14	9.2E-16	ND	
1,2,3,4,6,7,8-HpCDD	O	0.305	ug/kg	6.14E-12	1.4E-13	ND	
HpCDDs (total)	O	0.56	ug/kg	1.13E-11	2.6E-13	ND	
OCDD	O	0.67	ug/kg	1.35E-11	3.1E-13	ND	
INORGANICS							
Antimony	I	7	mg/kg	1.41E-07	3.2E-09	ND	
Arsenic	I	4.1	mg/kg	8.25E-08	1.9E-09	ND	
Cadmium	I	20.9	mg/kg	4.21E-07	9.6E-09	ND	
Chromium	I	70.8	mg/kg	1.42E-06	3.3E-08	ND	
Cobalt	I	2.6	mg/kg	5.23E-08	1.2E-09	ND	
Lead	I	250	mg/kg	5.03E-06	1.1E-07	ND	
Manganese	I	77.5	mg/kg	1.56E-06	3.6E-08	ND	
Nickel	I	36.6	mg/kg	7.36E-07	1.7E-08	ND	
					SUMMARY HAZARD INDEX		0E+00

ND = No data available

TABLE R – 10.5
CURRENT USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
CHILD TRANSIENT – WADING
NAS Jacksonville
Jacksonville, Florida

ICTSWW6	01-Jun-95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION WATER	CW	chemical specific	ug/liter	
INGESTION RATE	IR	0.1	liters/day	USEPA, 1989
AGE-SPECIFIC SURFACE AREA	SA_i	age-specific	cm^2	USEPA, 1989
EVENT FREQUENCY	EV	1	events/day	Assumption
BODY WEIGHT	BW	40	kg	USEPA, 1989
AGE-SPECIFIC BODY WEIGHT	BW_i	age-specific	kg	USEPA, 1989
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2-event	Calculated
EXPOSURE TIME	ET	2	hours/day	Assumption
EXPOSURE FREQUENCY	EF	100	days/year	Assumption
EXPOSURE DURATION	ED	11	years	Assumption
AGE-SPECIFIC EXPSOURE DURATION	ED_i	age-specific	years	USEPA, 1989
AGE-WEIGHTED SURFACE AREA [1]	$SA_{aw/adj}$	1136	cm^2-yr/kg	Calculated per USEPA, 1992
DIFFUSION DEPTH PER EVENT	PCevent	chemical specific	cm/event	Calculated per USEPA, 1992
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	11	years	Assumption
CONVERSION FACTOR	CF1	0.001	mg/ug	
CONVERSION FACTOR	CF2	0.001	$liter/cm^3$	

[1] Age weighted, body weight normalized surface area
PC_{event} calculated per Dermal Exposure Assessment Appendix of this document.
Ingestion Rate = 0.1 l/day = 50 ml/hourx 2.0 hours/day x 0.001 l/ml
Surface Area assumes lower legs, hands, feet are exposed.
USEPA, 1989. Exposure Factors Handbook; EPA/600/8-89/043; May 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Parameters";
USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B and Dermal Exposure Appendix of this document

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CW \times IR \times EF \times ED \times CF1}{BW \times AT \times 365\ \text{days/yr}}$$

$$\text{INTAKE-DERMAL} = \frac{DA_{event} \times EV \times EF \times SA_{aw/adj}}{AT \times 365\ \text{days/yr}}$$

Where:
$SA_{aw/adj}$ = Sum (SA_i x ED_i / BW_i)
DA_{event} = PC_{event} x CW x CF1 x CF2

Note:
For non-carcinogenic effects: AT = ED

TABLE R – 10.5, continued
CURRENT USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
CHILD TRANSIENT – WADING
NAS Jacksonville
Jacksonville, Florida
CARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF (mg/kg-day)^-1	CANCER RISK INGESTION	PC_{EVENT} [2] (cm/event)	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [3] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
VOLATILES										
Benzene	4.4	ug/liter	4.7E-07	2.9E-02	1.4E-08	3.41E-01	6.7E-06	2.9E-02	1.9E-07	2.1E-07
Trichloroethene	6	ug/liter	6.5E-07	1.1E-02	7.1E-09	8.49E-01	2.3E-05	1.1E-02	2.5E-07	2.6E-07
Vinyl Chloride	5.4	ug/liter	5.8E-07	1.9E+00	1.1E-06	2.20E-02	5.3E-07	1.9E+00	1.0E-06	2.1E-06
INORGANICS										
Arsenic	7.3	ug/liter	7.9E-07	1.8E+00	1.4E-06	2.60E-03	8.4E-08	1.8E+00	1.5E-07	1.5E-06
Beryllium	0.75	ug/liter	8.1E-08	4.3E+00	3.5E-07	2.60E-03	8.7E-09	4.3E+02	3.7E-06	4.1E-06
SUMMARY CANCER RISK					3E-06				5E-06	8E-06

[1] Exposure point concentrations for any carcinogenic PAH compounds have been adjusted by application of USEPA Region IV Toxicity Equivalence Factors (February 10, 1992).
[2] This chemical-specific value has been calculated in a separate spreadsheet.
[3] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.5, continued
CURRENT USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
CHILD TRANSIENT – WADING
NAS Jacksonville
Jacksonville, Florida
NONCARCINOGENIC EFFECTS

1CTSWW6	01-Jun-95

COMPOUND	WATER CONCENTRATION (mg/l)	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	FC_{EVENT} [1] (cm/event)	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)^-1	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
VOLATILES										
1,2-Dichloroethene	5.4	ug/liter	3.7E-06	9.0E-03	4.1E-04	3.27E-02	5.0E-06	9.0E-03	5.6E-04	9.7E-04
Benzene	4.4	ug/liter	3.0E-06	3.0E-04	1.0E-02	3.41E-01	4.2E-05	3.0E-04	1.4E-01	1.5E-01
Trichloroethene	6	ug/liter	4.1E-06	6.0E-03	6.8E-04	8.49E-01	1.4E-04	6.0E-03	2.4E-02	2.5E-02
Vinyl chloride	5.4	ug/liter	3.7E-06	ND		2.20E-02	3.4E-06	ND		
INORGANICS										
Aluminum	424	ug/liter	2.9E-04	1.0E+00	2.9E-04	2.60E-03	3.1E-05	2.0E-01	1.6E-04	4.5E-04
Antimony	24.1	ug/liter	1.7E-05	4.0E-04	4.1E-02	2.60E-03	1.8E-06	4.0E-06	4.4E-01	4.8E-01
Arsenic	7.3	ug/liter	5.0E-06	3.0E-04	1.7E-02	2.60E-03	5.4E-07	2.9E-04	1.8E-03	1.8E-02
Beryllium	0.75	ug/liter	5.1E-07	5.0E-03	1.0E-04	2.60E-03	5.5E-08	5.0E-05	1.1E-03	1.2E-03
Cadmium	3.2	ug/liter	2.2E-06	5.0E-04	4.4E-03	2.60E-03	2.4E-07	1.0E-05	2.4E-02	2.8E-02
Cobalt	6.3	ug/liter	4.3E-06	6.0E-02	7.2E-05	2.60E-03	4.6E-07	1.8E-02	2.6E-05	9.8E-05
Iron	7864	ug/liter	5.4E-03	ND		2.60E-03	5.8E-04	ND		
Manganese	99.5	ug/liter	6.8E-05	5.0E-03	1.4E-02	2.60E-03	7.3E-06	5.6E-03	1.3E-03	1.5E-02
Sodium	73865	ug/liter	5.1E-02	ND		2.60E-03	5.4E-03	ND		
SUMMARY HAZARD INDEX					9E-02				6E-01	7E-01

[1] This chemical-specific value has been calculated in a separate spreadsheet.
[2] calculated from Oral RfDs.
ND = No data available

TABLE R – 10.6
CURRENT USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
ADULT AND/OR CHILD
NAS Jacksonville
Jacksonville, Florida

1PCEV6	01–Jun–95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
Diffusion depth per event	PC_{event}	chemical specific	cm/event	
Permeability Constant	PC	chemical specific	cm/hr	USEPA, 1992
Duration of a Single Event	t_{event}	2.6	hr	USEPA,1989
Thickness of Stratum Corneum	L_{sc}	10	um	USEPA, 1992
Octanol–water partition coefficient/10^4	B	chemical specific	dimensionless	USEPA, 1992
PI	π	3.14	dimensionless	USEPA, 1992
	T	chemical specific	hr	USEPA, 1992
Time to Reach Steady State	t^*	chemical specific	hr	USEPA, 1992
Stratum Corneum Diffusion Coefficient	D_{sc}	chemical specific	cm^2/hr	USEPA, 1992

EQUATIONS

INORGANICS

$$PC_{event} = PC \times t_{event}$$

ORGANICS

$$PC_{event} = 2PC \times (6T \times t_{event}/\pi)^{0.5}$$

Where $t_{event} < t^*$

and: $$PC_{event} = PC \times ((t_{event}/(1+B)) + 2T \times ((1+3B)/(1+B))$$

Where $t_{event} > t^*$

Note: $T = L_{sc}^2/6D_{sc}$

REFERENCES

USEPA,1989. Risk Assessment Guidance for Superfund, Volume I, Part A, EPA/540/1–89/002, December 1989. This value is receptor–specific
USEPA, 1992. Dermal Exposure Assessment: Principles and Applications.
The term T is not calculated here. Values are provided in USEPA, 1992.

CURRENT USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
ADULT AND/OR CHILD
NAS Jacksonville
Jacksonville, Florida

COMPOUND	INORGANIC OR ORGANIC? I/O	PC (cm/hr)	T (hr)	t* (hr)	B (unitless)	PC_{event} (cm/event)
1,2–Dichloroethene	O	1.0E–02	3.4E–01	8.2E–01	7.2E–03	3.27E–02
Benzene	O	1.1E–01	2.6E–01	6.3E–01	1.3E–02	3.41E–01
Trichloroethene	O	2.3E–01	5.5E–01	1.3E+00	2.6E–02	8.49E–01
Vinyl Chloride	O	7.3E–03	2.1E–01	5.1E–01	2.3E–03	2.20E–02
Aluminum	I	1.0E–03	NA	NA	NA	2.60E–03
Antimony	I	1.0E–03	NA	NA	NA	2.60E–03
Arsenic	I	1.0E–03	NA	NA	NA	2.60E–03
Beryllium	I	1.0E–03	NA	NA	NA	2.60E–03
Cadmium	I	1.0E–03	NA	NA	NA	2.60E–03
Cobalt	I	1.0E–03	NA	NA	NA	2.60E–03
Iron	I	1.0E–03	NA	NA	NA	2.60E–03
Manganese	I	1.0E–03	NA	NA	NA	2.60E–03
Sodium	I	1.0E–03	NA	NA	NA	2.60E–03

NA = Not applicable. For inorganic analytes, this term is not used to calculate PCevent.

REFERENCES:
Unless otherwise noted, values are taken from USEPA, 1992. Dermal Exposure Assessment:Principles and Applications,EPA/600/8–91/011B

TABLE R – 10.7
CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT – OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SEDIMENT	CS	chemical specific	chemical-specific	
INGESTION RATE	IR	100	mg/day	USEPA, 1991
FRACTION INGESTED	FI	50%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm²-event	USEPA, 1992a
AGE-SPECIFIC SURFACE AREA	SA_i	age-specific	cm²	USEPA, 1989
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
CONVERSION FACTOR	CF	1.00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	40	kg	USEPA, 1991
AGE-SPECIFIC BODY WEIGHT	BW_i	age-specific	kg	USEPA, 1989
EXPOSURE FREQUENCY	EF	100	days/year *	USEPA, 1991
EXPOSURE DURATION	ED	11	years	USEPA, 1991
AGE-SPECIFIC EXPOSURE DURATION	ED_i	age-specific	years	Assumption
AGE-WEIGHTED SURFACE AREA [1]	$SA_{sed/adj}$	1136	cm2-year/kg	Per USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm²-event	Per USEPA, 1992a
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	11	years	USEPA, 1991

* Units for exposure frequency are in events/year in the calculation of the dermally absorbed dose.

[1] In estimating the dermally absorbed dose for children age 6 through 16, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and body weight for each of 11 age periods, age 6 through 16, per USEPA, 1992.

USEPA, 1989. Exposure Factors Handbook;EPA/600/8-89/043; May 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992 and Dermal Exposure Appendix of this document.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.

CF = 10E-09 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

$$\text{INTAKE-DERMAL} = (DA_{event} \times EF / AT \times 365\ \text{days/year}) \times SA_{soil/adj}$$

Where:

$$SA_{soil/adj} = SUM\ (SA_i \times ED_i / BW_i)$$
$$DA_{event} = CS \times AF \times ABS_d \times CF$$

Note:
For noncarcinogenic effects: AT = ED

TABLE R – 10.7, continued
CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT – OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

1CTRSD6	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	240	ug/kg	1.3E-08	7.3E-01	9.4E-09	0.01	1.1E-08	8.0E-01	8.5E-09	1.8E-08
Benzo(a)pyrene	O	290	ug/kg	1.6E-08	7.3E+00	1.1E-07	0.01	1.3E-08	8.0E+00	1.0E-07	2.2E-07
Benzo(b)fluoranthene	O	424	ug/kg	2.3E-08	7.3E-01	1.7E-08	0.01	1.9E-08	8.0E-01	1.5E-08	3.2E-08
Benzo(k)fluoranthene	O	370	ug/kg	2.0E-08	7.3E-02	1.5E-09	0.01	1.6E-08	8.0E-02	1.3E-09	2.8E-09
Chrysene	O	433	ug/kg	2.3E-08	7.3E-03	1.7E-10	0.01	1.9E-08	8.0E-03	1.5E-10	3.2E-10
Indeno(1,2,3-cd)pyrene	O	220	ug/kg	1.2E-08	7.3E-01	8.6E-09	0.01	9.8E-09	8.0E-01	7.8E-09	1.6E-08
PESTICIDES											
Aroclor-1248	O	176	ug/kg	9.5E-09	7.7E+00	7.3E-08	0.06	4.7E-08	8.6E+00	4.0E-07	4.7E-07
Aroclor-1260	O	2864	ug/kg	1.5E-07	7.7E+00	1.2E-06	0.06	7.6E-07	8.6E+00	6.5E-06	7.7E-06
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDD	O	0.0051	ug/kg	2.7E-13	1.6E+05	4.3E-08	0.03	6.8E-13	3.2E+05	2.2E-07	2.6E-07
OCDD	O	0.00335	ug/kg	1.8E-13	1.6E+05	2.8E-08	0.03	4.5E-13	3.2E+05	1.4E-07	1.7E-07
2,3,7,8-TCDF	O	0.0054	ug/kg	2.9E-13	1.6E+05	4.5E-08	0.03	7.2E-13	3.2E+05	2.3E-07	2.8E-07
OCDF	O	0.000501	ug/kg	2.7E-14	1.6E+05	4.2E-09	0.03	6.7E-14	3.2E+05	2.1E-08	2.6E-08
INORGANICS											
Arsenic	I	1.8	mg/kg	9.7E-08	1.8E+00	1.7E-07	0.001	8.0E-09	1.8E+00	1.4E-08	1.8E-07
Beryllium	I	3.1	mg/kg	1.7E-07	4.3E+00	7.2E-07	0.001	1.4E-08	4.3E+02	5.9E-06	6.6E-06
				SUMMARY CANCER RISK		2E-06				1E-05	2E-05

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993)
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R - 10.7, continued
CURRENT USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT - OU 1
CHILD TRANSIENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	240	ug/kg	8.2E-08	ND		0.01	6.8E-08	ND		
Benzo(a)pyrene	O	290	ug/kg	9.9E-08	ND		0.01	8.2E-08	ND		
Benzo(b)fluoranthene	O	424	ug/kg	1.5E-07	ND		0.01	1.2E-07	ND		
Benzo(k)fluoranthene	O	370	ug/kg	1.3E-07	ND		0.01	1.0E-07	ND		
Chrysene	O	433	ug/kg	1.5E-07	ND		0.01	1.2E-07	ND		
Indeno(1,2,3-cd)pyrene	O	220	ug/kg	7.5E-08	ND		0.01	6.2E-08	ND		
PESTICIDES											
Aroclor-1248	O	176	ug/kg	6.0E-08	2.0E-05	3.0E-03	0.06	3.0E-07	1.8E-05	1.7E-02	2.0E-02
Aroclor-1260	O	2864	ug/kg	9.8E-07	2.0E-05	4.9E-02	0.06	4.9E-06	1.8E-05	2.7E-01	3.2E-01
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDD	O	0.51	ug/kg	1.7E-10	ND		0.03	4.3E-10	ND		
OCDD	O	3.35	ug/kg	1.1E-09	ND		0.03	2.8E-09	ND		
2,3,7,8-TCDF	O	0.054	ug/kg	1.8E-11	ND		0.03	4.6E-11	ND		
OCDF	O	0.501	ug/kg	1.7E-10	ND		0.03	4.3E-10	ND		
INORGANICS											
Arsenic	I	1.8	mg/kg	6.2E-07	3.0E-04	2.1E-03	0.001	5.1E-08	2.9E-04	1.7E-04	2.2E-03
Beryllium	I	3.1	mg/kg	1.1E-06	5.0E-03	2.1E-04	0.001	8.8E-08	5.0E-05	1.8E-03	2.0E-03
Chromium	I	11.8	mg/kg	4.0E-06	5.0E-03	8.1E-04	0.001	3.3E-07	5.5E-04	6.1E-04	1.4E-03
Manganese	I	23.1	mg/kg	7.9E-06	1.4E-01	5.7E-05	0.001	6.5E-07	5.6E-03	1.2E-04	1.7E-04
Mercury	I	0.24	mg/kg	8.2E-08	3.0E-04	2.7E-04	0.001	6.8E-09	6.0E-05	1.1E-04	3.9E-04
Thallium	I	2.6	mg/kg	8.9E-07	8.0E-05	1.1E-02	0.001	7.4E-08	8.0E-05	9.2E-04	1.2E-02
				SUMMARY HAZARD INDEX		6.7E-02				3E-01	4E-01

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[2] Calculated from Oral RfDs.
ND = No data available

TABLE R – 10.8
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical specific	
INGESTION RATE	IR	100	mg/day	USEPA, 1991
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm^2–event	USEPA, 1992a
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
SURFACE AREA EXPOSED	SA	5,750	cm^2	USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2–event	Per USEPA, 1992a
CONVERSION FACTOR	CF	1.00E–06	kg/mg	SEE BELOW
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE FREQUENCY	EF	350	days/year *	USEPA, 1991
EXPOSURE DURATION	ED	24	years	USEPA, 1991
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	24	years	USEPA, 1991

* Units for exposure frequency are events/year in the calculation of the dermally absorbed dose.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6–03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8–91/011B; January 1992.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E–9 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg–day) x CANCER SLOPE FACTOR $(mg/kg\text{–}day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg–day) / REFERENCE DOSE (mg/kg–day)

$$\text{INTAKE–INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE–DERMAL} = \frac{DAevent \times SA \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

Where:

$$DAevent = CS \times AF \times ABS_d \times CF$$

Note: For noncarcinogenic effects: AT = ED

TABLE R – 10.8, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

1ARSSN	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,5] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	510	ug/kg	2.4E-07	7.3E-01	1.7E-07	0.01	1.4E-07	8.0E-01	1.1E-07	2.9E-07
Benzo(a)pyrene	O	485	ug/kg	2.3E-07	7.3E+00	1.7E-06	0.01	1.3E-07	8.0E+00	1.1E-06	2.7E-06
Benzo(b)fluoranthene	O	1000	ug/kg	4.7E-07	7.3E-01	3.4E-07	0.01	2.7E-07	8.0E-01	2.2E-07	5.6E-07
Benzo(k)fluoranthene	O	735	ug/kg	3.5E-07	7.3E-02	2.5E-08	0.01	2.0E-07	8.0E-02	1.6E-08	4.1E-08
Chrysene	O	520	ug/kg	2.4E-07	7.3E-03	1.8E-09	0.01	1.4E-07	8.0E-03	1.1E-09	2.9E-09
Dibenz(a,h)anthracene	O	237	ug/kg	1.1E-07	7.3E+00	8.1E-07	0.01	6.4E-08	8.0E+00	5.1E-07	1.3E-06
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	1.4E-07	7.3E-01	9.9E-08	0.01	7.8E-08	8.0E-01	6.3E-08	1.6E-07
PESTICIDES											
Aroclor-1260	O	400	ug/kg	1.9E-07	7.7E+00	1.4E-06	0.06	6.5E-07	8.6E+00	5.5E-06	7.0E-06
Heptachlor	O	42.1	ug/kg	2.0E-08	4.5E+00	8.9E-08	0.01	1.1E-08	9.2E+00	1.0E-07	1.9E-07
Heptachlor epoxide	O	46.5	ug/kg	2.2E-08	9.1E+00	2.0E-07	0.01	1.3E-08	1.9E+01	2.4E-07	4.4E-07
alpha-Chlordane	O	47	ug/kg	2.2E-08	1.3E+00	2.9E-08	0.01	1.3E-08	1.6E+00	2.1E-08	4.9E-08
gamma-Chlordane	O	113	ug/kg	5.3E-08	1.3E+00	6.9E-08	0.01	3.1E-08	1.6E+00	5.0E-08	1.2E-07
INORGANICS											
Arsenic	I	1.4	mg/kg	6.6E-07	1.8E+00	1.2E-06	0.001	3.8E-08	1.8E+00	6.8E-08	1.2E-06
					SUMMARY CANCER RISK	6E-06				8E-06	1E-05

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993)
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.8, continued

1ARSSN	01-Jun-95

FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	510	ug/kg	7.0E-07	ND		0.01	4.0E-07	ND		
Benzo(a)pyrene	O	485	ug/kg	6.6E-07	ND		0.01	3.8E-07	ND		
Benzo(b)fluoranthene	O	1000	ug/kg	1.4E-06	ND		0.01	7.9E-07	ND		
Benzo(k)fluoranthene	O	735	ug/kg	1.0E-06	ND		0.01	5.8E-07	ND		
Chrysene	O	520	ug/kg	7.1E-07	ND		0.01	4.1E-07	ND		
Dibenz(a,h)anthracene	O	237	ug/kg	3.2E-07	ND		0.01	1.9E-07	ND		
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	4.0E-07	ND		0.01	2.3E-07	ND		
PESTICIDES											
Aroclor 1260	O	400	ug/kg	5.5E-07	2.0E-05	2.7E-02	0.06	1.9E-06	1.8E-05	1.1E-01	1.3E-01
Heptachlor	O	42.1	ug/kg	5.8E-08	5.0E-04	1.2E-04	0.01	3.3E-08	2.5E-04	1.3E-04	2.5E-04
Heptachlor epoxide	O	46.5	ug/kg	6.4E-08	1.3E-05	4.9E-03	0.01	3.7E-08	6.4E-06	5.7E-03	1.1E-02
alpha-Chlordane	O	47	ug/kg	6.4E-08	6.0E-05	1.1E-03	0.01	3.7E-08	4.8E-05	7.7E-04	1.8E-03
gamma-Chlordane	O	113	ug/kg	1.5E-07	6.0E-05	2.6E-03	0.01	8.9E-08	4.8E-05	1.9E-03	4.4E-03
INORGANICS											
Arsenic	I	1.4	mg/kg	1.9E-06	3.0E-04	6.4E-03	0.001	1.1E-07	2.9E-04	3.8E-04	6.8E-03
Cadmium	I	23.8	mg/kg	3.3E-05	1.0E-03	3.3E-02	0.001	1.9E-06	1.0E-05	1.9E-01	2.2E-01
Cobalt	I	13.2	mg/kg	1.8E-05	1.8E-01	1.0E-04	0.001	1.0E-06	1.8E-02	5.8E-05	1.6E-04
Manganese	I	52.7	mg/kg	7.2E-05	1.4E-01	5.2E-04	0.001	4.2E-06	5.6E-03	7.4E-04	1.3E-03
					SUMMARY HAZARD INDEX	8E-02				3E-01	4E-01

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[2] Calculated from Oral RfDs.
ND = No Data

TABLE R - 10.9
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

1ARAIRN | 01-Jun-95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
SOIL CONCENTRATION	C	chemical specific	chemical specific	
PART. EMISSION FACTOR	PEF	4.97E+07	m^3/kg	Appendix
CONCENTRATION AIR	CA	chemical specific	mg/m^3	
INHALATION RATE	IR	0.833	m^3/hour	USEPA, 1991
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE TIME	ET	16	hours/day	Assumption
EXPOSURE FREQUENCY	EF	350	days/year	USEPA, 1991
EXPOSURE DURATION	ED	24	years	USEPA, 1991
CONVERSION FACTOR	CF	0.001	mg/ug	Organics only
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	24	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
PEF has been derived in the Appendix to this report, Derivation of Particulate Emissions Factor

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x INHALATION CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / INHALATION REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

Where:

CA = C x CF x (1/PEF)

Note:

For noncarcinogenic effects: AT = ED

TABLE R - 10.9, continued
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION CSF (mg/kg-day)^-1	CANCER RISK
SEMIVOLATILES							
Benzo(a)anthracene	O	510	ug/kg	1.03E-08	6.4E-10	ND	
Benzo(a)pyrene	O	485	ug/kg	9.76E-09	6.1E-10	ND	
Benzo(b)fluoranthene	O	1000	ug/kg	2.01E-08	1.3E-09	ND	
Benzo(k)fluoranthene	O	735	ug/kg	1.48E-08	9.3E-10	ND	
Chrysene	O	520	ug/kg	1.05E-08	6.5E-10	ND	
Dibenz(a,h)anthracene	O	237	ug/kg	4.77E-09	3.0E-10	ND	
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	5.84E-09	3.7E-10	ND	
PESTICIDES							
Aroclor-1260	O	400	ug/kg	8.05E-09	5.0E-10	ND	
Heptachlor	O	42.1	ug/kg	8.47E-10	5.3E-11	4.5E+00	2.4E-10
Heptachlor epoxide	O	46.5	ug/kg	9.36E-10	5.9E-11	9.1E+00	5.3E-10
alpha-Chlordane	O	47	ug/kg	9.46E-10	5.9E-11	1.3E+00	7.7E-11
gamma-Chlordane	O	113	ug/kg	2.27E-09	1.4E-10	1.3E+00	1.9E-10
INORGANICS							
Arsenic	I	1.4	mg/kg	2.82E-08	1.8E-09	5.0E+01	8.8E-08
Cadmium	I	23.8	mg/kg	4.79E-07	3.0E-08	ND	
						SUMMARY CANCER RISK	9E-08

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
ND = No data available

TABLE R - 10.9, continued
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION RfD (mg/kg-day)	HAZARD QUOTIENT
SEMIVOLATILES							
Benzo(a)anthracene	O	510	ug/kg	1.03E-08	1.9E-09	ND	
Benzo(a)pyrene	O	485	ug/kg	9.76E-09	1.8E-09	ND	
Benzo(b)fluoranthene	O	1000	ug/kg	2.01E-08	3.7E-09	ND	
Benzo(k)fluoranthene	O	735	ug/kg	1.48E-08	2.7E-09	ND	
Chrysene	O	520	ug/kg	1.05E-08	1.9E-09	ND	
Dibenz(a,h)anthracene	O	237	ug/kg	4.77E-09	8.7E-10	ND	
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	5.84E-09	1.1E-09	ND	
PESTICIDES							
Aroclor 1260	O	400	ug/kg	8.05E-09	1.5E-09	ND	
Heptachlor	O	42.1					
Heptachlor epoxide	O	46.5					
alpha-Chlordane	O	47	ug/kg	9.46E-10	1.7E-10	ND	
gamma-Chlordane	O	113	ug/kg	2.27E-09	4.2E-10	ND	
INORGANICS							
Arsenic	I	1.4	mg/kg	2.82E-08	5.1E-09	ND	
Cadmium	I	23.8	mg/kg	4.79E-07	8.7E-08	ND	
Cobalt	I	13.2	mg/kg	2.66E-07	4.8E-08	ND	
Manganese	I	52.7	mg/kg	1.06E-06	1.9E-07	ND	
SUMMARY HAZARD INDEX							0E+00

ND = No data available

TABLE R - 10.10
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical-specific	
INGESTION RATE	IR	200	mg/day	USEPA, 1991
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm²-event	USEPA, 1992a
AGE-SPECIFIC SURFACE AREA	SA_i	age-specific	cm²	USEPA, 1989
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
CONVERSION FACTOR	CF	1.00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	15	kg	USEPA, 1991
AGE-SPECIFIC BODY WEIGHT	BW_i	age-specific	kg	USEPA, 1989
EXPOSURE FREQUENCY	EF	350	days/year *	USEPA, 1991
EXPOSURE DURATION	ED	6	years	USEPA, 1991
AGE-SPECIFIC EXPOSURE DURATION	ED_i	age-specific	years	Assumption
AGE-WEIGHTED SURFACE AREA [1]	$SA_{soil/adj}$	766	cm2-year/kg	Per USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm²-event	Per USEPA, 1992a
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	USEPA, 1991

* Units for exposure frequency are in events/year in the calculation of the dermally absorbed dose.
[1] In estimating the dermally absorbed dose for children age 1 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per USEPA, 1992.
USEPA, 1989. Exposure Factors Handbook; EPA/600/8-89/043; May 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992 and Dermal Exposure Appendix of this document.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E-09 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

$$\text{INTAKE-DERMAL} = (DA_{event} \times EF / AT \times 365\ \text{days/year}) \times SA_{soil/adj}$$

Where:

$$SA_{soil/adj} = SUM\ (SA_i \times ED_i / BW_i)$$
$$DA_{event} = CS \times AF \times ABS_d \times CF$$

Note:
For noncarcinogenic effects: AT = ED

TABLE R – 10.10, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET – OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

ICRSSN	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,5] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	510	ug/kg	5.6E-07	7.3E-01	4.1E-07	0.01	5.4E-08	8.0E-01	4.3E-08	4.5E-07
Benzo(a)pyrene	O	485	ug/kg	5.3E-07	7.3E+00	3.9E-06	0.01	5.1E-08	8.0E+00	4.1E-07	4.3E-06
Benzo(b)fluoranthene	O	1000	ug/kg	1.1E-06	7.3E-01	8.0E-07	0.01	1.0E-07	8.0E-01	8.4E-08	8.8E-07
Benzo(k)fluoranthene	O	735	ug/kg	8.1E-07	7.3E-02	5.9E-08	0.01	7.7E-08	8.0E-02	6.2E-09	6.5E-08
Chrysene	O	520	ug/kg	5.7E-07	7.3E-03	4.2E-09	0.01	5.5E-08	8.0E-03	4.4E-10	4.6E-09
Dibenz(a,h)anthracene	O	237	ug/kg	2.6E-07	7.3E+00	1.9E-06	0.01	2.5E-08	8.0E+00	2.0E-07	2.1E-06
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	3.2E-07	7.3E-01	2.3E-07	0.01	3.0E-08	8.0E-01	2.4E-08	2.6E-07
PESTICIDES											
Aroclor-1260	O	400	ug/kg	4.4E-07	7.7E+00	3.4E-06	0.06	2.5E-07	8.6E+00	2.2E-06	5.5E-06
Heptachlor	O	42.1	ug/kg	4.6E-08	4.5E+00	2.1E-07	0.01	4.4E-09	9.2E+00	4.1E-08	2.5E-07
Heptachlor epoxide	O	46.5	ug/kg	5.1E-08	9.1E+00	4.6E-07	0.01	4.9E-09	1.9E+01	9.3E-08	5.6E-07
alpha-Chlordane	O	47	ug/kg	5.2E-08	1.3E+00	6.7E-08	0.01	4.9E-09	1.6E+00	8.0E-09	7.5E-08
gamma-Chlordane	O	113	ug/kg	1.2E-07	1.3E+00	1.6E-07	0.01	1.2E-08	1.6E+00	1.9E-08	1.8E-07
INORGANICS											
Arsenic	I	1.4	mg/kg	1.5E-06	1.8E+00	2.7E-06	0.001	1.5E-08	1.8E+00	2.6E-08	2.7E-06
					SUMMARY CANCER RISK	1.4E-05				3E-06	2E-05

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993)
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.10, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL NORTH OF CHILD STREET – OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

ICRSSN	01-Jun-95

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	510	ug/kg	6.5E-06	ND		0.01	6.2E-07	ND		
Benzo(a)pyrene	O	485	ug/kg	6.2E-06	ND		0.01	5.9E-07	ND		
Benzo(b)fluoranthene	O	1000	ug/kg	1.3E-05	ND		0.01	1.2E-06	ND		
Benzo(k)fluoranthene	O	735	ug/kg	9.4E-06	ND		0.01	9.0E-07	ND		
Chrysene	O	520	ug/kg	6.6E-06	ND		0.01	6.4E-07	ND		
Dibenz(a,h)anthracene	O	237	ug/kg	3.0E-06	ND		0.01	2.9E-07	ND		
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	3.7E-06	ND		0.01	3.6E-07	ND		
PESTICIDES											
Aroclor 1260	O	400	ug/kg	5.1E-06	2.0E-05	2.6E-01	0.06	2.9E-06	1.8E-05	1.6E-01	4.2E-01
Heptachlor	O	42.1	ug/kg	5.4E-07	5.0E-04	1.1E-03	0.01	5.2E-08	2.5E-04	2.1E-04	1.3E-03
Heptachlor epoxide	O	46.5	ug/kg	5.9E-07	1.3E-05	4.6E-02	0.01	5.7E-08	6.4E-06	8.9E-03	5.5E-02
alpha-Chlordane	O	47	ug/kg	6.0E-07	6.0E-05	1.0E-02	0.01	5.8E-08	4.8E-05	1.2E-03	1.1E-02
gamma-Chlordane	O	113	ug/kg	1.4E-06	6.0E-05	2.4E-02	0.01	1.4E-07	4.8E-05	2.9E-03	2.7E-02
INORGANICS											
Arsenic	I	1.4	mg/kg	1.8E-05	3.0E-04	6.0E-02	0.001	1.7E-07	2.9E-04	5.8E-04	6.0E-02
Cadmium	I	23.8	mg/kg	3.0E-04	1.0E-03	3.0E-01	0.001	2.9E-06	1.0E-05	2.9E-01	6.0E-01
Cobalt	I	13.2	mg/kg	1.7E-04	6.0E-02	2.8E-03	0.001	1.6E-06	1.8E-02	9.0E-05	2.9E-03
Manganese	I	52.7	mg/kg	6.7E-04	1.4E-01	4.8E-03	0.001	6.5E-06	5.6E-03	1.2E-03	6.0E-03
				SUMMARY HAZARD INDEX		7E-01				5E-01	1E+00

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[2] Calculated from Oral RfDs.
ND = No data available

TABLE R – 10.11
FUTURE USE INHALATION OF PARTICULATE DUST – SURFACE SOIL NORTH OF CHILD STREET – OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

1CRAIRN	01-Jun-95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
SOIL CONCENTRATION	C	chemical specific	chemical specific	
PART. EMISSION FACTOR	PEF	4.97E+07	m^3/kg	Appendix
CONCENTRATION AIR	CA	chemical specific	mg/m^3	
INHALATION RATE	IR	0.833	$m^3/hour$	USEPA, 1991
BODY WEIGHT	BW	15	kg	USEPA, 1991
EXPOSURE TIME	ET	16	hours/day	Assumption
EXPOSURE FREQUENCY	EF	350	days/year	USEPA, 1991
EXPOSURE DURATION	ED	6	years	USEPA, 1991
CONVERSION FACTOR	CF	0.001	mg/ug	Organics only
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
PEF has been derived in the Appendix to this report, Derivation of Particulate Emissions Factor

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x INHALATION CANCER SLOPE FACTOR (mg/kg-day) ^ -1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / INHALATION REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

Where:

CA C x CF x (1/PEF)

Note:

For noncarcinogenic effects AT = ED

TABLE R - 10.11, continued
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION CSF (mg/kg-day)^-1	CANCER RISK
SEMIVOLATILES							
Benzo(a)anthracene	O	510	ug/kg	1.03E-08	7.5E-10	ND	
Benzo(a)pyrene	O	485	ug/kg	9.76E-09	7.1E-10	ND	
Benzo(b)fluoranthene	O	1000	ug/kg	2.01E-08	1.5E-09	ND	
Benzo(k)fluoranthene	O	735	ug/kg	1.48E-08	1.1E-09	ND	
Chrysene	O	520	ug/kg	1.05E-08	7.6E-10	ND	
Dibenz(a,h)anthracene	O	237	ug/kg	4.77E-09	3.5E-10	ND	
Indeno(1,2,3-cd)pyrene	O	290	ug/kg	5.84E-09	4.3E-10	ND	
PESTICIDES							
Aroclor-1260	O	400	ug/kg	8.05E-09	5.9E-10	ND	
Heptachlor	O	42.1	ug/kg	8.47E-10	6.2E-11	4.5E+00	2.8E-10
Heptachlor epoxide	O	46.5	ug/kg	9.36E-10	6.8E-11	9.1E+00	6.2E-10
alpha-Chlordane	O	47	ug/kg	9.46E-10	6.9E-11	1.3E+00	9.0E-11
gamma-Chlordane	O	113	ug/kg	2.27E-09	1.7E-10	1.3E+00	2.2E-10
INORGANICS							
Arsenic	I	1.4	mg/kg	2.82E-08	2.1E-09	5.0E+01	1.0E-07
Cadmium	I	23.8	mg/kg	4.79E-07	3.5E-08	ND	
						SUMMARY CANCER RISK	1E-07

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
ND = No data available

TABLE R - 10.11, continued
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL NORTH OF CHILD STREET - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION RfD (mg/kg-day)	HAZARD QUOTIENT
SEMIVOLATILES							
Benzo(a)anthracene	O	510	ug/kg	1.03E-08	8.7E-09	ND	
Benzo(a)pyrene	O	485	ug/kg	9.76E-09	8.3E-09	ND	
Benzo(b)fluoranthene	O	1000	ug/kg	2.01E-08	1.7E-08	ND	
Benzo(k)fluoranthene	O	735	ug/kg	1.48E-08	1.3E-08	ND	
Chrysene	O	520	ug/kg	1.05E-08	8.9E-09	ND	
Dibenz(a,h)anthracene	O	237	ug/kg	4.77E-09	4.1E-09	ND	
Indeno(1,2,3-cd)pyrene)	O	290	ug/kg	5.84E-09	5.0E-09	ND	
PESTICIDES							
Aroclor 1260	O	400	ug/kg	8.05E-09	6.9E-09	ND	
Heptachlor	O	42.1	ug/kg	8.47E-10	7.2E-10	ND	
Heptachlor epoxide	O	46.5	ug/kg	9.36E-10	8.0E-10	ND	
alpha-Chlordane	O	47	ug/kg	9.46E-10	8.1E-10	ND	
gamma-Chlordane	O	113	ug/kg	2.27E-09	1.9E-09	ND	
INORGANICS							
Arsenic	I	1.4	mg/kg	2.82E-08	2.4E-08	ND	
Cadmium	I	23.8	mg/kg	4.79E-07	4.1E-07	ND	
Cobalt	I	13.2	mg/kg	2.66E-07	2.3E-07	ND	
Manganese	I	52.7	mg/kg	1.06E-06	9.0E-07	ND	
						SUMMARY HAZARD INDEX	0E+00

ND = No data available

TABLE R – 10.12
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical specific	
INGESTION RATE	IR	100	mg/day	USEPA, 1991
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm²–event	USEPA, 1992a
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
SURFACE AREA EXPOSED	SA	5,750	cm²	USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm²–event	Per USEPA, 1992a
CONVERSION FACTOR	CF	1.00E–06	kg/mg	SEE BELOW
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE FREQUENCY	EF	350	days/year *	USEPA, 1991
EXPOSURE DURATION	ED	24	years	USEPA, 1991
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	24	years	USEPA, 1991

* Units for exposure frequency are events/year in the calculation of the dermally absorbed dose.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6–03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8–91/011B; January 1992.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E–9 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg–day) x CANCER SLOPE FACTOR $(mg/kg\text{–}day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg–day) / REFERENCE DOSE (mg/kg–day)

$$\text{INTAKE–INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE–DERMAL} = \frac{DAevent \times SA \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

Where:

$$DAevent = CS \times AF \times ABS_d \times CF$$

Note: For noncarcinogenic effects: AT = ED

TABLE R – 10.12, continued

1ARSSS	01-Jun-95

FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	416	ug/kg	2.0E-07	7.3E-01	1.4E-07	0.01	1.1E-07	8.0E-01	9.0E-08	2.3E-07
Benzo(a)pyrene	O	433	ug/kg	2.0E-07	7.3E+00	1.5E-06	0.01	1.2E-07	8.0E+00	9.4E-07	2.4E-06
Benzo(b)fluoranthene	O	407	ug/kg	1.9E-07	7.3E-01	1.4E-07	0.01	1.1E-07	8.0E-01	8.8E-08	2.3E-07
Benzo(k)fluoranthene	O	399	ug/kg	1.9E-07	7.3E-02	1.4E-08	0.01	1.1E-07	8.0E-02	8.6E-09	2.2E-08
Chrysene	O	424	ug/kg	2.0E-07	7.3E-03	1.5E-09	0.01	1.1E-07	8.0E-03	9.2E-10	2.4E-09
Dibenz(a,h)anthracene	O	160	ug/kg	7.5E-08	7.3E+00	5.5E-07	0.01	4.3E-08	8.0E+00	3.5E-07	9.0E-07
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	1.7E-07	7.3E-01	1.2E-07	0.01	9.7E-08	8.0E-01	7.8E-08	2.0E-07
PESTICIDES											
4,4'-DDD	O	20	ug/kg	9.4E-09	2.4E-01	2.3E-09	0.01	5.4E-09	1.2E+00	6.5E-09	8.7E-09
4,4'-DDE	O	45	ug/kg	2.1E-08	3.4E-01	7.2E-09	0.01	1.2E-08	1.7E+00	2.1E-08	2.8E-08
4,4'-DDT	O	358	ug/kg	1.7E-07	3.4E-01	5.7E-08	0.01	9.7E-08	1.7E+00	1.6E-07	2.2E-07
Aroclor-1254	O	478	ug/kg	2.2E-07	7.7E+00	1.7E-06	0.06	7.7E-07	8.6E+00	6.6E-06	8.4E-06
Aroclor-1260	O	4403	ug/kg	2.1E-06	7.7E+00	1.6E-05	0.06	7.1E-06	8.6E+00	6.1E-05	7.7E-05
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDF	O	0.00325	ug/kg	1.5E-12	1.6E+05	2.4E-07	0.03	2.6E-12	3.2E+05	8.4E-07	1.1E-06
HpCDFs (other)	O	0			1.6E+05		0.03		3.2E+05		
HxCDFs (other)	O	0			1.6E+05		0.03		3.2E+05		
OCDF	O	0.000002	ug/kg	9.4E-16	1.6E+05	1.5E-10	0.03	1.6E-15	3.2E+05	5.2E-10	6.7E-10
1,2,3,4,6,7,8-HpCDD	O	0.00305	ug/kg	1.4E-12	1.6E+05	2.3E-07	0.03	2.5E-12	3.2E+05	7.9E-07	1.0E-06
HpCDDs (other)	O	0			1.6E+05		0.03		3.2E+05		
OCDD	O	0.00067	ug/kg	3.1E-13	1.6E+05	5.0E-08	0.03	5.4E-13	3.2E+05	1.7E-07	2.2E-07
INORGANICS											
Arsenic	I	4.1	mg/kg	1.9E-06	1.8E+00	3.4E-06	0.001	1.1E-07	1.8E+00	2.0E-07	3.6E-06
Lead	I	250	mg/kg	1.2E-04	ND		0.001	6.8E-06	ND		
				SUMMARY CANCER RISK		2E-05				7E-05	1E-04

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993)
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.12, continued

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FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	416	ug/kg	5.7E–07	ND		0.01	3.3E–07	ND		
Benzo(a)pyrene	O	433	ug/kg	5.9E–07	ND		0.01	3.4E–07	ND		
Benzo(b)fluoranthene	O	407	ug/kg	5.6E–07	ND		0.01	3.2E–07	ND		
Benzo(k)fluoranthene	O	399	ug/kg	5.5E–07	ND		0.01	3.1E–07	ND		
Chrysene	O	424	ug/kg	5.8E–07	ND		0.01	3.3E–07	ND		
Dibenz(a,h)anthracene	O	160	ug/kg	2.2E–07	ND		0.01	1.3E–07	ND		
Indeno(1,2,3–cd)pyrene	O	361	ug/kg	4.9E–07	ND		0.01	2.8E–07	ND		
PESTICIDES											
4,4'–DDD	O	20	ug/kg	2.7E–08	ND		0.01	1.6E–08	ND		
4,4'–DDE	O	45	ug/kg	6.2E–08	ND		0.01	3.5E–08	ND		
4,4'–DDT	O	358	ug/kg	4.9E–07	5.0E–04	9.8E–04	0.01	2.8E–07	1.0E–04	2.8E–03	3.8E–03
Aroclor 1254	O	478	ug/kg	6.5E–07	2.0E–05	3.3E–02	0.06	2.3E–06	1.8E–05	1.3E–01	1.6E–01
Aroclor 1260	O	4403	ug/kg	6.0E–06	2.0E–05	3.0E–01	0.06	2.1E–05	1.8E–05	1.2E+00	1.5E+00
DIOXINS/FURANS											
1,2,3,4,6,7,8–HpCDF	O	0.325	ug/kg	4.5E–10	ND		0.03	7.7E–10	ND		
HpCDFs (total)	O	0.001	ug/kg	1.4E–12	ND		0.03	2.4E–12	ND		
HxCDFs (total)	O	0.135	ug/kg	1.8E–10	ND		0.03	3.2E–10	ND		
OCDF	O	0.002	ug/kg	2.7E–12	ND		0.03	4.7E–12	ND		
1,2,3,4,6,7,8–HpCDD	O	0.305	ug/kg	4.2E–10	ND		0.03	7.2E–10	ND		
HpCDDs (total)	O	0.56	ug/kg	7.7E–10	ND		0.03	1.3E–09	ND		
OCDD	O	0.67	ug/kg	9.2E–10	ND		0.03	1.6E–09	ND		
INORGANICS											
Antimony	I	7	mg/kg	9.6E–06	4.0E–04	2.4E–02	0.001	5.5E–07	4.0E–06	1.4E–01	1.6E–01
Arsenic	I	4.1	mg/kg	5.6E–06	3.0E–04	1.9E–02	0.001	3.2E–07	2.9E–04	1.1E–03	2.0E–02
Cadmium	I	20.9	mg/kg	2.9E–05	1.0E–03	2.9E–02	0.001	1.6E–06	1.0E–05	1.6E–01	1.9E–01
Chromium	I	70.8	mg/kg	9.7E–05	5.0E–03	1.9E–02	0.001	5.6E–06	5.5E–04	1.0E–02	3.0E–02
Cobalt	I	2.6	mg/kg	3.6E–06	1.8E–01	2.0E–05	0.001	2.0E–07	1.8E–02	1.1E–05	3.1E–05
Lead	I	250	mg/kg	3.4E–04	ND		0.001	2.0E–05	ND		
Manganese	I	77.5	mg/kg	1.1E–04	1.4E–01	7.6E–04	0.001	6.1E–06	5.6E–03	1.1E–03	1.8E–03
Nickel	I	36.6	mg/kg	5.0E–05	2.0E–02	2.5E–03	0.001	2.9E–06	1.0E–03	2.9E–03	5.4E–03
					SUMMARY HAZARD INDEX	4E–01				2E+00	2E+00

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in *USEPA Dermal Guidance (January 1992)*.
[2] Calculated from Oral RfDs.
ND = No Data

TABLE R – 10.13
FUTURE USE INHALATION OF PARTICULATE DUST – SURFACE SOIL SOUTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
SOIL CONCENTRATION	C	chemical specific	chemical specific	
PART. EMISSION FACTOR	PEF	4.97E+07	m^3/kg	Appendix
CONCENTRATION AIR	CA	chemical specific	mg/m^3	
INHALATION RATE	IR	0.833	m^3/hour	USEPA, 1991
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE TIME	ET	16	hours/day	Assumption
EXPOSURE FREQUENCY	EF	350	days/year	USEPA, 1991
EXPOSURE DURATION	ED	24	years	USEPA, 1991
CONVERSION FACTOR	CF	0.001	mg/ug	Organics only
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	24	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
PEF has been derived in the Appendix to this report, Derivation of Particulate Emissions Factor

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x INHALATION CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / INHALATION REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

Where:

CA = C x CF x (1/PEF)

Note:

For noncarcinogenic effects AT = ED

TABLE R - 10.13, continued
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL SOUTH OF CHILD STREET - OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION CSF (mg/kg-day)^-1	CANCER RISK
SEMIVOLATILES							
Benzo(a)anthracene	O	416	ug/kg	8.37E-09	5.2E-10	ND	
Benzo(a)pyrene	O	433	ug/kg	8.71E-09	5.5E-10	ND	
Benzo(b)fluoranthene	O	407	ug/kg	8.19E-09	5.1E-10	ND	
Benzo(k)fluoranthene	O	399	ug/kg	8.03E-09	5.0E-10	ND	
Chrysene	O	424	ug/kg	8.53E-09	5.3E-10	ND	
Dibenz(a,h)anthracene	O	160	ug/kg	3.22E-09	2.0E-10	ND	
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	7.26E-09	4.5E-10	ND	
PESTICIDES							
4,4'-DDD	O	20	ug/kg	4.02E-10	2.5E-11	ND	
4,4'-DDE	O	45	ug/kg	9.05E-10	5.7E-11	ND	
4,4'-DDT	O	358	ug/kg	7.20E-09	4.5E-10	3.4E-01	1.5E-10
Aroclor-1254	O	478	ug/kg	9.62E-09	6.0E-10	ND	
Aroclor-1260	O	4403	ug/kg	8.86E-08	5.5E-09	ND	
DIOXINS/FURANS							
1,2,3,4,6,7,8-HpCDF	O	0.00325	ug/kg	6.54E-14	4.1E-15	1.5E+05	6.1E-10
HpCDFs (other)	O	0				1.5E+05	
HxCDFs (other)	O	0				1.5E+05	
OCDF	O	0.000002	ug/kg	4.02E-17	2.5E-18	1.5E+05	3.8E-13
1,2,3,4,6,7,8-HpCDD	O	0.00305	ug/kg	6.14E-14	3.8E-15	1.5E+05	5.8E-10
HpCDDs (other)	O	0				1.5E+05	
OCDD	O	0.00067	ug/kg	1.35E-14	8.4E-16	1.5E+05	1.3E-10
INORGANICS							
Arsenic	I	4.1	mg/kg	8.25E-08	5.2E-09	5.0E+01	2.6E-07
Cadmium	I	20.9	mg/kg	4.21E-07	2.6E-08	ND	
Chromium	I	70.8	mg/kg	1.42E-06	8.9E-08	4.1E+01	3.7E-06
Nickel	I	36.6	mg/kg	7.36E-07	4.6E-08	8.4E-01	3.9E-08
						SUMMARY CANCER RISK	4E-06

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
ND = No data available

TABLE R – 10.13, continued
FUTURE USE INHALATION OF PARTICULATE DUST – SURFACE SOIL SOUTH OF CHILD STREET – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION RfD (mg/kg-day)	HAZARD QUOTIENT
SEMIVOLATILES							
Benzo(a)anthracene	O	416	ug/kg	8.37E-09	1.5E-09	ND	
Benzo(a)pyrene	O	433	ug/kg	8.71E-09	1.6E-09	ND	
Benzo(b)fluoranthene	O	407	ug/kg	8.19E-09	1.5E-09	ND	
Benzo(k)fluoranthene	O	399	ug/kg	8.03E-09	1.5E-09	ND	
Chrysene	O	424	ug/kg	8.53E-09	1.6E-09	ND	
Dibenz(a,h)anthracene	O	160	ug/kg	3.22E-09	5.9E-10	ND	
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	7.26E-09	1.3E-09	ND	
PESTICIDES							
4,4'-DDD	O	20	ug/kg	4.02E-10	7.3E-11	ND	
4,4'-DDE	O	45	ug/kg	9.05E-10	1.7E-10	ND	
4,4'-DDT	O	358	ug/kg	7.20E-09	1.3E-09	ND	
Aroclor 1254	O	478	ug/kg	9.62E-09	1.8E-09	ND	
Aroclor 1260	O	4403	ug/kg	8.86E-08	1.6E-08	ND	
DIOXINS/FURANS							
1,2,3,4,6,7,8-HpCDF	O	0.325	ug/kg	6.54E-12	1.2E-12	ND	
HpCDFs (total)	O	0.001	ug/kg	2.01E-14	3.7E-15	ND	
HxCDFs (total)	O	0.135	ug/kg	2.72E-12	5.0E-13	ND	
OCDF	O	0.002	ug/kg	4.02E-14	7.3E-15	ND	
1,2,3,4,6,7,8-HpCDD	O	0.305	ug/kg	6.14E-12	1.1E-12	ND	
HpCDDs (total)	O	0.56	ug/kg	1.13E-11	2.1E-12	ND	
OCDD	O	0.67	ug/kg	1.35E-11	2.5E-12	ND	
INORGANICS							
Antimony	I	7	mg/kg	1.41E-07	2.6E-08	ND	
Arsenic	I	4.1	mg/kg	8.25E-08	1.5E-08	ND	
Cadmium	I	20.9	mg/kg	4.21E-07	7.7E-08	ND	
Chromium	I	70.8	mg/kg	1.42E-06	2.6E-07	ND	
Cobalt	I	2.6	mg/kg	5.23E-08	9.6E-09	ND	
Lead	I	250	mg/kg	5.03E-06	9.2E-07	ND	
Manganese	I	77.5	mg/kg	1.56E-06	2.8E-07	ND	
Nickel	I	36.6	mg/kg	7.36E-07	1.3E-07	ND	
					SUMMARY HAZARD INDEX		0E+00

ND = No data available

TABLE R - 10.14
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical-specific	
INGESTION RATE	IR	200	mg/day	USEPA, 1991
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm²-event	USEPA, 1992a
AGE-SPECIFIC SURFACE AREA	SA_i	age-specific	cm²	USEPA, 1989
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
CONVERSION FACTOR	CF	1.00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	15	kg	USEPA, 1991
AGE-SPECIFIC BODY WEIGHT	BW_i	age-specific	kg	USEPA, 1989
EXPOSURE FREQUENCY	EF	350	days/year *	USEPA, 1991
EXPOSURE DURATION	ED	6	years	USEPA, 1991
AGE-SPECIFIC EXPOSURE DURATION	ED_i	age-specific	years	Assumption
AGE-WEIGHTED SURFACE AREA [1]	$SA_{soil/adj}$	766	cm2-year/kg	Per USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm²-event	Per USEPA, 1992a
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	USEPA, 1991

* Units for exposure frequency are in events/year in the calculation of the dermally absorbed dose.
[1] In estimating the dermally absorbed dose for children age 1 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per USEPA, 1992.
USEPA, 1989. Exposure Factors Handbook; EPA/600/8-89/043; May 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992 and Dermal Exposure Appendix of this document.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E-09 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^ -1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

$$\text{INTAKE-DERMAL} = (DA_{event} \times EF / AT \times 365\ \text{days/year}) \times SA_{soil/adj}$$

Where:

$$SA_{soil/adj} = SUM\ (SA_i \times ED_i / BW_i)$$
$$DA_{event} = CS \times AF \times ABS_d \times CF$$

Note:
For noncarcinogenic effects AT = ED

TABLE R – 10.14, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET – OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

ICR555	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,5] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	416	ug/kg	4.6E-07	7.3E-01	3.3E-07	0.01	4.4E-08	8.0E-01	3.5E-08	3.7E-07
Benzo(a)pyrene	O	433	ug/kg	4.7E-07	7.3E+00	3.5E-06	0.01	4.5E-08	8.0E+00	3.6E-07	3.8E-06
Benzo(b)fluoranthene	O	407	ug/kg	4.5E-07	7.3E-01	3.3E-07	0.01	4.3E-08	8.0E-01	3.4E-08	3.6E-07
Benzo(k)fluoranthene	O	399	ug/kg	4.4E-07	7.3E-02	3.2E-08	0.01	4.2E-08	8.0E-02	3.4E-09	3.5E-08
Chrysene	O	424	ug/kg	4.6E-07	7.3E-03	3.4E-09	0.01	4.4E-08	8.0E-03	3.6E-10	3.7E-09
Dibenz(a,h)anthracene	O	160	ug/kg	1.8E-07	7.3E+00	1.3E-06	0.01	1.7E-08	8.0E+00	1.3E-07	1.4E-06
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	4.0E-07	7.3E-01	2.9E-07	0.01	3.8E-08	8.0E-01	3.0E-08	3.2E-07
PESTICIDES											
4,4'-DDD	O	20	ug/kg	2.2E-08	2.4E-01	5.3E-09	0.01	2.1E-09	1.2E+00	2.5E-09	7.8E-09
4,4'-DDE	O	45	ug/kg	4.9E-08	3.4E-01	1.7E-08	0.01	4.7E-09	1.7E+00	8.0E-09	2.5E-08
4,4'-DDT	O	358	ug/kg	3.9E-07	3.4E-01	1.3E-07	0.01	3.8E-08	1.7E+00	6.4E-08	2.0E-07
Aroclor-1254	O	478	ug/kg	5.2E-07	7.7E+00	4.0E-06	0.06	3.0E-07	8.6E+00	2.6E-06	6.6E-06
Aroclor-1260	O	4403	ug/kg	4.8E-06	7.7E+00	3.7E-05	0.06	2.8E-06	8.6E+00	2.4E-05	6.1E-05
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDF	O	0.00325	ug/kg	3.6E-12	1.6E+05	5.7E-07	0.03	1.0E-12	3.2E+05	3.3E-07	9.0E-07
HpCDFs (other)	O	0			1.6E+05		0.03		3.2E+05		
HxCDFs (other)	O	0			1.6E+05		0.03		3.2E+05		
OCDF	O	0.000002	ug/kg	2.2E-15	1.6E+05	3.5E-10	0.03	6.3E-16	3.2E+05	2.0E-10	5.5E-10
1,2,3,4,6,7,8-HpCDD	O	0.00305	ug/kg	3.3E-12	1.6E+05	5.3E-07	0.03	9.6E-13	3.2E+05	3.1E-07	8.4E-07
HpCDDs (other)	O	0			1.6E+05		0.03		3.2E+05		
OCDD	O	0.00067	ug/kg	7.3E-13	1.6E+05	1.2E-07	0.03	2.1E-13	3.2E+05	6.7E-08	1.8E-07
INORGANICS											
Arsenic	I	4.1	mg/kg	4.5E-06	1.8E+00	7.9E-06	0.001	4.3E-08	1.8E+00	7.7E-08	7.9E-06
Lead	I	250	mg/kg	2.7E-04	ND		0.001	2.6E-06	ND		
					SUMMARY CANCER RISK	5.6E-05				3E-05	8E-05

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993)
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R - 10.14, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	416	ug/kg	5.3E-06	ND		0.01	5.1E-07			
Benzo(a)pyrene	O	433	ug/kg	5.5E-06	ND		0.01	5.3E-07	ND		
Benzo(b)fluoranthene	O	407	ug/kg	5.2E-06	ND		0.01	5.0E-07	ND		
Benzo(k)fluoranthene	O	399	ug/kg	5.1E-06	ND		0.01	4.9E-07	ND		
Chrysene	O	424	ug/kg	5.4E-06	ND		0.01	5.2E-07	ND		
Dibenz(a,h)anthracene	O	160	ug/kg	2.0E-06	ND		0.01	2.0E-07	ND		
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	4.6E-06	ND		0.01	4.4E-07	ND		
PESTICIDES											
4,4'-DDD	O	20	ug/kg	2.6E-07	ND		0.01	2.4E-08	ND		
4,4'-DDE	O	45	ug/kg	5.8E-07	ND		0.01	5.5E-08	ND		
4,4'-DDT	O	358	ug/kg	4.6E-06	5.0E-04	9.2E-03	0.01	4.4E-07	1.0E-04	4.4E-03	1.4E-02
Aroclor 1254	O	478	ug/kg	6.1E-06	2.0E-05	3.1E-01	0.06	3.5E-06	1.8E-05	2.0E-01	5.0E-01
Aroclor 1260	O	4403	ug/kg	5.6E-05	2.0E-05	2.8E+00	0.06	3.2E-05	1.8E-05	1.8E+00	4.6E+00
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDF	O	0.325	ug/kg	4.2E-09	ND		0.03	1.2E-09	ND		
HpCDFs (total)	O	0.001	ug/kg	1.3E-11	ND		0.03	3.7E-12	ND		
HxCDFs (total)	O	0.135	ug/kg	1.7E-09	ND		0.03	5.0E-10	ND		
OCDF	O	0.002	ug/kg	2.6E-11	ND		0.03	7.3E-12	ND		
1,2,3,4,6,7,8-HpCDD	O	0.305	ug/kg	3.9E-09	ND		0.03	1.1E-09	ND		
HpCDDs (total)	O	0.56	ug/kg	7.2E-09	ND		0.03	2.1E-09	ND		
OCDD	O	0.67	ug/kg	8.6E-09	ND		0.03	2.5E-09	ND		
INORGANICS											
Antimony	I	7	mg/kg	8.9E-05	4.0E-04	2.2E-01	0.001	8.6E-07	4.0E-06	2.1E-01	4.4E-01
Arsenic	I	4.1	mg/kg	5.2E-05	3.0E-04	1.7E-01	0.001	5.0E-07	2.9E-04	1.7E-03	1.8E-01
Cadmium	I	20.9	mg/kg	2.7E-04	1.0E-03	2.7E-01	0.001	2.6E-06	1.0E-05	2.6E-01	5.2E-01
Chromium	I	70.8	mg/kg	9.1E-04	5.0E-03	1.8E-01	0.001	8.7E-06	5.5E-04	1.6E-02	2.0E-01
Cobalt	I	2.6	mg/kg	3.3E-05	6.0E-02	5.5E-04	0.001	3.2E-07	1.8E-02	1.8E-05	5.7E-04
Lead	I	250	mg/kg	3.2E-03	ND		0.001	3.1E-05	ND		
Manganese	I	77.5	mg/kg	9.9E-04	1.4E-01	7.1E-03	0.001	9.5E-06	5.6E-03	1.7E-03	8.8E-03
Nickel	I	36.6	mg/kg	4.7E-04	2.0E-02	2.3E-02	0.001	4.5E-06	1.0E-03	4.5E-03	2.8E-02
				SUMMARY HAZARD INDEX		4.0E+00				2E+00	6E+00

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[2] Calculated from Oral RfDs.
ND = No data available

TABLE R - 10.15
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

ICRAIRS	01-Jun-95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
SOIL CONCENTRATION	C	chemical specific	chemical specific	
PART. EMISSION FACTOR	PEF	4.97E+07	m^3/kg	Appendix
CONCENTRATION AIR	CA	chemical specific	mg/m^3	
INHALATION RATE	IR	0.833	m^3/hour	USEPA, 1991
BODY WEIGHT	BW	15	kg	USEPA, 1991
EXPOSURE TIME	ET	16	hours/day	Assumption
EXPOSURE FREQUENCY	EF	350	days/year	USEPA, 1991
EXPOSURE DURATION	ED	6	years	USEPA, 1991
CONVERSION FACTOR	CF	0.001	mg/ug	Organics only
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
PEF has been derived in the Appendix to this report, Derivation of Particulate Emissions Factor

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x INHALATION CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / INHALATION REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

Where:

CA C x CF x (1/PEF)

Note:

For noncarcinogenic effects AT = ED

TABLE R - 10.15, continued
FUTURE USE INHALATION OF PARTICULATE DUST - SURFACE SOIL SOUTH OF CHILD STREET - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION CSF (mg/kg-day)^-1	CANCER RISK
SEMIVOLATILES							
Benzo(a)anthracene	O	416	ug/kg	8.37E-09	6.1E-10	ND	
Benzo(a)pyrene	O	433	ug/kg	8.71E-09	6.4E-10	ND	
Benzo(b)fluoranthene	O	407	ug/kg	8.19E-09	6.0E-10	ND	
Benzo(k)fluoranthene	O	399	ug/kg	8.03E-09	5.9E-10	ND	
Chrysene	O	424	ug/kg	8.53E-09	6.2E-10	ND	
Dibenz(a,h)anthracene	O	160	ug/kg	3.22E-09	2.4E-10	ND	
Indeno(1,2,3-cd)pyrene	O	361	ug/kg	7.26E-09	5.3E-10	ND	
PESTICIDES							
4,4'-DDD	O	20	ug/kg	4.02E-10	2.9E-11	ND	
4,4'-DDD	O	45	ug/kg	9.05E-10	6.6E-11	ND	
4,4'-DDT	O	358	ug/kg	7.20E-09	5.3E-10	3.4E-01	1.8E-10
Aroclor-1254	O	478	ug/kg	9.62E-09	7.0E-10	ND	
Aroclor-1260	O	4403	ug/kg	8.86E-08	6.5E-09	ND	
DIOXINS/FURANS							
1,2,3,4,6,7,8-HpCDF	O	0.00325	ug/kg	6.54E-14	4.8E-15	1.5E+05	7.2E-10
HpCDFs (other)	O	0				1.5E+05	
HxCDFs (other)	O	0				1.5E+05	
OCDF	O	0.000002	ug/kg	4.02E-17	2.9E-18	1.5E+05	4.4E-13
1,2,3,4,6,7,8-HpCDD	O	0.00305	ug/kg	6.14E-14	4.5E-15	1.5E+05	6.7E-10
HpCDDs (other)	O	0				1.5E+05	
OCDD	O	0.00067	ug/kg	1.35E-14	9.8E-16	1.5E+05	1.5E-10
INORGANICS							
Arsenic	I	4.1	mg/kg	8.25E-08	6.0E-09	5.0E+01	3.0E-07
Cadmium	I	20.9	mg/kg	4.21E-07	3.1E-08	ND	
Chromium	I	70.8	mg/kg	1.42E-06	1.0E-07	4.1E+01	4.3E-06
Nickel	I	36.6	mg/kg	7.36E-07	5.4E-08	8.4E-01	4.5E-08
						SUMMARY CANCER RISK	5E-06

[1] Exposure point concentrations for dioxins and furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
ND = No data available

TABLE R – 10.15, continued
FUTURE USE INHALATION OF PARTICULATE DUST – SURFACE SOIL SOUTH OF CHILD STREET – OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION RfD (mg/kg-day)	HAZARD QUOTIENT
SEMIVOLATILES							
Benzo(a)anthracene	O	416	ug/kg	8.37E-09	7.1E-09	ND	
Benzo(a)pyrene	O	433	ug/kg	8.71E-09	7.4E-09	ND	
Benzo(b)fluoranthene	O	407	ug/kg	8.19E-09	7.0E-09	ND	
Benzo(k)fluoranthene	O	399	ug/kg	8.03E-09	6.8E-09	ND	
Chrysene	O	424	ug/kg	8.53E-09	7.3E-09	ND	
Dibenz(a,h)anthracene	O	160	ug/kg	3.22E-09	2.7E-09	ND	
Indeno(1,2,3-cd)pyrene)	O	361	ug/kg	7.26E-09	6.2E-09	ND	
PESTICIDES							
4,4'-DDD	O	20	ug/kg	4.02E-10	3.4E-10	ND	
4,4'-DDE	O	45	ug/kg	9.05E-10	7.7E-10	ND	
4,4'-DDT	O	358	ug/kg	7.20E-09	6.1E-09	ND	
Aroclor 1254	O	478	ug/kg	9.62E-09	8.2E-09	ND	
Aroclor 1260	O	4403	ug/kg	8.86E-08	7.5E-08	ND	
DIOXINS/FURANS							
1,2,3,4,6,7,8-HpCDF	O	0.325	ug/kg	6.54E-12	5.6E-12	ND	
HpCDFs (total)	O	0.001	ug/kg	2.01E-14	1.7E-14	ND	
HxCDFs (total)	O	0.135	ug/kg	2.72E-12	2.3E-12	ND	
OCDF	O	0.002	ug/kg	4.02E-14	3.4E-14	ND	
1,2,3,4,6,7,8-HpCDD	O	0.305	ug/kg	6.14E-12	5.2E-12	ND	
HpCDDs (total)	O	0.56	ug/kg	1.13E-11	9.6E-12	ND	
OCDD	O	0.67	ug/kg	1.35E-11	1.1E-11	ND	
INORGANICS							
Antimony	I	7	mg/kg	1.41E-07	1.2E-07	ND	
Arsenic	I	4.1	mg/kg	8.25E-08	7.0E-08	ND	
Cadmium	I	20.9	mg/kg	4.21E-07	3.6E-07	ND	
Chromium	I	70.8	mg/kg	1.42E-06	1.2E-06	ND	
Cobalt	I	2.6	mg/kg	5.23E-08	4.5E-08	ND	
Lead	I	250	mg/kg	5.03E-06	4.3E-06	ND	
Manganese	I	77.5	mg/kg	1.56E-06	1.3E-06	ND	
Nickel	I	36.6	mg/kg	7.36E-07	6.3E-07	ND	
				SUMMARY HAZARD INDEX			0E+00

ND = No data available

1WRKSB	01-Jun-95

TABLE R – 10.16
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SUBSURFACE SOIL – OU1
EXCAVATION WORKER
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical specific	
INGESTION RATE	IR	110	mg/day	Dermal Appendix
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm²–event	USEPA, 1992a
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
SURFACE AREA EXPOSED	SA	5,750	cm²	USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm²–event	Per USEPA, 1992a
CONVERSION FACTOR	CF	1.00E–06	kg/mg	SEE BELOW
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE FREQUENCY	EF	30	days/year *	Assumption
EXPOSURE DURATION	ED	1	years	Assumption
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	1	years	USEPA, 1991

* Units for exposure frequency are events/year in the calculation of the dermally absorbed dose.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6–03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8–91/011B; January 1992.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E–9 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg–day) x CANCER SLOPE FACTOR $(mg/kg\text{–}day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg–day) / REFERENCE DOSE (mg/kg–day)

$$\text{INTAKE–INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE–DERMAL} = \frac{DAevent \times SA \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

Where:

$$DAevent = CS \times AF \times ABS_d \times CF$$

Note: For noncarcinogenic effects: AT = ED

TABLE R – 10.16, continued
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SUBSURFACE SOIL – OU1
EXCAVATION WORKER
NAS Jacksonville
Jacksonville, Florida

1WRKSB	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [2]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [3] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
VOLATILES											
1,2-Dichloroethane	O	54	ug/kg	1.0E-10	9.1E-02	9.1E-12	0.01	5.2E-11	9.1E-02	4.7E-12	1.4E-11
Benzene	O	26	ug/kg	4.8E-11	2.9E-02	1.4E-12	0.01	2.5E-11	2.9E-02	7.3E-13	2.1E-12
Chloroform	O	180	ug/kg	3.3E-10	6.1E-03	2.0E-12	0.01	1.7E-10	6.1E-03	1.1E-12	3.1E-12
Tetrachloroethane	O	150	ug/kg	2.8E-10	5.2E-02	1.4E-11	0.01	1.4E-10	5.2E-02	7.5E-12	2.2E-11
Trichloroethene	O	2000	ug/kg	3.7E-09	1.1E-02	4.1E-11	0.01	1.9E-09	1.1E-02	2.1E-11	6.2E-11
INORGANICS											
Lead	I	57.2	mg/kg	1.1E-07	ND		0.001	5.5E-09	ND		
				SUMMARY CANCER RISK		7E-11				4E-11	1E-10

[1] Exposure point concentrations for carcinogenic PAH compounds have been adjusted by application of USEPA Region IV Toxicity Equivalence Factors (February 10, 1992).
[2] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992).
[3] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.16, continued
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SUBSURFACE SOIL – OU1
EXCAVATION WORKER
NAS Jacksonville
Jacksonville, Florida

LWRKSB	01-Jun-95

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS (1)	INTAKE DERMAL (mg/kg-day)	DERMAL RfD (2) (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
VOLATILES											
1,2-Dichloroethane	O	54	ug/kg	7.0E-09	3.0E-01	2.3E-08	0.01	3.6E-09	3.0E-01	1.2E-08	3.5E-08
Benzene	O	26	ug/kg	3.4E-09	3.0E-04	1.1E-05	0.01	1.8E-09	3.0E-04	5.9E-06	1.7E-05
Chlorobenzene	O	2500	ug/kg	3.2E-07	2.0E-02	1.6E-05	0.01	1.7E-07	2.0E-02	8.4E-06	2.5E-05
Chloroform	O	180	ug/kg	2.3E-08	1.0E-02	2.3E-06	0.01	1.2E-08	1.0E-02	1.2E-06	3.5E-06
Ethylbenzene	O	24000	ug/kg	3.1E-06	1.0E-01	3.1E-05	0.01	1.6E-06	8.2E-02	2.0E-05	5.1E-05
Tetrachloroethane	O	150	ug/kg	1.9E-08	1.0E-02	1.9E-06	0.01	1.0E-08	2.0E-01	5.1E-08	2.0E-06
Toluene	O	26000	ug/kg	3.4E-06	2.0E-01	1.7E-05	0.01	1.8E-06	2.0E-01	8.8E-06	2.6E-05
Trichloroethene	O	2000	ug/kg	2.6E-07	6.0E-03	4.3E-05	0.01	1.4E-07	6.0E-03	2.3E-05	6.6E-05
Xylenes	O	2900	ug/kg	3.7E-07	2.0E+00	1.9E-07	0.01	2.0E-07	2.0E+00	9.8E-08	2.9E-07
SEMIVOLATILES											
2-Methylnaphthalene	O	9600	ug/kg	1.2E-06	ND		0.01	6.5E-07	ND		
Acenaphthene	O	2600	ug/kg	3.4E-07	6.0E-02	5.6E-06	0.01	1.8E-07	5.5E-02	3.2E-06	8.8E-06
Dibenzofuran	O	2500	ug/kg	3.2E-07	ND		0.01	1.7E-07	ND		
Fluoranthene	O	850	ug/kg	1.1E-07	4.0E-01	2.7E-07	0.01	5.7E-08	3.6E-01	1.6E-07	4.3E-07
Naphthalene	O	7800	ug/kg	1.0E-06	4.0E-02	2.5E-05	0.01	5.3E-07	4.0E-02	1.3E-05	3.8E-05
Phenanthrene	O	1800	ug/kg	2.3E-07	ND		0.01	1.2E-07	ND		
Pyrene	O	1200	ug/kg	1.5E-07	3.0E-01	5.2E-07	0.01	8.1E-08	2.7E-01	3.0E-07	8.1E-07
INORGANICS											
Aluminum	I	2400	mg/kg	3.1E-04	1.0E+00	3.1E-04	0.001	1.6E-05	ND		3.1E-04
Barium	I	4.9	mg/kg	6.3E-07	7.0E-02	9.0E-06	0.001	3.3E-08	4.9E-03	6.8E-06	1.6E-05
Cadmium	I	4	mg/kg	5.2E-07	1.0E-03	5.2E-04	0.001	2.7E-08	1.0E-05	2.7E-03	3.2E-03
Calcium	I	219	mg/kg	2.8E-05	ND		0.001	1.5E-06	ND		
Chromium	I	28.9	mg/kg	3.7E-06	5.0E-03	7.5E-04	0.001	2.0E-07	5.5E-04	3.5E-04	1.1E-03
Copper	I	5.1	mg/kg	6.6E-07	ND		0.001	3.4E-08	ND		
Iron	I	585	mg/kg	7.6E-05	ND		0.001	3.9E-06	ND		
Lead	I	57.2	mg/kg	7.4E-06	ND		0.001	3.9E-07	ND		
Magnesium	I	32.7	mg/kg	4.2E-06	ND		0.001	2.2E-07	ND		
Manganese	I	3.5	mg/kg	4.5E-07	1.4E-01	3.2E-06	0.001	2.4E-08	5.6E-03	4.2E-06	7.4E-06
Mercury	I	0.19	mg/kg	2.5E-08	3.0E-04	8.2E-05	0.001	1.3E-09	6.0E-05	2.1E-05	1.0E-04
Nickel	I	6.5	mg/kg	8.4E-07	2.0E-02	4.2E-05	0.001	4.4E-08	1.0E-03	4.4E-05	8.6E-05
Selenium	I	0.23	mg/kg	3.0E-08	5.0E-03	5.9E-06	0.001	1.6E-09	3.0E-03	5.2E-07	6.5E-06
Sodium	I	86.9	mg/kg	1.1E-05	ND		0.001	5.9E-07	ND		
Vanadium	I	2.6	mg/kg	3.4E-07	7.0E-03	4.8E-05	0.001	1.8E-08	2.1E-03	8.4E-06	5.6E-05
Zinc	I	106	mg/kg	1.4E-05	3.0E-01	4.6E-05	0.001	7.2E-07	1.0E-01	7.0E-06	5.3E-05
				SUMMARY HAZARD INDEX		2E-03				3E-03	5E-03

ND = No data available

TABLE R – 10.17
FUTURE USE INHALATION OF PARTICULATE DUST – SUBSURFACE SOIL – OU1
SITE WORKER
NAS Jacksonville
Jacksonville, Florida

1WR KAIR	01-Jun-93

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
SOIL CONCENTRATION	C	chemical specific	chemical specific	
PART. EMISSION FACTOR	PEF	4.97E+07	m^3/kg	Appendix
CONCENTRATION AIR	CA	chemical specific	mg/m^3	
INHALATION RATE	IR	0.833	$m^3/hour$	USEPA, 1991
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE TIME	ET	8	hours/day	Assumption
EXPOSURE FREQUENCY	EF	250	days/year	USEPA, 1991
EXPOSURE DURATION	ED	25	years	USEPA, 1991
CONVERSION FACTOR	CF	0.001	mg/ug	Organics only
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	25	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
PEF has been derived in the Appendix to this report, Derivation of Particulate Emissions Factor

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x INHALATION CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / INHALATION REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ \text{days/yr}}$$

Where:

CA = C x CF x (1/PEF)

Note:

For noncarcinogenic effects: AT = ED

TABLE R – 10.17, continued
FUTURE USE INHALATION OF PARTICULATE DUST – SUBSURFACE SOIL – OU1
SITE WORKER
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION [1]	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION CSF (mg/kg-day)^-1	CANCER RISK
VOLATILES							
1,2-Dichloroethane	O	54	ug/kg	1.09E-09	2.5E-11	9.1E-02	2.3E-12
Benzene	O	2600	ug/kg	5.23E-08	1.2E-09	2.9E-02	3.5E-11
Chloroform	O	180	ug/kg	3.62E-09	8.4E-11	8.1E-02	6.8E-12
Tetrachloroethene	O	150	ug/kg	3.02E-09	7.0E-11	2.0E-03	1.4E-13
Trichloroethylene	O	2000	ug/kg	4.02E-08	9.4E-10	6.0E-03	5.6E-12
INORGANICS							
Cadmium	O	4	ug/kg	8.05E-11	1.9E-12	ND	
Chromium	O	28.9	ug/kg	5.81E-10	1.4E-11	4.1E+00	5.6E-11
Nickel	O	6.5	ug/kg	1.31E-10	3.0E-12	8.4E-01	2.6E-12
						SUMMARY CANCER RISK	1E-10

[1] Exposure point concentrations for carcinogenic PAH compounds have been adjusted by application of USEPA Region IV Toxicity Equivalence Factors (February 10, 1992).
ND = No data available

TABLE R - 10.17, continued
FUTURE USE INHALATION OF PARTICULATE DUST - SUBSURFACE SOIL - OU1
SITE WORKER
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SOIL CONCENTRATION	UNITS	AIR CONCENTRATION (mg/m³)	INTAKE (mg/kg-day)	INHALATION RfD (mg/kg-day)	HAZARD QUOTIENT
VOLATILES							
1,2-Dichloroethane	O	54	ug/kg	1.09E-09	7.1E-11	ND	
Benzene	O	26	ug/kg	5.23E-10	3.4E-11	ND	
Chlorobenzene	O	2500	ug/kg	5.03E-08	3.3E-09	2.0E+01	1.6E-10
Chloroform	O	180	ug/kg	3.62E-09	2.4E-10	ND	
Tetrachloroethene	O	24000	ug/kg	4.83E-07	3.1E-08	ND	
Toluene	O	150	ug/kg	3.02E-09	2.0E-10	4.0E+02	4.9E-13
Trichloroethylene	O	26000	ug/kg	5.23E-07	3.4E-08	ND	
Xylenes	O	2000	ug/kg	4.02E-08	2.6E-09	ND	
SEMIVOLATILES							
2-Methylnaphthalene	O	9600	ug/kg	1.93E-07	1.3E-08	ND	
Acenaphthene	O	2600	ug/kg	5.23E-08	3.4E-09	ND	
Dibenzofuran	O	2500	ug/kg	5.03E-08	3.3E-09	ND	
Fluoranthene	O	850	ug/kg	1.71E-08	1.1E-09	ND	
Naphthalene	O	7800	ug/kg	1.57E-07	1.0E-08	ND	
Phenanthrene	O	1800	ug/kg	3.62E-08	2.4E-09	ND	
Pyrene	O	1200	ug/kg	2.41E-08	1.6E-09	ND	
INORGANICS							
Aluminum	I	2400	mg/kg	4.83E-05	3.1E-06	ND	
Barium	I	4.9	mg/kg	9.86E-08	6.4E-09	5.0E-01	1.3E-08
Cadmium	I	4	mg/kg	8.05E-08	5.2E-09	ND	
Calcium	I	219	mg/kg	4.41E-06	2.9E-07	ND	
Chromium	I	28.9	mg/kg	5.81E-07	3.8E-08	ND	
Copper	I	5.1	mg/kg	1.03E-07	6.7E-09	ND	
Iron	I	585	mg/kg	1.18E-05	7.7E-07	ND	
Lead	I	57.2	mg/kg	1.15E-06	7.5E-08	ND	
Magnesium	I	32.7	mg/kg	6.58E-07	4.3E-08	ND	
Manganese	I	3.5	mg/kg	7.04E-08	4.6E-09	5.0E-02	9.2E-08
Mercury	I	0.19	mg/kg	3.82E-09	2.5E-10	3.0E-01	8.3E-10
Nickel	I	6.5	mg/kg	1.31E-07	8.5E-09	ND	
Selenium	I	0.23	mg/kg	4.63E-09	3.0E-10	ND	
Sodium	I	86.9	mg/kg	1.75E-06	1.1E-07	ND	
Vanadium	I	2.6	mg/kg	5.23E-08	3.4E-09	ND	
Zinc	I	106	mg/kg	2.13E-06	1.4E-07	ND	
						SUMMARY HAZARD INDEX	1E-07

ND = No data available

TABLE R - 10.18
FUTURE USE INHALATION EXPOSURE TO VOCs FROM SUBSURFACE SOIL - OU 1
EXCAVATION WORKER
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION AIR	CA [1]	chemical-specific	ug/m3	Calculated
CONVERSION FACTOR 1	CF1	24	hours/day	
EXPOSURE TIME AT SITE	ET	8	hours/day	USEPA, 1989
EXPOSURE FREQUENCY	EF	5	days/week	Assumption
EXPOSURE DURATION	ED	1	week	Assumption
CONVERSION FACTOR 2	CF2	7	days/week*	
AVERAGING TIME CANCER	AT	70	years	USEPA, 1989
AVERAGING TIME NONCANCER	AT	1	week	USEPA, 1989

* For carcinogenic effects, CF2 = 365 days/year
[1] Average chemical concentration over a 5 day release period. Calculated as described in text and shown in Appendix R-XXXXX.
USEPA, 1989. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, (Part A)
EPA/540/1-89/002; December 1989.

EQUATIONS

CANCER RISK = AVG. CONC. (ug/m3) * CANCER UNIT RISK (ug/m3)^-1

HAZARD QUOTIENT = AVG.CONC.(ug/m3)/REF. CONC. (ug/m3)

$$\text{AVG. CONC.} = \frac{CA * EF * ET * ED}{AT * CF1 * CF2}$$

Note:
*For noncarcinogenic effects: AT = ED

TABLE R - 10.18, continued
FUTURE USE INHALATION EXPOSURE TO VOCs FROM SUBSURFACE SOIL - OU 1
EXCAVATION WORKER
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	VOLATILE OR NON-VOLATILE? V/NV	AIR CONCENTRATION (ug/m³) [1]	AVERAGE AIR CONCENTRATION LIFETIME (ug/m3)	INHALATION CANCER UNIT RISK (ug/m3)^-1	CANCER RISK
VOLATILES					
1,2-Dichloroethane	V	1.14	7.4E-05	2.60E-05	1.9E-09
Benzene	V	0.547	3.6E-05	8.30E-06	3.0E-10
Chloroform	V	3.79	2.5E-04	2.30E-05	5.7E-09
Tetrachloroethene	V	3.16	2.1E-04	5.80E-07	1.2E-10
Trichloroethene	V	42.1	2.7E-03	1.70E-06	4.7E-09
				SUMMARY CANCER RISK	1E-08

[1] Air concentration is the average air concentration of chemical released over a 5 day period from a volume of soil equal to the area sampled.
NA - Not Applicable
ND = No data available.

TABLE R – 10.18, continued
FUTURE USE INHALATION EXPOSURE TO VOCs FROM SUBSURFACE SOIL – OU 1
EXCAVATION WORKER
NAS Jacksonville
Jacksonville, Florida

1WKSHINH	01-Jun-95

NONCARCINOGENIC EFFECTS

COMPOUND	VOLATILE OR NON-VOLATILE? V/NV	AIR CONCENTRATION (ug/m³) [1]	AVERAGE AIR CONCENTRATION FOR TIME PERIOD (ug/m3)	SUBCHRONIC INHALATION RfC [2] (ug/m3)	HAZARD QUOTIENT
VOLATILES					
1,2-Dichloroethane	V	1.14	2.7E-01	ND	NA
Benzene	V	0.547	1.3E-01	ND	NA
Chlorobenzene	V	52.6	1.3E+01	2.00E+01	6.5E-01
Chloroform	V	3.79	9.0E-01	ND	NA
Ethylbenzene	V	505	1.2E+02	1.00E+03	1.2E-01
Tetrachloroethene	V	3.16	7.5E-01	ND	NA
Toluene	V	547	1.3E+02	4.00E+02	3.3E-01
Trichloroethene	V	42.1	1.0E+01	ND	NA
Xylenes	V	61	1.5E+01	ND	NA
				SUMMARY HAZARD INDEX	1.1E+00

[1] Air concentration is the average air concentration of chemical released over a 5 day period from a volume of soil equal to the area sampled.
[2] RfC is the Reference Concentration published by USEPA. The chronic RfC was used when subchronic RfCs were unavailable (Chlorobenzen, Ethylbenzene, Toluene).
NA – Not Applicable
ND = No data available.

TABLE R – 10.19
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
ADULT RESIDENT – WADING
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION WATER	CW	chemical specific	ug/liter	
INGESTION RATE	IR	0.1	liters/day	USEPA, 1989
SURFACE AREA	SA	1,971	cm^2	USEPA, 1989
EVENT FREQUENCY	EV	1	events/day	Assumption
BODY WEIGHT	BW	70	kg	USEPA, 1991
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2–event	Calculated
EXPOSURE TIME	ET	2	hours/day	Assumption
EXPOSURE FREQUENCY	EF	100	days/year	Assumption
EXPOSURE DURATION	ED	24	years	Assumption
DIFFUSION DEPTH PER EVENT	PCevent	chemical–specific	cm/event	Calculated per USEPA, 1992
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	24	years	Assumption
CONVERSION FACTOR	CF1	0.001	mg/ug	
CONVERSION FACTOR	CF2	0.001	$liter/cm^3$	

PC_{event} calculated per Dermal Exposure Assessment Appendix of this document.
Ingestion Rate = 0.1 l/day = 50 ml/hour x 2.0 hours/day x 0.001 l/ml
Surface Area assumes lower legs, hands, feet are exposed.
USEPA, 1989. Exposure Factors Handbook; EPA/600/8–89/043; May 1989.
USEPA, 1991b. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Parameters";
USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8–91/011B and Dermal Exposure Appendix of this document

EQUATIONS

CANCER RISK = INTAKE (mg/kg–day) x CANCER SLOPE FACTOR (mg/kg–day)^ –1

HAZARD QUOTIENT = INTAKE (mg/kg–day) / REFERENCE DOSE (mg/kg–day)

$$\text{INTAKE–INGESTION} = \frac{CW \times IR \times EF \times ED \times CF1}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE–DERMAL} = \frac{DA_{event} \times EV \times EF \times ED \times SA}{AT \times BW \times 365\ days/yr}$$

Where:
$DA_{event} = PC_{event} \times CW \times CF1 \times CF2$

Note:
For non–carcinogenic effects AT = ED

TABLE R – 10.19, continued

FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1

ADULT RESIDENT – WADING

NAS Jacksonville

Jacksonville, Florida

CARCINOGENIC EFFECTS

1ARSWW6	01–Jun–95

COMPOUND	WATER CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg–day)	ORAL CSF (mg/kg–day)^–1	CANCER RISK INGESTION	PC_{EVENT}[2] (cm/event)	INTAKE DERMAL (mg/kg–day)	DERMAL CSF [3] (mg/kg–day)^–1	CANCER RISK DERMAL	TOTAL CANCER RISK
VOLATILES										
Benzene	4.4	ug/liter	5.9E–07	2.9E–02	1.7E–08	3.41E–01	4.0E–06	2.9E–02	1.2E–07	1.3E–07
Trichloroethene	6	ug/liter	8.1E–07	1.1E–02	8.9E–09	8.49E–01	1.3E–05	1.1E–02	1.5E–07	1.6E–07
Vinyl Chloride	5.4	ug/liter	7.2E–07	1.9E+00	1.4E–06	2.20E–02	3.1E–07	1.9E+00	6.0E–07	2.0E–06
INORGANICS										
Arsenic	7.3	ug/liter	9.8E–07	1.8E+00	1.7E–06	2.60E–03	5.0E–08	1.8E+00	8.8E–08	1.8E–06
Beryllium	0.75	ug/liter	1.0E–07	4.3E+00	4.3E–07	2.60E–03	5.2E–09	4.3E+02	2.2E–06	2.7E–06
SUMMARY CANCER RISK					4E–06				3E–06	7E–06

[1] Exposure point concentrations for any carcinogenic PAHs have been adjusted by application of USEPA Region IV Toxicity Equivalence Factors (February 10, 1992)

[2] This chemical–specific value has been calculated in a separate spreadsheet

[3] Calculated from Oral CSFs.

ND = No data available

TABLE R – 10.19, continued
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
ADULT RESIDENT – WADING
NAS Jacksonville
Jacksonville, Florida
NON CARCINOGENIC EFFECTS

1ARSWW6	01-Jun-95

COMPOUND	WATER CONCENTRATION (mg/l)	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	PC_{EVENT}[1] (cm/event)	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)^-1	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
VOLATILES										
1,2-Dichloroethene	5.4	ug/liter	2.1E-06	9.0E-03	2.3E-04	3.27E-02	1.4E-06	9.0E-03	1.5E-04	**3.9E-04**
Benzene	4.4	ug/liter	1.7E-06	3.0E-04	5.7E-03	3.41E-01	1.2E-05	3.0E-04	3.9E-02	**4.4E-02**
Trichloroethene	6	ug/liter	2.3E-06	6.0E-03	3.9E-04	8.49E-01	3.9E-05	6.0E-03	6.5E-03	**6.9E-03**
Vinyl chloride	5.4	ug/liter	2.1E-06	ND		2.20E-02	9.2E-07	ND		
INORGANICS										
Aluminum	424	ug/liter	1.7E-04	1.0E+00	1.7E-04	2.60E-03	8.5E-06	2.0E-01	4.3E-05	**2.1E-04**
Antimony	24.1	ug/liter	9.4E-06	4.0E-04	2.4E-02	2.60E-03	4.8E-07	4.0E-06	1.2E-01	**1.4E-01**
Arsenic	7.3	ug/liter	2.9E-06	3.0E-04	9.5E-03	2.60E-03	1.5E-07	2.9E-04	5.0E-04	**1.0E-02**
Beryllium	0.75	ug/liter	2.9E-07	5.0E-03	5.9E-05	2.60E-03	1.5E-08	5.0E-05	3.0E-04	**3.6E-04**
Cadmium	3.2	ug/liter	1.3E-06	5.0E-04	2.5E-03	2.60E-03	6.4E-08	1.0E-05	6.4E-03	**8.9E-03**
Cobalt	6.3	ug/liter	2.5E-06	1.8E-01	1.4E-05	2.60E-03	1.3E-07	1.8E-02	7.0E-06	**2.1E-05**
Iron	7864	ug/liter	3.1E-03	ND		2.60E-03	1.6E-04	ND		
Manganese	99.5	ug/liter	3.9E-05	5.0E-03	7.8E-03	2.60E-03	2.0E-06	5.6E-03	3.6E-04	**8.1E-03**
Sodium	73865	ug/liter	2.9E-02	ND		2.60E-03	1.5E-03	ND		
				SUMMARY HAZARD INDEX	5E-02				2E-01	2E-01

[1] This chemical-specific value has been calculated in a separate spreadsheet
[2] Calculated from Oral RfDs.
ND = No data available

TABLE R – 10.20
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
CHILD RESIDENT – WADING
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION WATER	CW	chemical specific	ug/liter	
INGESTION RATE	IR	0.1	liters/day	USEPA, 1989
AGE–SPECIFIC SURFACE AREA	SA_i	age–specific	cm^2	USEPA, 1989
EVENT FREQUENCY	EV	1	events/day	Assumption
BODY WEIGHT	BW	15	kg	USEPA, 1991
AGE–SPECIFIC BODY WEIGHT	BW_i	age–specific	kg	USEPA, 1989
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2–event	Calculated
EXPOSURE TIME	ET	2	hours/day	Assumption
EXPOSURE FREQUENCY	EF	100	days/year	Assumption
EXPOSURE DURATION	ED	6	years	Assumption
AGE–SPECIFIC EXPSOURE DURATION	ED_i	age–specific	years	USEPA, 1989
AGE–WEIGHTED SURFACE AREA [1]	$SA_{aw/kdi}$	766.0	cm^2–yr/kg	Calculated per USEPA, 1992
DIFFUSION DEPTH PER EVENT	PCevent	chemical specific	cm/event	Calculated per USEPA, 1992
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	Assumption
CONVERSION FACTOR	CF1	0.001	mg/ug	
CONVERSION FACTOR	CF2	0.001	liter/cm^3	

[1] Age weighted, body weight normalized surface area
PC_{event} calculated per Dermal Exposure Assessment Appendix of this document.
Ingestion Rate = 0.1 l/day = 50 ml/hour x 2.0 hours/day x 0.001 l/ml
Surface Area assumes lower legs, hands, feet are exposed.
USEPA, 1989. Exposure Factors Handbook; EPA/600/8–89/043; May 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Parameters";
USEPA, 1992. Dermal Exposure Assessment: Principles and Applications; EPA/600/8--91/011B and Dermal Exposure Appendix of this document

EQUATIONS

CANCER RISK = INTAKE (mg/kg–day) x CANCER SLOPE FACTOR (mg/kg–day)^–1

HAZARD QUOTIENT = INTAKE (mg/kg–day) / REFERENCE DOSE (mg/kg–day)

$$\text{INTAKE–INGESTION} = \frac{CW \times IR \times EF \times ED \times CF1}{BW \times AT \times 365\ \text{days/yr}}$$

$$\text{INTAKE–DERMAL} = \frac{DA_{event} \times EV \times EF \times SA_{aw/kdi}}{AT \times 365\ \text{days/yr}}$$

Where:
$SA_{aw/kdi}$ = Sum (SA_i x ED_i / BW_i)
DA_{event} = PC_{event} x CW x CF1 x CF2

Note:
For non–carcinogenic effects AT = ED

TABLE R – 10.20, continued
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
CHILD RESIDENT – WADING
NAS Jacksonville
Jacksonville, Florida
CARCINOGENIC EFFECTS

1CRSWW6	01-Jun-95

COMPOUND	WATER CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF (mg/kg-day)^-1	CANCER RISK INGESTION	PC EVENT [2] (cm/event)	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [3] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
VOLATILES										
Benzene	4.4	ug/liter	6.9E-07	2.9E-02	2.0E-08	3.41E-01	4.5E-06	2.9E-02	1.3E-07	1.5E-07
Trichloroethene	6	ug/liter	9.4E-07	1.1E-02	1.0E-08	8.49E-01	1.5E-05	1.1E-02	1.7E-07	1.8E-07
Vinyl Chloride	5.4	ug/liter	8.5E-07	1.9E+00	1.6E-06	2.20E-02	3.6E-07	1.9E+00	6.8E-07	2.3E-06
INORGANICS										
Arsenic	7.3	ug/liter	1.1E-06	1.8E+00	2.0E-06	2.60E-03	5.7E-08	1.8E+00	1.0E-07	2.1E-06
Beryllium	0.75	ug/liter	1.2E-07	4.3E+00	5.0E-07	2.60E-03	5.8E-09	4.3E+02	2.5E-06	3.0E-06
SUMMARY CANCER RISK					4E-06				4E-06	8E-06

[1] Exposure point concentrations for any carcinogenic PAH compounds have been adjusted by application of USEPA Region IV Toxicity Equivalence Factors (February 10, 1992).
[2] This chemical-specific value has been calculated in a separate spreadsheet.
[3] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.20, continued
FUTURE USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
CHILD RESIDENT – WADING
NAS Jacksonville
Jacksonville, Florida
NONCARCINOGENIC EFFECTS

1CRSWW6	01–Jun–95

COMPOUND	WATER CONCENTRATION (mg/l)	UNITS	INTAKE INGESTION (mg/kg–day)	ORAL RfD (mg/kg–day)	HAZARD QUOTIENT INGESTION	PC_{EVENT}[1] (cm/event)	INTAKE DERMAL (mg/kg–day)	DERMAL RfD [2] (mg/kg–day)^–1	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
VOLATILES										
1,2–Dichloroethene	5.4	ug/liter	9.9E–06	9.0E–03	1.1E–03	3.27E–02	6.2E–06	9.0E–03	6.9E–04	**1.8E–03**
Benzene	4.4	ug/liter	8.0E–06	3.0E–04	2.7E–02	3.41E–01	5.2E–05	3.0E–04	1.7E–01	**2.0E–01**
Trichloroethene	6	ug/liter	1.1E–05	6.0E–03	1.8E–03	8.49E–01	1.8E–04	6.0E–03	3.0E–02	**3.2E–02**
Vinyl chloride	5.4	ug/liter	9.9E–06	ND		2.20E–02	4.2E–06	ND		
INORGANICS										
Aluminum	424	ug/liter	7.7E–04	1.0E+00	7.7E–04	2.60E–03	3.9E–05	2.0E–01	1.9E–04	**9.7E–04**
Antimony	24.1	ug/liter	4.4E–05	4.0E–04	1.1E–01	2.60E–03	2.2E–06	4.0E–06	5.5E–01	**6.6E–01**
Arsenic	7.3	ug/liter	1.3E–05	3.0E–04	4.4E–02	2.60E–03	6.6E–07	2.9E–04	2.3E–03	**4.7E–02**
Beryllium	0.75	ug/liter	1.4E–06	5.0E–03	2.7E–04	2.60E–03	6.8E–08	5.0E–05	1.4E–03	**1.6E–03**
Cadmium	3.2	ug/liter	5.8E–06	5.0E–04	1.2E–02	2.60E–03	2.9E–07	1.0E–05	2.9E–02	**4.1E–02**
Cobalt	6.3	ug/liter	1.2E–05	6.0E–02	1.9E–04	2.60E–03	5.7E–07	1.8E–02	3.2E–05	**2.2E–04**
Iron	7864	ug/liter	1.4E–02	ND		2.60E–03	7.2E–04	ND		
Manganese	99.5	ug/liter	1.8E–04	5.0E–03	3.6E–02	2.60E–03	9.0E–06	5.6E–03	1.6E–03	**3.8E–02**
Sodium	73865	ug/liter	1.3E–01	ND		2.60E–03	6.7E–03	ND		
					SUMMARY HAZARD INDEX	**2E–01**			**8E–01**	**1E+00**

[1] This chemical–specific value has been calculated in a separate spreadsheet.
[2] Calculated from Oral RfDs.
ND = No data available

TABLE R – 10.21

CURRENT USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER – OU 1
ADULT AND/OR CHILD
NAS Jacksonville
Jacksonville, Florida

1PCEV6	01–Jun–95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
Diffusion depth per event	PC_{event}	chemical specific	cm/event	
Permeability Constant	PC	chemical specific	cm/hr	USEPA, 1992
Duration of a Single Event	t_{event}	2.6	hr	USEPA,1989
Thickness of Stratum Corneum	L_{sc}	10	um	USEPA, 1992
Octanol–water partition coefficient/10^4	B	chemical specific	dimensionless	USEPA, 1992
Pi	π	3.14	dimensionless	USEPA, 1992
	T	chemical specific	hr	USEPA, 1992
Time to Reach Steady State	t^*	chemical specific	hr	USEPA, 1992
Stratum Corneum Diffusion Coefficient	D_{sc}	chemical specific	cm^2/hr	USEPA, 1992

EQUATIONS

INORGANICS

$PC_{event} = PC \times t_{event}$

ORGANICS

$PC_{event} = 2PC \times (6T \times t_{event}/\pi)^{0.5}$

Where $t_{event} < t^*$

and: $PC_{event} = PC \times ((t_{event}/(1+B)) + 2T \times ((1+3B)/(1+B))$

Where $t_{event} > t^*$

Note: $T = L_{sc}^2/6D_{sc}$

REFERENCES

USEPA,1989. Risk Assessment Guidance for Superfund, Volume I, Part A, EPA/540/1–89/002, December 1989. This value is receptor–specific
USEPA, 1992. Dermal Exposure Assessment: Principles and Applications.
The term T is not calculated here. Values are provided in USEPA, 1992.

TABLE R - 10.21,continued
CURRENT USE INGESTION OF AND DIRECT CONTACT WITH SURFACE WATER - OU 1
ADULT AND/OR CHILD
NAS Jacksonville
Jacksonville, Florida

COMPOUND	INORGANIC OR ORGANIC? I/O	PC (cm/hr)	T (hr)	t* (hr)	B (unitless)	PC_{event} (cm/event)
1,2-Dichloroethene	O	1.0E-02	3.4E-01	8.2E-01	7.2E-03	3.27E-02
Benzene	O	1.1E-01	2.6E-01	6.3E-01	1.3E-02	3.41E-01
Trichloroethene	O	2.3E-01	5.5E-01	1.3E+00	2.6E-02	8.49E-01
Vinyl Chloride	O	7.3E-03	2.1E-01	5.1E-01	2.3E-03	2.20E-02
Aluminum	I	1.0E-03	NA	NA	NA	2.60E-03
Antimony	I	1.0E-03	NA	NA	NA	2.60E-03
Arsenic	I	1.0E-03	NA	NA	NA	2.60E-03
Beryllium	I	1.0E-03	NA	NA	NA	2.60E-03
Cadmium	I	1.0E-03	NA	NA	NA	2.60E-03
Cobalt	I	1.0E-03	NA	NA	NA	2.60E-03
Iron	I	1.0E-03	NA	NA	NA	2.60E-03
Manganese	I	1.0E-03	NA	NA	NA	2.60E-03
Sodium	I	1.0E-03	NA	NA	NA	2.60E-03

NA = Not applicable. For inorganic analytes, this term is not used to calculate PCevent.

REFERENCES:
Unless otherwise noted, values are taken from USEPA, 1992. Dermal Exposure Assessment:Principles and Applications,EPA/600/8-91/011B

TABLE R - 10.22
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT - OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SEDIMENT	CS	chemical specific	chemical specific	
INGESTION RATE	IR	100	mg/day	USEPA, 1991
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm^2-event	USEPA, 1992a
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
SURFACE AREA EXPOSED	SA	1,971	cm^2	USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2-event	Per USEPA, 1992a
CONVERSION FACTOR	CF	1.00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE FREQUENCY	EF	100	days/year *	Assumption
EXPOSURE DURATION	ED	24	years	USEPA, 1991
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	24	years	USEPA, 1991

* Units for exposure frequency are events/year in the calculation of the dermally absorbed dose.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.
USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992.
USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.
CF = 10E-9 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR $(mg/kg\text{-}day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE-DERMAL} = \frac{DAevent \times SA \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

Where:

$$DAevent = CS \times AF \times ABS_d \times CF$$

Note: For noncarcinogenic effects: AT = ED

TABLE R - 10.22, continued

1ARSED6	01-Jun-95

FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT - OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [2,5] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	240	ug/kg	3.2E-08	7.3E-01	2.4E-08	0.01	6.3E-09	8.0E-01	5.1E-09	2.9E-08
Benzo(a)pyrene	O	290	ug/kg	3.9E-08	7.3E+00	2.8E-07	0.01	7.7E-09	8.0E+00	6.2E-08	3.5E-07
Benzo(b)fluoranthene	O	424	ug/kg	5.7E-08	7.3E-01	4.2E-08	0.01	1.1E-08	8.0E-01	9.0E-09	5.1E-08
Benzo(k)fluoranthene	O	370	ug/kg	5.0E-08	7.3E-02	3.6E-09	0.01	9.8E-09	8.0E-02	7.8E-10	4.4E-09
Chrysene	O	433	ug/kg	5.8E-08	7.3E-03	4.2E-10	0.01	1.1E-08	8.0E-03	9.2E-11	5.2E-10
Indeno(1,2,3-cd)pyrene	O	220	ug/kg	3.0E-08	7.3E-01	2.2E-08	0.01	5.8E-09	8.0E-01	4.7E-09	2.6E-08
PESTICIDES											
Aroclor-1248	O	176	ug/kg	2.4E-08	7.7E+00	1.8E-07	0.06	2.8E-08	8.6E+00	2.4E-07	4.2E-07
Aroclor-1260	O	2864	ug/kg	3.8E-07	7.7E+00	3.0E-06	0.06	4.5E-07	8.6E+00	3.9E-06	6.8E-06
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDD	O	0.0051	ug/kg	6.8E-13	1.6E+05	1.1E-07	0.03	4.0E-13	3.2E+05	1.3E-07	2.4E-07
OCDD	O	0.00335	ug/kg	4.5E-13	1.6E+05	7.0E-08	0.03	2.7E-13	3.2E+05	8.5E-08	1.6E-07
2,3,7,8-TCDF	O	0.0054	ug/kg	7.2E-13	1.6E+05	1.1E-07	0.03	4.3E-13	3.2E+05	1.4E-07	2.5E-07
OCDF	O	0.000501	ug/kg	6.7E-14	1.6E+05	1.0E-08	0.03	4.0E-14	3.2E+05	1.3E-08	2.3E-08
INORGANICS											
Arsenic	I	1.8	mg/kg	2.4E-07	1.8E+00	4.2E-07	0.001	4.8E-09	1.8E+00	8.5E-09	4.3E-07
Beryllium	I	3.1	mg/kg	4.2E-07	4.3E+00	1.8E-06	0.001	8.2E-09	4.3E+02	3.5E-06	5.3E-06
				SUMMARY CANCER RISK		6E-06				8E-06	1E-05

[1] Exposure point concentrations for dioxins/furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993).
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended for use by USEPA Region 4 (April 1995). The value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.22, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	240	ug/kg	9.4E-08	ND		0.01	1.9E-08	ND		
Benzo(a)pyrene	O	290	ug/kg	1.1E-07	ND		0.01	2.2E-08	ND		
Benzo(b)fluoranthene	O	424	ug/kg	1.7E-07	ND		0.01	3.3E-08	ND		
Benzo(k)fluoranthene	O	370	ug/kg	1.4E-07	ND		0.01	2.9E-08	ND		
Chrysene	O	433	ug/kg	1.7E-07	ND		0.01	3.3E-08	ND		
Indeno(1,2,3-cd)pyrene	O	220	ug/kg	8.6E-08	ND		0.01	1.7E-08	ND		
PESTICIDES											
Aroclor-1248	O	176	ug/kg	6.9E-08	2.0E-05	3.4E-03	0.06	8.1E-08	1.8E-05	4.5E-03	8.0E-03
Aroclor-1260	O	2864	ug/kg	1.1E-06	2.0E-05	5.6E-02	0.06	1.3E-06	1.8E-05	7.4E-02	1.3E-01
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDD	O	0.51	ug/kg	2.0E-10	ND		0.03	1.2E-10	ND		
OCDD	O	3.35	ug/kg	1.3E-09	ND		0.03	7.8E-10	ND		
2,3,7,8-TCDF	O	0.054	ug/kg	2.1E-11	ND		0.03	1.2E-11	ND		
OCDF	O	0.501	ug/kg	2.0E-10	ND		0.03	1.2E-10	ND		
INORGANICS											
Arsenic	I	1.8	mg/kg	7.0E-07	3.0E-04	2.3E-03	0.001	1.4E-08	2.9E-04	4.7E-05	2.4E-03
Beryllium	I	3.1	mg/kg	1.2E-06	5.0E-03	2.4E-04	0.001	2.4E-08	5.0E-05	4.8E-04	7.2E-04
Chromium	I	11.8	mg/kg	4.6E-06	5.0E-03	9.2E-04	0.001	9.1E-08	5.5E-04	1.7E-04	1.1E-03
Manganese	I	23.1	mg/kg	9.0E-06	1.4E-01	6.5E-05	0.001	1.8E-07	5.6E-03	3.2E-05	9.6E-05
Mercury	I	0.24	mg/kg	9.4E-08	3.0E-04	3.1E-04	0.001	1.9E-09	6.0E-05	3.1E-05	3.4E-04
Thallium	I	2.6	mg/kg	1.0E-06	8.0E-05	1.3E-02	0.001	2.0E-08	8.0E-05	2.5E-04	1.3E-02
SUMMARY HAZARD INDEX						8E-02				8E-02	2E-01

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified in USEPA Dermal Guidance (January 1992).
[2] Calculated from Oral RfDs.
ND = No data available

TABLE R - 10.23
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT - OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SEDIMENT	CS	chemical specific	chemical-specific	
INGESTION RATE	IR	200	mg/day	USEPA, 1991
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm^2-event	USEPA, 1992a
AGE-SPECIFIC SURFACE AREA	SA_i	age-specific	cm^2	USEPA, 1989
ABSORPTION FRACTION	ABS_d	chemical specific	unitless	USEPA, 1992b
CONVERSION FACTOR	CF	1.00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	15	kg	USEPA, 1991
AGE-SPECIFIC BODY WEIGHT	BW_i	age-specific	kg	USEPA, 1989
EXPOSURE FREQUENCY	EF	100	days/year *	Assumption
EXPOSURE DURATION	ED	6	years	USEPA, 1991
AGE-SPECIFIC EXPOSURE DURATION	ED_i	age-specific	years	Assumption
AGE-WEIGHTED SURFACE AREA [1]	$SA_{soil/adj}$	766	cm2-year/kg	Per USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2-event	Per USEPA, 1992a
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	USEPA, 1991

* Units for exposure frequency are in events/year in the calculation of the dermally absorbed dose.

[1] In estimating the dermally absorbed dose for children age 1 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per USEPA, 1992.

USEPA, 1989. Exposure Factors Handbook; EPA/600/8-89/043; May 1989.

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03

USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992 and Dermal Exposure Appendix of this document.

USEPA, 1992b. USEPA Region IV Guidance Memo February 10, 1992.

CF = 10E-09 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE-DERMAL} = (DA_{event} \times EF / AT \times 365\ days/year) \times SA_{soil/adj}$$

Where:

$$SA_{soil/adj} = SUM\ (SA_i \times ED_i / BW_i)$$

$$DA_{event} = CS \times AF \times ABS_d \times CF$$

Note:
For noncarcinogenic effects AT = ED

TABLE R – 10.23, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT – OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

1CRSD6	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF[2,3] (mg/kg-day)^-1	CANCER RISK INGESTION	DERMAL ABS [4]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF[2,5] (mg/kg-day)^-1	CANCER RISK DERMAL	TOTAL CANCER RISK
SEMIVOLATILES											
Benzo(a)anthracene	O	240	ug/kg	7.5E-08	7.3E-01	5.5E-08	0.01	7.2E-09	8.0E-01	5.8E-09	6.1E-08
Benzo(a)pyrene	O	290	ug/kg	9.1E-08	7.3E+00	6.6E-07	0.01	8.7E-09	8.0E+00	7.0E-08	7.3E-07
Benzo(b)fluoranthene	O	424	ug/kg	1.3E-07	7.3E-01	9.7E-08	0.01	1.3E-08	8.0E-01	1.0E-08	1.1E-07
Benzo(k)fluoranthene	O	370	ug/kg	1.2E-07	7.3E-02	8.5E-09	0.01	1.1E-08	8.0E-02	8.9E-10	9.3E-09
Chrysene	O	433	ug/kg	1.4E-07	7.3E-03	9.9E-10	0.01	1.3E-08	8.0E-03	1.0E-10	1.1E-09
Indeno(1,2,3-cd)pyrene	O	220	ug/kg	6.9E-08	7.3E-01	5.0E-08	0.01	6.6E-09	8.0E-01	5.3E-09	5.6E-08
PESTICIDES											
Aroclor-1248	O	176	ug/kg	5.5E-08	7.7E+00	4.2E-07	0.06	3.2E-08	8.6E+00	2.7E-07	7.0E-07
Aroclor-1260	O	2864	ug/kg	9.0E-07	7.7E+00	6.9E-06	0.06	5.2E-07	8.6E+00	4.4E-06	1.1E-05
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDD	O	0.0051	ug/kg	1.6E-12	1.6E+05	2.5E-07	0.03	4.6E-13	3.2E+05	1.5E-07	4.0E-07
OCDD	O	0.00335	ug/kg	1.0E-12	1.6E+05	1.6E-07	0.03	3.0E-13	3.2E+05	9.6E-08	2.6E-07
2,3,7,8-TCDF	O	0.0054	ug/kg	1.7E-12	1.6E+05	2.6E-07	0.03	4.9E-13	3.2E+05	1.6E-07	4.2E-07
OCDF	O	0.000501	ug/kg	1.6E-13	1.6E+05	2.4E-08	0.03	4.5E-14	3.2E+05	1.4E-08	3.9E-08
INORGANICS											
Arsenic	I	1.8	mg/kg	5.6E-07	1.8E+00	9.9E-07	0.001	5.4E-09	1.8E+00	9.7E-09	1.0E-06
Beryllium	I	3.1	mg/kg	9.7E-07	4.3E+00	4.2E-06	0.001	9.3E-09	4.3E+02	4.0E-06	8.2E-06
					SUMMARY CANCER RISK	1.4E-05				9E-06	2E-05

[1] Exposure point concentrations for dioxins/furans have been adjusted by application of USEPA toxicity equivalency factors (March 1989).
[2] The CSF for carcinogenic PAHs has been adjusted with a relative potency factor as specified in USEPA guidance (July 1993).
[3] The CSF for dioxins/furans is a withdrawn 1992 HEAST value that has been recommended by USEPA Region 4 (April 1995). This value is subject to change by USEPA.
[4] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified by USEPA Dermal Guidance (January 1992).
[5] Calculated from Oral CSFs.
ND = No data available

TABLE R – 10.23, continued
FUTURE USE DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT – OU 1
CHILD RESIDENT
NAS Jacksonville
Jacksonville, Florida

1CRSD6	01-Jun-95

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
SEMIVOLATILES											
Benzo(a)anthracene	O	240	ug/kg	8.8E-07	ND		0.01	8.4E-08	ND		
Benzo(a)pyrene	O	290	ug/kg	1.1E-06	ND		0.01	1.0E-07	ND		
Benzo(b)fluoranthene	O	424	ug/kg	1.5E-06	ND		0.01	1.5E-07	ND		
Benzo(k)fluoranthene	O	370	ug/kg	1.4E-06	ND		0.01	1.3E-07	ND		
Chrysene	O	433	ug/kg	1.6E-06	ND		0.01	1.5E-07	ND		
Indeno(1,2,3-cd)pyrene	O	220	ug/kg	8.0E-07	ND		0.01	7.7E-08	ND		
PESTICIDES											
Aroclor-1248	O	176	ug/kg	6.4E-07	2.0E-05	3.2E-02	0.06	3.7E-07	1.8E-05	2.1E-02	5.3E-02
Aroclor-1260	O	2864	ug/kg	1.0E-05	2.0E-05	5.2E-01	0.06	6.0E-06	1.8E-05	3.3E-01	8.6E-01
DIOXINS/FURANS											
1,2,3,4,6,7,8-HpCDD	O	0.51	ug/kg	1.9E-09	ND		0.03	5.4E-10	ND		
OCDD	O	3.35	ug/kg	1.2E-08	ND		0.03	3.5E-09	ND		
2,3,7,8-TCDF	O	0.054	ug/kg	2.0E-10	ND		0.03	5.7E-11	ND		
OCDF	O	0.501	ug/kg	1.8E-09	ND		0.03	5.3E-10	ND		
INORGANICS											
Arsenic	I	1.8	mg/kg	6.6E-06	3.0E-04	2.2E-02	0.001	6.3E-08	2.9E-04	2.1E-04	2.2E-02
Beryllium	I	3.1	mg/kg	1.1E-05	5.0E-03	2.3E-03	0.001	1.1E-07	5.0E-05	2.2E-03	4.4E-03
Chromium	I	11.8	mg/kg	4.3E-05	5.0E-03	8.6E-03	0.001	4.1E-07	5.5E-04	7.5E-04	9.4E-03
Manganese	I	23.1	mg/kg	8.4E-05	1.4E-01	6.0E-04	0.001	8.1E-07	5.6E-03	1.4E-04	7.5E-04
Mercury	I	0.24	mg/kg	8.8E-07	3.0E-04	2.9E-03	0.001	8.4E-09	6.0E-05	1.4E-04	3.1E-03
Thallium	I	2.6	mg/kg	9.5E-06	8.0E-05	1.2E-01	0.001	9.1E-08	8.0E-05	1.1E-03	1.2E-01
					SUMMARY HAZARD INDEX	7.1E-01				4E-01	1E+00

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0.1% for inorganics (February 10, 1992). Absorbtion factors for PCBs, dioxins, and furans are specified by USEPA Dermal Guidance (January 1992).
[2] Calculated from Oral RfDs.
ND = No data available

1ARGW7	01-Jun-95

TABLE R – 10.24
FUTURE USE INGESTION OF GROUNDWATER AS DRINKING WATER (UNFILTERED SAMPLES) – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION WATER	CW	chemical specific	ug/liter	
INGESTION RATE	IR	2	liters/day	USEPA, 1991
BODY WEIGHT	BW	70	kg	USEPA, 1991
CONVERSION FACTOR	CF	0.001	mg/ug	
EXPOSURE FREQUENCY	EF	350	days/year	USEPA, 1991
EXPOSURE DURATION	ED	30	years	USEPA, 1991
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	30	years	USEPA, 1991

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"; OSWER Directive 9285.6-03.

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$INTAKE_{ing} = \frac{CW \times IR \times EF \times ED \times CF}{BW \times AT \times 365 \text{ days/year}}$$

NOTE:
For noncarcinogenic effects AT = ED

TABLE R – 10.24, continued
FUTURE USE INGESTION OF GROUNDWATER AS DRINKING WATER (UNFILTERED SAMPLES) – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

1ARGW7	01-Jun-95

CARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION [1]	UNITS	INTAKE INGESTION (mg/kg-day)	CANCER SLOPE FACTOR (mg/kg-day)^-1	CANCER RISK INGESTION
VOLATILES					
1,1-Dichloroethene	9.9	ug/liter	1.2E-04	6.0E-01	7.0E-05
1,2-Dichloroethane	7.8	ug/liter	9.2E-05	9.1E-02	8.3E-06
Benzene	15.3	ug/liter	1.8E-04	2.9E-02	5.2E-06
Trichloroethene	257	ug/liter	3.0E-03	1.1E-02	3.3E-05
Vinyl chloride	22	ug/liter	2.6E-04	1.9E+00	4.9E-04
SEMIVOLATILES					
Carbazole	4	ug/liter	4.7E-05	2.0E-02	9.4E-07
bis(2-Ethylhexyl)phthalate	8.2	ug/liter	9.6E-05	1.4E-02	1.3E-06
INORGANICS					
Arsenic	8.7	ug/liter	1.0E-04	1.8E+00	1.8E-04
Beryllium	7.2	ug/liter	8.5E-05	4.3E+00	3.6E-04
TOTAL CANCER RISK					1E-03

ND = No data available.

TABLE R – 10.24, continued

1ARGW7

FUTURE USE INGESTION OF GROUNDWATER AS DRINKING WATER (UNFILTERED SAMPLES) – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

NONCARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	REFERENCE DOSE (mg/kg-day)	HAZARD QUOTIENT INGESTION
VOLATILES					
1,1-Dichloroethane	9.9	ug/liter	2.7E-04	9.0E-03	3.0E-02
1,2-Dichloroethane	7.8	ug/liter	2.1E-04	3.0E-01	7.1E-04
1,2-Dichloroethene (total)	287	ug/liter	7.9E-03	9.0E-03	8.7E-01
Benzene	15.3	ug/liter	4.2E-04	3.0E-04	1.4E+00
Carbon Disulfide	6.4	ug/liter	1.8E-04	1.0E-01	1.8E-03
Ethylbenzene	9.6	ug/liter	2.6E-04	1.0E-01	2.6E-03
Trichloroethene	257	ug/liter	7.0E-03	6.0E-03	1.2E+00
Vinyl chloride	22	ug/liter	6.0E-04	ND	
SEMIVOLATILES					
2-Methylnaphthalene	6.6	ug/liter	1.8E-04	ND	
2-Methylphenol	4	ug/liter	1.1E-04	5.0E-02	2.2E-03
4-Methylphenol	7.9	ug/liter	2.2E-04	5.0E-03	4.3E-02
Acenaphthene	7.3	ug/liter	2.0E-04	6.0E-02	3.3E-03
Carbazole	4	ug/liter	1.1E-04	ND	
Dibenzofuran	6.8	ug/liter	1.9E-04	ND	
Naphthalene	7.9	ug/liter	2.2E-04	4.0E-02	5.4E-03
Phenanthrene	5.4	ug/liter	1.5E-04	ND	
Phenol	8	ug/liter	2.2E-04	6.0E-01	3.7E-04
bis(2-Ethylhexyl)phthalate	8.2	ug/liter	2.2E-04	2.0E-02	1.1E-02
INORGANICS					
Aluminum	271000	ug/liter	7.4E+00	1.0E+00	7.4E+00
Arsenic	8.7	ug/liter	2.4E-04	3.0E-04	7.9E-01
Barium	469	ug/liter	1.3E-02	7.0E-02	1.8E-01
Beryllium	7.2	ug/liter	2.0E-04	5.0E-03	3.9E-02
Chromium	294	ug/liter	8.1E-03	5.0E-03	1.6E+00
Cobalt	20.1	ug/liter	5.5E-04	1.8E-01	3.1E-03
Iron	168000	ug/liter	4.6E+00	ND	
Lead	27.9	ug/liter	7.6E-04	ND	
Nickel	38.9	ug/liter	1.1E-03	2.0E-02	5.3E-02
Thallium	1.9	ug/liter	5.2E-05	8.0E-05	6.5E-01
Vanadium	378	ug/liter	1.0E-02	7.0E-03	1.5E+00
			TOTAL HAZARD INDEX		2E+01

ND = No data available

TABLE R – 10.25
FUTURE USE INHALATION EXPOSURE TO VOCs DURING SHOWERING – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SHOWER AIR	CA [1]	chemical-specific	ug/m3	Modeled
CONVERSION FACTOR 1	CF1	24	hours/day	
EXPOSURE TIME SHOWER	ET	0.2	hours/day	USEPA, 1989
EXPOSURE FREQUENCY	EF	350	days/year	USEPA, 1991
EXPOSURE DURATION	ED	30	years	USEPA, 1991
CONVERSION FACTOR 2	CF2	365	days/year	
AVERAGING TIME CANCER	AT	70	years	USEPA, 1989
AVERAGING TIME NONCANCER	AT	30	years	USEPA, 1989

[1] Calculated via model by Foster and Chrostowski, Air Pollution Control Association Annual Meeting, 1987.
USEPA, 1989. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, (Part A) EPA/540/1-89/002; December 1989.
USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Assumptions".

EQUATIONS

CANCER RISK = AVG. CONC. (ug/m3) * CANCER UNIT RISK (ug/m3)^-1

HAZARD QUOTIENT = AVG.CONC.(ug/m3)/RIF. CONC. (ug/m3)

$$\text{AVG. CONC.} = \frac{CAair * EF * ET * ED}{AT * CF1 * CF2}$$

Note:
*For noncarcinogenic effects: AT = ED

TABLE R – 10.25, continued
FUTURE USE INHALATION EXPOSURE TO VOCs DURING SHOWERING – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	VOLATILE OR NON-VOLATILE? V/NV	SHOWER AIR CONCENTRATION (ug/m³)	AVERAGE AIR CONCENTRATION LIFETIME (ug/m3)	INHALATION CANCER UNIT RISK (ug/m3)^-1	CANCER RISK
VOLATILES					
1,1-Dichloroethene	V	50	1.7E-01	5.00E-05	8.6E-06
1,2-Dichloroethane	V	32	1.1E-01	2.60E-05	2.8E-06
Benzene	V	82	2.8E-01	8.30E-06	2.3E-06
Trichloroethene	V	1100	3.8E+00	1.70E-06	6.4E-06
Vinyl chloride	V	130	4.5E-01	8.40E-05	3.7E-05
SEMIVOLATILES					
Carbazole	NV		NA	ND	NA
bis(2-Ethylhexyl)phthalate	NV		NA	ND	NA
INORGANICS					
Arsenic	NV		NA	ND	NA
Beryllium	NV		NA	ND	NA
				SUMMARY CANCER RISK	6E-05

NA – Not Applicable – The analyte is not volatile and has therefore not been evaluated via this volatilization model.
ND = No data available.

TABLE R – 10.25, continued
FUTURE USB INHALATION EXPOSURE TO VOCs DURING SHOWERING – OU 1
ADULT RESIDENT
NAS Jacksonville
Jacksonville, Florida

1ARSWR7	01-Jun-95

NONCARCINOGENIC EFFECTS

COMPOUND	VOLATILE OR NON-VOLATILE? V/NV	SHOWER AIR CONCENTRATION (ug/m³)	AVERAGE AIR CONCENTRATION FOR TIME PERIOD (ug/m3)	CHRONIC INHALATION RfC [1] (ug/m3)	HAZARD QUOTIENT
VOLATILES					
1,1-Dichloroethene	V	5.0E+01	4.0E-01	ND	NA
1,2-Dichloroethane	V	3.2E+01	2.6E-01	ND	NA
1,2-Dichloroethene (total)	V	1.4E+03	1.1E+01	ND	NA
Benzene	V	8.2E+01	6.6E-01	ND	NA
Carbon Disulfide	V	3.5E+01	2.8E-01	1.00E+01	2.8E-02
Ethylbenzene	V	4.6E+01	3.7E-01	1.00E+03	3.7E-04
Trichloroethene	V	1.1E+03	8.8E+00	ND	NA
Vinyl chloride	V	1.3E+02	1.0E+00	ND	NA
SEMIVOLATILES					
2-Methylnaphthalene	NV		NA	ND	NA
2-Methylphenol	NV		NA	ND	NA
4-Methylphenol	NV		NA	ND	NA
Acenaphthene	NV		NA	ND	NA
Carbazole	NV		NA	ND	NA
Dibenzofuran	NV		NA	ND	NA
Naphthalene	NV		NA	ND	NA
Phenanthrene	NV		NA	ND	NA
Phenol	NV		NA	ND	NA
bis(2-Ethylhexyl)phthalate	NV		NA	ND	NA
INORGANICS					
Aluminum	NV		NA	ND	NA
Arsenic	NV		NA	ND	NA
Barium	NV		NA	ND	NA
Beryllium	NV		NA	ND	NA
Chromium	NV		NA	ND	NA
Cobalt	NV		NA	ND	NA
Iron	NV		NA	ND	NA
Lead	NV		NA	ND	NA
Nickel	NV		NA	ND	NA
Thallium	NV		NA	ND	NA
Vanadium	NV		NA	ND	NA
			SUMMARY HAZARD INDEX		2.8E-02

[1] RfC is the Reference Concentration published by USEPA
NA – Not Applicable – The analyte is not volatile and has therefore not been evaluated via this volatilization model.
ND = No data available.

TABLE R – 10.26

1SHMOD7	01–Jun–95

FUTURE USE CONCENTRATION OF VOLATILE COMPOUNDS RESULTING FROM SHOWERING
RESIDENT
NAS Jacksonville
Jacksonville, Florida

EMPIRICAL CONSTANTS

CONSTANT	SYMBOL	VALUE	UNIT	SOURCE
Liquid–film mass transfer for CO_2	$K_l(CO_2)$	20	cm/hr	Calculated
Gas–film mass transfer for H_2O	$K_g(H_2O)$	3000	cm/hr	Calculated
Molar gas constant x Temperature	RT	0.024	atm–m³/mole	
Reference temperature	T_1	293	K	
Temperature of shower water	T_s	318	K	Assumption
Viscosity of water at shower temperature	u_s	0.6178	cp	Calculated
Viscosity of water at reference temperature	u_1	0.65	cp	Calculated
Shower droplet free–fall time	t_s	1.5	sec	Assumption
Droplet diameter	d	1	mm	Foster and Chrostowski
Flow rate in shower	FR	20	l/min	Assumption
Volume of shower area	SV	12	m³	Assumption
Air exchange rate	R	0.03	min^{-1}	Calculated
Time in shower	D_s	12	min	USEPA, 1989b
Time at which concentration is being calculated	t	12	min	Assumption

Foster, S.A. and Chrostowski, P.C., 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower
All equations and definition of terms are presented in "Calculation of Shower–Generated Air Contaminants from Groundwater" which is appended to this report.

TABLE R – 10.26, continued

1SHMOD7	01–Jun–95

FUTURE USE CONCENTRATION OF VOLATILE COMPOUNDS RESULTING FROM SHOWERING
RESIDENT
NAS Jacksonville
Jacksonville, Florida

SHOWER CONCENTRATIONS

COMPOUND	C_{wo} (ug/l)	MW (g/mol)	H atm–m³/mol	k_l (cm/hr)	k_g (cm/hr)	K_L (cm/hr)	K_{al} (cm/hr)	C_{wd} (µg/l)	S (µg/m³–min)	$C_{(voc)}$ (µg/m³)
1,1,2–Trichloroethane	0	133.4	0.00117	1.1E+01	1.1E+03	9.5E+00	1.0E+01	0.0E+00	0.0E+00	**0.0E+00**
1,1–Dichloroethene	9.9	96.9	0.034	1.3E+01	1.3E+03	1.3E+01	1.4E+01	3.0E+00	5.0E+00	**5.0E+01**
1,2–Dichloroethane	8	99.0	0.000978	1.3E+01	1.3E+03	1.1E+01	1.1E+01	1.9E+00	3.2E+00	**3.2E+01**
1,2–Dichloroethene (total)	287	96.9	0.00758	1.3E+01	1.3E+03	1.3E+01	1.4E+01	8.4E+01	1.4E+02	**1.4E+03**
Benzene	15	78.1	0.00559	1.5E+01	1.4E+03	1.4E+01	1.5E+01	4.9E+00	8.1E+00	**8.2E+01**
Carbon Disulfide	6.4	76.0	0.0123	1.5E+01	1.5E+03	1.5E+01	1.6E+01	2.1E+00	3.5E+00	**3.5E+01**
Carbon Tetrachloride	0	153.8	0.0241	1.1E+01	1.0E+03	1.1E+01	1.1E+01	0.0E+00	0.0E+00	**0.0E+00**
Chloroform	0	119.4	0.00287	1.2E+01	1.2E+03	1.1E+01	1.2E+01	0.0E+00	0.0E+00	**0.0E+00**
Chlorobenzene	0	112.6	0.00372	1.3E+01	1.2E+03	1.2E+01	1.3E+01	0.0E+00	0.0E+00	**0.0E+00**
Ethylbenzene	9.6	106.2	0.00844	1.3E+01	1.2E+03	1.3E+01	1.3E+01	2.7E+00	4.5E+00	**4.6E+01**
Methylene Chloride	0	84.9	0.00203	1.4E+01	1.4E+03	1.3E+01	1.4E+01	0.0E+00	0.0E+00	**0.0E+00**
Toluene	0	92.1	0.00637	1.4E+01	1.3E+03	1.3E+01	1.4E+01	0.0E+00	0.0E+00	**0.0E+00**
Trichloroethene	257	131.4	0.0091	1.2E+01	1.1E+03	1.1E+01	1.2E+01	6.7E+01	1.1E+02	**1.1E+03**
Vinyl Chloride	22	62.5	0.0819	1.7E+01	1.6E+03	1.7E+01	1.8E+01	7.9E+00	1.3E+01	**1.3E+02**
Xylenes	0	106.2	0.00704	1.3E+01	1.2E+03	1.2E+01	1.3E+01	0.0E+00	0.0E+00	**0.0E+00**

C_{wo} = Concentration in groundwater
MW = Molecular weight
H = Henry's Law constant
k_l = Chemical–specific mass–transfer coefficient
k_g = Chemical–specific gas mass–transfer coefficient
K_l = Mass transfer coefficient
K_{al} = Temperature correction of mass transfer coefficient
C_{wd} = Analyte concentration in water droplet
S = Release rate of analyte to air
$C_{(voc)}$ = Analyte concentration in bathroom air at time-t.

$$C_{(voc)} = (S/R) \times (e^{(RDt)} - 1) \times e^{(-Rt)}$$

TABLE R – 10.27
INCIDENTAL INGESTION OF SURFACE WATER
SURFACEWATER RADIONUCLIDE CONCENTRATIONS – SITE
FUTURE RESIDENT – WADING
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION SURFACE WATER	CS	See Below	pCi/L
INGESTION RATE	IR	0.1	L/day
EXPOSURE DURATION	ED	30	years
EXPOSURE FREQUENCY	EF	100	days/year

EQUATIONS

TOTAL CANCER RISK = INGESTION CANCER RISK

INGESTION CANCER RISK = INGESTION INTAKE (pCi) x INGESTION SLOPE FACTOR (risk/pCi)

INGESTION INTAKE = CS x EF x IR x ED

CARCINOGENIC EFFECTS – INGESTION

COMPOUND		SURFACE WATER CONCENTRATION (pCi/g)	INGESTION INTAKE (pCi)	INGESTION SLOPE FACTOR (risk/pCi)	CANCER RISK INGESTION
Radioisotopes					
Actinium-228		3.4	1.0E+03	1.62E-12	1.7E-09
Gross Alpha		27.9	8.4E+03	ND	
Gross BEta		43.8	1.3E+04	ND	
Lead-214		5.1	1.5E+03	2.94E-13	4.5E-10
Radium-226		2.2	6.6E+02	2.95E-10	1.9E-07
Radium-228		0.72	2.2E+02	2.46E-10	5.3E-08
Thallium-208		1.8	5.4E+02	2.31E-10	1.2E-07
				Total	4E-07

TABL[illegible] – 9.28
INCIDENTAL INGESTION OF SURFACE WATER
SURFACE WATER RADIONUCLIDES AVERAGE BACKGROUND CONCENTRATIONS
FUTURE RESIDENT – WADING
NAS Jacksonville
Jacksonville, Florida

ARSWBKR	01-Ju[illegible]

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION SURFACE WATER	CS	See Below	pCi/L
INGESTION RATE	IR	0.1	L/day
EXPOSURE DURATION	ED	30	years
EXPOSURE FREQUENCY	EF	100	days/year

EQUATIONS

TOTAL CANCER RISK = INGESTION CANCER RISK

INGESTION CANCER RISK = INGESTION INTAKE (pCi) x INGESTION SLOPE FACTOR (risk/pCi)

INGESTION INTAKE = CS x EF x IR x ED

CARCINOGENIC EFFECTS – INGESTION

COMPOUND	SURFACE WATER CONCENTRATION (pCi/g)	INGESTION INTAKE (pCi)	INGESTION SLOPE FACTOR (risk/pCi)	CANCER RISK INGESTION
Radioisotopes				
Bismuth-214	11.2	3.4E+03	2.96E-10	9.9E-07
Thorium-234	158	4.7E+04	6.20E-11	2.9E-06
Radium-226	11.2	3.4E+03	NA	
			Total	4E-06

TABLE R – 10.29
INCIDENTAL INGESTION AND EXTERNAL EXPOSURE TO SEDIMENT
SEDIMENT RADIONUCLIDE CONCENTRATIONS – SITE
FUTURE RESIDENT
NAS Jacksonville
Jacksonville, Florida

1ARSDRAD	01-Jun-95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION SEDIMENT	CS	See Below	pCi/g
INGESTION RATE	IR	100	mg/day
EXPOSURE DURATION	ED	30	years
CONVERSION FACTOR 1	CF1	0.001	g/mg
EXPOSURE FREQUENCY	EF	100	days/year
GAMMA SHIELDING FACTOR	Se	0.2	unitless
GAMMA EXPOSURE TIME FACTOR	Te	0.11	unitless

EQUATIONS

TOTAL CANCER RISK = INGESTION CANCER RISK + EXTERNAL CANCER RISK

INGESTION CANCER RISK = INGESTION INTAKE (pCi) x INGESTION SLOPE FACTOR (risk/pCi)

EXTERNAL CANCER RISK = EXTERNAL EXPOSURE FACTOR (pCi-yr/g) x
EXTERNAL EXPOSURE SLOPE FACTOR (risk/yr per pCi/g)

INGESTION INTAKE = CS x EF x IR x ED x CF1

EXTERNAL EXPOSURE FACTOR = CS x ED x (1-Se) x Te

CARCINOGENIC EFFECTS – INGESTION AND EXTERNAL

COMPOUND		SEDIMENT CONCENTRATION (pCi/g)	INGESTION INTAKE (pCi)	INGESTION SLOPE FACTOR (risk/pCi)	CANCER RISK INGESTION	EXTERNAL EXPOSURE FACTOR (pCi-yr/g)	EXTERNAL EXPOSURE SLOPE FACTOR (risk/yr per pCi/g)	CANCER RISK EXTERNAL	TOTAL CANCER RISK
Radioisotopes									
Bismuth-214		0.9	2.7E+02	1.95E-13	5E-11	2.4E+00	6.0E-06	1E-05	1E-05
Cesium-137		3.7	1.1E+03	3.16E-11	4E-08	9.8E+00	2.1E-06	2E-05	2E-05
Gross Alpha		2.4	7.2E+02	ND			ND		
Gross Beta		1.6	4.8E+02	ND		4.2E+00	ND		
Lead-212		1.9	5.7E+02	2.31E-10	1E-07	5.0E+00	9.9E-07	5E-06	5E-06
Lead-214		1.5	4.5E+02	2.94E-13	1E-10	4.0E+00	7.1E-07	3E-06	3E-06
Potassium-40		3.7	1.1E+03	1.25E-11	1E-08	9.8E+00	6.1E-07	6E-06	6E-06
Radium-226		0.84	2.5E+02	2.95E-10	7E-08	2.2E+00	1.3E-08	3E-08	1E-07
Radium-228		0.35	1.1E+02	2.46E-10	3E-08	9.2E-01	0.0E+00		3E-08
Thallium-208		1.1	3.3E+02	NA		2.9E+00	NA		0E+00
Uranium-235		2.3	6.9E+02	4.70E-11	3E-08	6.1E+00	2.7E-07	2E-06	2E-06
								Total	5E-05

TABLE – 10.30

INCIDENTAL INGESTION AND EXTERNAL EXPOSURE TO SEDIMENT
SEDIMENT RADIONUCLIDES AVERAGE BACKGROUND CONCNETRATIONS
FUTURE RESIDENT
NAS Jacksonville
Jacksonville, Florida

JARSDBKR | -Jun-95

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION SEDIMENT	CS	See Below	pCi/g
INGESTION RATE	IR	100	mg/day
EXPOSURE DURATION	ED	30	years
CONVERSION FACTOR 1	CF1	0.001	g/mg
EXPOSURE FREQUENCY	EF	100	days/year
GAMMA SHIELDING FACTOR	Se	0.2	unitless
GAMMA EXPOSURE TIME FACTOR	Te	0.11	unitless

EQUATIONS

TOTAL CANCER RISK = INGESTION CANCER RISK + EXTERNAL CANCER RISK

INGESTION CANCER RISK = INGESTION INTAKE (pCi) x INGESTION SLOPE FACTOR (risk/pCi)

EXTERNAL CANCER RISK = EXTERNAL EXPOSURE FACTOR (pCi-yr/g) x EXTERNAL EXPOSURE SLOPE FACTOR (risk/yr per pCi/g)

INGESTION INTAKE = CS x EF x IR x ED x CF1

EXTERNAL EXPOSURE FACTOR = CS x ED x (1-Se) x Te

CARCINOGENIC EFFECTS – INGESTION AND EXTERNAL

COMPOUND		SEDIMENT CONCENTRATION (pCi/g)	INGESTION INTAKE (pCi)	INGESTION SLOPE FACTOR (risk/pCi)	CANCER RISK INGESTION	EXTERNAL EXPOSURE FACTOR (pCi-yr/g)	EXTERNAL EXPOSURE SLOPE FACTOR (risk/yr per pCi/g)	CANCER RISK EXTERNAL	TOTAL CANCER RSIK
Radioisotopes									
Actinium-228		0.8	2.4E+02	2.48E-10	6E-08	2.1E+00	3.3E-06	7E-06	7E-06
Bismuth-212		1.2	3.6E+02	6.20E-13	2E-10	3.2E+00	4.3E-07	1E-06	1E-06
Bismuth-214		0.54	1.6E+02	1.95E-13	3E-11	1.4E+00	6.0E-06	9E-06	9E-06
Cesium-137		0.12	3.6E+01	3.16E-11	1E-09	3.2E-01	2.1E-06	7E-07	7E-07
Lead-212		0.52	1.6E+02	2.31E-10	4E-08	1.4E+00	9.9E-07	1E-06	1E-06
Lead-214		0.45	1.4E+02	2.94E-13	4E-11	1.2E+00	7.1E-07	8E-07	8E-07
Potassium-40		3.7	1.1E+03	1.25E-11	1E-08	9.8E+00	6.1E-07	6E-06	6E-06
Radium-226		0.535	1.6E+02	2.95E-10	5E-08	1.4E+00	1.3E-08	2E-08	7E-08
Thallium-208		0.24	7.2E+01	NA		6.3E-01	NA		
Uranium-235		0.13	3.9E+01	4.70E-11	2E-09	3.4E-01	2.7E-07	9E-08	9E-08
								Total	3E-05

1ARGWRAD	01-Jun-95

TABLE R – 10.31
INGESTION OF GROUNDWATER AS DRINKING WATER
RADIONUCLIDE GROUNDWATER CONCENTRATIONS – SITE
FUTURE RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION WATER	CW	see below	pCi/liter
INGESTION RATE	IR	2	liters/day
EXPOSURE FREQUENCY	EF	350	days/year
EXPOSURE DURATION	ED	30	years

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR $(mg/kg\text{-}day)^{-1}$

INTAKE-INGESTION = CW x IR x EF x ED

TABLE R – 10.31, continued
INGESTION OF GROUNDWATER AS DRINKING WATER
RADIONUCLIDE GROUNDWATER CONCENTRATIONS – SITE
FUTURE RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND			WATER CONCENTRATION (pCi/L)	INTAKE INGESTION (pCi)	INGESTION SLOPE FACTOR (Risk/pCi)	CANCER RISK INGESTION
Radioisotopes						
Bismuth–214			3.2	6.7E+04	NA	
Gross Alpha			161	3.4E+06	ND	
Gross Beta			212		ND	
Radium–223			2	4.2E+04	6.2E–10	3E–05
Radium–226			27.9	5.9E+05	2.9E–10	2E–04
Thorium–234			60.3	1.3E+06	6.2E–11	8E–05
Radium–228			4.9	1.0E+05	3.0E–10	3E–05
					Total	3E–04

TABLE R – 10.32, continued
INGESTION OF GROUNDWATER AS DRINKING WATER
GROUNDWATER RADIONUCLIDE AVERAGE BACKGROUND CONCENTRATIONS
FUTURE RESIDENT
NAS Jacksonville
Jacksonville, Florida

CARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (pCi/L)	INTAKE INGESTION (pCi)	INGESTION SLOPE FACTOR	CANCER RISK INGESTION
Radioisotopes				
Actinium–228	16.8	3.5E+05	2.48E–10	9E–05
Bismuth–214	7.5	1.6E+05	1.95E–13	3E–08
Lead–214	13.3	2.8E+05	2.94E–13	8E–08
Potassium–40	92.6	1.9E+06	1.25E–11	2E–05
Radium–224	88.4	1.9E+06	2.31E–10	4E–04
Radium–226	13.3	2.8E+05	2.95E–10	8E–05
Thallium–208	5.7	1.2E+05	NA	
			Total	6E–04

TABLE R – 10.32

1ARGWBKR	01–Jun–95

INGESTION OF GROUNDWATER AS DRINKING WATER
GROUNDWATER RADIONUCLIDE AVERAGE BACKGROUND CONCENTRATIONS
FUTURE RESIDENT
NAS Jacksonville
Jacksonville, Florida

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION WATER	CW	see below	pCi/liter
INGESTION RATE	IR	2	liters/day
EXPOSURE FREQUENCY	EF	350	days/year
EXPOSURE DURATION	ED	30	years

EQUATIONS

CANCER RISK = INTAKE (mg/kg–day) x CANCER SLOPE FACTOR $(mg/kg-day)^{-1}$

INTAKE–INGESTION = CW x IR x EF x ED

APPENDIX R-11

DOSE-RESPONSE DATA

Table R-11.1
Oral Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Oral Slope Factor (mg/kg/day)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
VOLATILES							
1,1-Dichloroethylene	C	6.00e-01	IRIS	Rat	Oral-drinking water	Adrenal	IRIS
1,2-Dichloroethane	B2	9.10e-02	IRIS	Rat	Oral-gavage	Hemanglosarcoma	IRIS
1,2-Dichloroethylene (total)	D	NE					
Benzene	A	2.90e-02	IRIS	Human	Inhalation	Leukemia	IRIS
Carbon Disulfide	D	NE					
Ethylbenzene	D	NE					
Trichloroethylene	B2	1.10e-02	(1)				
Vinyl Chloride	A	1.90e+00	HEAST		Oral-diet	Liver,lung	HEAST
SEMIVOLATILES							
2-Methylnaphthalene	D	NE					
2-Methylphenol	D	NE					
4-Methylphenol	C	NE					
Acenaphthene	D	NE					
Benzo(a)Anthracene	B2	7.30e+00	(2)				
Benzo(a)Pyrene	B2	7.30e+00	IRIS	Mouse	Oral-diet	Forestomach	IRIS
Benzo(b)Fluoranthene	B2	7.30e+00	(2)				

Table R-11.1
Oral Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Oral Slope Factor (mg/kg/day)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
Benzo(k)Fluoranthene	B2	7.30e+00	(2)				
bis(2-Ethylhexyl)phthalate	B2	1.40e-02	IRIS	Rat	Oral-diet	Liver	IRIS
Carbazole	B2	2.00e-02	HEAST	Mouse	Oral-diet	Liver	HEAST
Chrysene	B2	7.30e+00	(2)				
Dibenzofuran	D	NE					
Dibenz(a,h)Anthracene	B2	7.30e+00	(2)				
Flouranthene	D	NE					
Indeno(1,2,3-c,d)Pyrene	B2	7.30e+00	(2)				
Naphthalene	D	NE					
Phenanthrene	D	NE					
Phenol	D	NE					
Pyrene	D	NE					
PESTICIDES/PCBs							
4,4'-DDD	B2	2.40e-01	IRIS	Mouse	Oral-diet	Liver	IRIS
4,4'-DDE	B2	3.40e-01	IRIS	Mouse/hamster	Oral-diet	Liver	IRIS
4,4'-DDT	B2	3.40e-01	IRIS	Mouse/rat	Oral-diet	Liver	IRIS
alpha-Chlordane	B2	1.30e+00	IRIS (3)	Mouse	Oral-diet	Liver	IRIS

Table R-11.1
Oral Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Oral Slope Factor (mg/kg/day)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
Aroclor-1248	B2	7.70e+00	(4)				
Aroclor-1254	B2	7.70e+00	(4)				
Aroclor-1260	B2	7.70e+00	IRIS	Rat	Oral-diet	Liver	IRIS
gamma-Chlordane	B2	1.30e+00	IRIS (3)	Mouse	Oral-diet	Liver	IRIS
Heptachlor	B2	4.5e+00	IRIS	Mouse	Oral-diet	Liver	IRIS
Heptachlor epoxide	B2	9.1e+00	IRIS	Mouse	Oral-diet	Liver	IRIS
DIOXINS/FURANS							
2,3,7,8-TCDD	B2	1.50e+05	(5)				
INORGANICS							
Aluminum	D	NE					
Antimony	D	NE					
Arsenic	A	1.75e+00	IRIS (6)	Human	Oral-drinking water	Skin	IRIS
Barium	D	NE					
Beryllium	B2	4.30e+00	IRIS	Rat	Oral-drinking water	Total	IRIS
Cadmium	D	NE					
Chromium	D	NE					

Table R-11.1
Oral Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Oral Slope Factor (mg/kg/day)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
Cobalt	D	NE					
Iron	D	NE					
Lead	B2	NE					
Manganese	D	NE					
Mercury	D	NE					
Nickel	D	NE					
Sodium	D	NE					
Thallium	D	NE					
Vanadium	D	NE					

Table R-11.1
Oral Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Oral Slope Factor (mg/kg/day)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source

Notes:
ND = No Data
NE = Not Evaluated
Integrated Risk Information System (IRIS) on-line database search, current as of March 1995.
Health Effects Assessment Summary Tables (HEAST), current as of November 1994.
(1) This value was provided by the Environmental Criteria and Assessment Office (ECAO) of the USEPA in response to a specific request.
(2) The ingestion slope factor for benzo(a)pyrene was used as a surrogate for all PAHs classified as A or B carcinogens and for which a chemical-specific slope factor was not available.
(3) The values for chlordane have been used as surrogates for alpha- and gamma-chlordane.
(4) The ingestion slope factor for PCBs, in which Aroclor-1260 was evaluated, has been used as a surrogate for all Aroclors.
(5) The values for 2,3,7,8-TCDD have been withdrawn from both IRIS and HEAST. However, they are being used as surrogates for all dioxins and furans at the request of USEPA Region IV (reference).
(6) The ingestion slope factor for arsenic has been calculated from the drinking water unit risk of 5.00E-05 per(ug/L).

Weight of Evidence (route-specific):
A = Human carcinogen
B = Probable human carcinogen (B1 = limited human evidence; B2 = sufficient human evidence)
C = Possible human carcinogen
D = Not classifiable as to human carcinogenicity

Table R-11.2
Inhalation Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Inhalation Slope Factor (mg/kg/day)(-1)	Source	Inhalation Unit Risk ($\mu g/m^3$)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
VOLATILES									
1,1-Dichloroethylene	C	1.20e+00	HEAST	5.00e-05	IRIS	Mouse	Inhalation	Kidney	IRIS
1,2-Dichloroethane	B2	9.10e-02	HEAST	2.60e-05	IRIS	Rat	Oral-gavage	Hemanglosarcoma	IRIS
1,2-Dichloroethylene (total)	D	NE		NE					
Benzene	A	2.90e-02	HEAST	8.30e-06	IRIS	Human	Inhalation	Leukemia	IRIS
Carbon Disulfide	D	NE		NE					
Ethylbenzene	D	NE		NE					
Trichloroethylene	B2	6.00e-03	(1)	1.70e-06	(1)				
Vinyl Chloride	A	3.00e-01	HEAST	8.40e-05	HEAST	Rat	Inhalation	Liver	HEAST
SEMIVOLATILES									
2-Methylnaphthalene	D	NE		NE					
2-Methylphenol	D	NE		NE					
4-Methylphenol	C	NE		NE					
Acenaphthene	D	NE		NE					
Benzo(a)Anthracene	B2	NE		NE					
Benzo(a)Pyrene	B2	NE		NE					
Benzo(b)Fluoranthene	B2	NE		NE					

Table R-11.2
Inhalation Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Inhalation Slope Factor (mg/kg/day)(-1)	Source	Inhalation Unit Risk ($\mu g/m^3$)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
Benzo(k)Fluoranthene	B2	NE		NE					
bis(2-Ethylhexyl)phthalate	D	NE		NE					
Carbazole	D	NE		NE					
Chrysene	B2	NE		NE					
Dibenzofuran	D	NE		NE					
Dibenz(a,h)Anthracene	B2	NE		NE					
Fluoranthene	D	NE		NE					
Indeno(1,2,3-c,d)Pyrene	B2	NE		NE					
Naphthalene	D	NE		NE					
Phenanthrene	D	NE		NE					
Phenol	D	NE		NE					
Pyrene	D	NE		NE					
PESTICIDES/PCBs									
4,4'-DDD	D	NE		NE					
4,4'-DDE	D	NE		NE					
4,4'-DDT	B2	3.40e-01	HEAST	9.70e-05	IRIS	Mouse/rat	Oral-diet	Liver	IRIS
alpha-Chlordane	B2	1.30e+00	HEAST (2)	3.70e-04	IRIS (2)	Mouse	Oral-diet	Liver	IRIS

Table R-11.2
Inhalation Dose-Response Data for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Inhalation Slope Factor (mg/kg/day)(-1)	Source	Inhalation Unit Risk ($\mu g/m^3$)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
Aroclor-1248	B2	NE		NE					
Aroclor-1254	B2	NE		NE					
Aroclor-1260	B2	NE		NE					
gamma-Chlordane	B2	1.30e+00	HEAST (2)	3.70e-04	IRIS (2)	Mouse	Oral-diet	Liver	IRIS
Heptachlor	B2	4.5e+00	HEAST	1.3e-03	IRIS	Mouse	Oral-diet	Liver	IRIS
Heptachlor epoxide	B2	9.1e+00	HEAST	2.6e-03	IRIS	Mouse	Oral-gavage	Liver	IRIS
DIOXINS/FURANS									
2,3,7,8-TCDD	B2	1.50e+05	(3)	3.30e+01	(3)				
INORGANICS									
Aluminum	D	NE		NE					
Antimony	D	NE		NE					
Arsenic	A	5.00e+01	HEAST	4.30e-03	IRIS	Human	Inhalation	Lung	IRIS
Barium	D	NE		NE					
Beryllium	B2	8.40e+00	HEAST	2.40e-03	IRIS	Human	Inhalation	Lung	IRIS
Cadmium	B1	NE		1.80e-03	IRIS	Human	Inhalation	Lung	IRIS
Chromium	A	4.10e+01	HEAST (4)	1.20e-02	IRIS (4)	Human	Inhalation	Lung	IRIS

Table R-11.2
Inhalation Dose-Response Data
for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Inhalation Slope Factor (mg/kg/day)(-1)	Source	Inhalation Unit Risk ($\mu g/m^3$)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source
Cobalt	D	NE		NE					
Iron	D	NE		NE					
Lead	D	NE		NE					
Manganese	D	NE		NE					
Mercury	D	NE		NE					
Nickel	A	8.40e-01	HEAST (5)	2.40e-04	IRIS (5)	Human	Inhalation	Lung	IRIS
Sodium	D	NE		NE					
Thallium	D	NE		NE					
Vanadium	D	NE		NE					

Table R-11.2
Inhalation Dose-Response Data for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Inhalation Slope Factor (mg/kg/day)(-1)	Source	Inhalation Unit Risk ($\mu g/m^3$)(-1)	Source	Test Species	Exposure Route	Tumor Type	Study Source

Notes:

NE = Not Evaluated
Integrated Risk Information System (IRIS) on-line database search, current as of March 1995.
Health Effects Assessment Summary Tables (HEAST), current as of November 1994.

(1) This value was provided by the Environmental Criteria and Assessment Office (ECAO) of the USEPA in response to a specific request.
(2) The values for chlordane have been used as surrogates for alpha- and gamma-chlordane.
(3) The values for 2,3,7,8-TCDD have been withdrawn from both IRIS and HEAST. However, they are being used as surrogates for all dioxins and furans at the request of USEPA Region IV (reference).
(4) The toxicity values for chromium are based on chromium VI.
(5) The toxicity values for nickel are based on nickel refinery dust.

Weight of Evidence (route-specific):
A = Human carcinogen
B = Probable human carcinogen (B1 = limited human evidence; B2 = sufficient human evidence)
C = Possible human carcinogen
D = Not classifiable as to human carcinogenicity

Table R-11.3
Oral Dose-Response Data
for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	Oral RfD (mg/kg-day)	Source	Oral RfD (mg/kg-day)	Source						
VOLATILES										
1,1-Dichloroethylene	9.00e-03	IRIS	9.00e-03	HEAST	Oral-drinking water	Medium	Hepatic lesions	Rat	1000 H,A,L	IRIS
1,2-Dichloroethane	3.00e-01	(1)	ND							
1,2-Dichloroethylene (total)	9.00e-03	HEAST (2)	9.00e-03	HEAST (2)						
Benzene	3.00e-04	(1)	ND							
Carbon Disulfide	1.00e-01	IRIS	1.00e-01	HEAST	Inhalation	Medium	Fetal toxicity/ teratogenicity	Rabbit	100 H,A	IRIS
Ethylbenzene	1.00e-01	IRIS	ND		Oral-gavage	Low	Liver, kidney toxicity	Rat	1000 H,A,S	IRIS
Trichloroethylene	6.00e-03	(1)	ND							
Vinyl Chloride	ND		ND							
SEMIVOLATILES										
2-Methylnaphthalene	ND		ND							
2-Methylphenol	5.00e-02	IRIS	5.00e-01	HEAST	Oral-gavage	Medium	Decreased weight, neurotoxicity	Rat	1000 H,A,S	IRIS

Table R-11.3
Oral Dose-Response Data
for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	Oral RfD (mg/kg-day)	Source	Oral RfD (mg/kg-day)	Source						
4-Methylphenol	5.00e-03	HEAST	5.00e-03	HEAST	Oral-gavage	Medium	Hypoactivity, respiratory distress	Rabbit	1000 H,A,S	HEAST
Acenaphthene	6.00e-02	IRIS	6.00e-01	HEAST	Oral-gavage	Low	Hepatotoxicity	Mouse	3000 H,A,S,D	IRIS
Benzo(a)Anthracene	ND		ND							
Benzo(a)Pyrene	ND		ND							
Benzo(b)Fluoranthene	ND		ND							
Benzo(k)Fluoranthene	ND		ND							
bis(2-Ethylhexyl)phthalate	2.00e-02	IRIS	ND		Oral-diet	Medium	Increased liver weight	Guinea pig	1000 H,A,S,L	IRIS
Carbazole	ND		ND							
Chrysene	ND		ND							
Dibenzofuran	ND		ND							
Dibenz(a,h)Anthracene	ND		ND							
Fluoranthene	4.00e-02	IRIS	4.00e-01	HEAST	Oral-gavage	Low	Increased liver weight, clinical effects	Mouse	3000 H,A,S,D	IRIS
Indeno(1,2,3-c,d)Pyrene	ND		ND							

Table R-11.3
Oral Dose-Response Data
for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	Oral RfD (mg/kg-day)	Source	Oral RfD (mg/kg-day)	Source						
Naphthalene	4.00e-02	(1)	ND							
Phenanthrene	ND		ND							
Phenol	6.00e-01	IRIS	6.00e-01	HEAST	Oral-gavage	Low	Decreased fetal weight	Rat	100 H,A	IRIS
Pyrene	3.00e-02	IRIS	3.00e-01	HEAST	Oral-gavag	Low	Renal tubular pathology	Mouse	3000 H,A,S,D	IRIS
PESTICIDES/PCBs										
4,4'-DDD	ND		ND							
4,4'-DDE	ND		ND							
4,4'-DDT	5.00e-04	IRIS	5.00e-04	HEAST	Oral-diet	Medium	Liver lesions	Rat	100 H,A	IRIS
alpha-Chlordane	6.00e-05	IRIS (3)	6.00e-05	HEAST (3)	Oral-diet	Low	Liver hypertrophy	Rat	1000 H,A,D	IRIS
Aroclor-1248	2.00e-05	(4)	5.00e-05	(4)						
Aroclor-1254	2.00e-05	IRIS	5.00e-05	HEAST	Oral-capsule	Medium	Immunological and clinical effects	Monkey	300 H,A,S,L	IRIS
Aroclor-1260	2.00e-05	(4)	5.00e-05	(4)						
gamma-Chlordane	6.00e-05	IRIS (3)	6.00e-05	HEAST (3)	Oral-diet	Low	Liver hypertrophy	Rat	1000 H,A,D	IRIS

Table R-11.3
Oral Dose-Response Data
for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	Oral RfD (mg/kg-day)	Source	Oral RfD (mg/kg-day)	Source						
Heptachlor	5.00e-04	IRIS	5.00e-04	HEAST	Oral-diet	Low	Increased liver weights	Rat	300 H,A,D	IRIS
Heptachlor epoxide	1.30e-05	IRIS	1.30e-05	HEAST	Oral-diet	Low	Increased liver weight	Dog	1000 H,A,L	IRIS
DIOXINS/FURANS										
2,3,7,8-TCDD	ND		ND							
INORGANICS										
Aluminum	1.00e+00	(1)	ND							
Antimony	4.00e-04	IRIS	4.00e-04	HEAST	Oral-drinking water	Low	Reduced lifespan	Rat	1000 H,A,L	IRIS
Arsenic	3.00e-04	IRIS	3.00e-04	HEAST	Oral-drinking water	Medium	Hyperpigmentation, keratosis	Human	3 D	IRIS
Barium	7.00e-02	IRIS	7.00e-02	HEAST	Oral-drinking water	Medium	Elevated blood pressure	Human	3 H	IRIS
Beryllium	5.00e-03	IRIS	5.00e-03	HEAST	Oral-drinking water	Low	No effects observed	Rat	100 H,A	IRIS
Cadmium Food	1.00e-03	IRIS	ND		Oral-diet	High	Proteinuria	Human	10 H	IRIS
Cadmium Drinking Water	5.00e-04	IRIS	ND		Oral-drinking water	High	Proteinuria	Human	10 H	IRIS

Table R-11.3
Oral Dose-Response Data
for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical		Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
		Oral RfD (mg/kg-day)	Source	Oral RfD (mg/kg-day)	Source						
Chromium		5.00e-03	IRIS (5)	2.00e-02	HEAST (5)	Oral-drinking water	Low	No effects observed	Rat	500 H,A,S	IRIS
Cobalt		6.00e-02	(1, 6)	ND							
Iron		3.00e-01	(1)	ND							
Lead		ND		ND							
Manganese	Food	1.40e-01	IRIS	1.40e-01	HEAST	Oral-diet	NA	CNS effects	Human	1	IRIS
	Drinking Water	5.00e-03	IRIS	5.00e-03	HEAST	Oral-drinking water	NA	CNS effects	Human	1	IRIS
Mercury		3.00e-04	HEAST (7)	3.00e-04	HEAST (7)	Oral-gavage	Low	Kidney effects	Rat	1000 H,A,D	HEAST
Nickel		2.00e-02	IRIS (8)	2.00e-02	HEAST (8)	Oral-diet	Medium	Decreased body, organ weights	Rat	300 H,A,D	IRIS
Sodium		ND		ND							
Thallium		8.00e-05	IRIS (9)	8.00e-04	HEAST (9)	Oral-gavage	Low	No effects observed	Rat	3000 H,A,S,D	IRIS
Vanadium		7.00e-03	HEAST	7.00e-03	HEAST	Oral-drinking water	Low	No effects observed	Rat	100 H,A	HEAST

Table R-11.3
Oral Dose-Response Data
for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	Oral RfD (mg/kg-day)	Source	Oral RfD (mg/kg-day)	Source						

Notes:
ND = No Data
NA = Not Applicable
Integrated Risk Information System (IRIS) on-line database search, current as of March 1995.
Health Effects Assessment Summary Tables (HEAST), current as of November 1994.
Environmental Criteria and Assessment Office (ECAO) of the USEPA in response to a specific request.
(1) This value was provided by the Environmental Criteria and Assessment Office (ECAO) of the USEPA in response to a specific request.
(2) The values for 1,1-dichloroethylene have been used as surrogates for 1,2-dichloroethylene (total) adopted based on analogy.
(3) The values for chlordane have been used as surrogates for alpha- and gamma-chlordane.
(4) The chronic and subchronic ingestion RfD for Aroclor-1254 has been used as a surrogate for all Aroclors lacking chemical specific RfDs.
(5) The toxicity values for chromium are based on chromium VI.
(6) This value is provided for childhood exposures. An oral RfD of 1.8e-01 mg/kg-day is provided for adult exposures (ECAO).
(7) This mercury value is specific for inorganic mercury.
(8) The ingestion RfD values for nickel are based on nickel, soluble salts.
(9) The ingestion RfD values for thallium are based on thallium sulfate.

Uncertainty factors:
H = Variation in human sensitivity
A = Animal to human extrapolation
S = Extrapolation from subchronic to chronic NOAEL
L = Extrapolation from LOAEL to NOAEL
D = Inadequate data
M = Modifying factor

Table R-11.4
Inhalation Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	RfC ($\mu g/m^3$)	Source	RfC ($\mu g/m^3$)	Source						
VOLATILES										
1,1-Dichloroethylene	ND		ND							
1,2-Dichloroethane	ND		ND							
1,2-Dichloroethylene (total)	ND		ND							
Benzene	ND		ND							
Carbon Disulfide	1.00e+01	HEAST	1.00e+01	HEAST	Inhalation	Low	Fetal toxicity	Rat	1000 H,A,S	HEAST
Ethylbenzene	1.00e+03	IRIS	ND		Inhalation	Low	Developmental toxicity	Rat/ rabbit	300 H,A,S	IRIS
Trichloroethylene	ND		ND							
Vinyl Chloride	ND		ND							
SEMIVOLATILES										
2-Methylnaphthalene	ND		ND							
2-Methylphenol	ND		ND							
4-Methylphenol	ND		ND							
Acenaphthene	ND		ND							
Benzo(a)Anthracene	ND		ND							
Benzo(a)Pyrene	ND		ND							

Table R-11.4
Inhalation Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	RfC ($\mu g/m^3$)	Source	RfC ($\mu g/m^3$)	Source						
Benzo(b)Fluoranthene	ND		ND							
Benzo(k)Fluoranthene	ND		ND							
bis(2-Ethylhexyl)phthalate	ND		ND							
Carbazole	ND		ND							
Chrysene	ND		ND							
Dibenzofuran	ND		ND							
Dibenz(a,h)Anthracene	ND		ND							
Fluoranthene	ND		ND							
Indeno(1,2,3-c,d)Pyrene	ND		ND							
Naphthalene	ND		ND							
Phenanthrene	ND		ND							
Phenol	ND		ND							
Pyrene	ND		ND							
PESTICIDES/PCBs										
4,4'-DDD	ND		ND							
4,4'-DDE	ND		ND							
4,4'-DDT	ND		ND							

Table R-11.4
Inhalation Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	RfC ($\mu g/m^3$)	Source	RfC ($\mu g/m^3$)	Source						
alpha-Chlordane	ND		ND							
Aroclor-1248	ND		ND							
Aroclor-1254	ND		ND							
Aroclor-1260	ND		ND							
gamma-Chlordane	ND		ND							
Heptachlor	ND		ND							
Heptachlor epoxide	ND		ND							
DIOXINS/FURANS										
2,3,7,8-TCDD	ND		ND							
INORGANICS										
Aluminum	ND		ND							
Antimony	ND		ND							
Arsenic	ND		ND							
Barium	5.00e-01	HEAST (1)	5.00e+00	HEAST (2)	Inhalation	Low	Fetotoxicity	Rat	1000 H,A,S	HEAST
Beryllium	ND		ND							
Cadmium	ND		ND							
Chromium	ND		ND							

Table R-11.4
Inhalation Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	RfC ($\mu g/m^3$)	Source	RfC ($\mu g/m^3$)	Source						
Cobalt	ND		ND							
Iron	ND		ND							
Lead	ND		ND							
Manganese	5.00e-02	IRIS	ND		Inhalation	Medium	Impaired neurobehavioal function	Human	1000 H,L,D	IRIS
Mercury	3.00e-01	HEAST (3)	3.00e-01	HEAST (3)	Inhalation	Low	Neurotoxicity	Human	30 H,D	HEAST
Nickel	ND		ND							
Sodium	ND		ND							
Thallium	ND		ND							
Vanadium	ND		ND							

Table R-11.4
Inhalation Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Chemical	Chronic		Subchronic		Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Study Source
	RfC ($\mu g/m^3$)	Source	RfC ($\mu g/m^3$)	Source						

Notes:

ND = No Data
NA = Not Applicable
Integrated Risk Information System (IRIS) on-line database search, current as of March 1995.
Health Effects Assessment Summary Tables (HEAST), current as of November 1994.
(1) Barium has a chronic inhalation RfD of 1.00e-04 mg/kg-day (HEAST).
(2) Barium has a subchronic inhalation RfD of 1.00e-03 mg/kg-day (HEAST).
(3) The mercury RfC values were developed specifically for elemental mercury.

Uncertainty factors:
A = Animal to human extrapolation
H = Variation in human sensitivity
S = Extrapolation from subchronic to chronic NOAEL
L = Extrapolation from LOAEL to NOAEL
D = Inadequate data
M = Modifying factor

Table R-11.5
Dermal Dose-Response Data for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Compound	Weight of Evidence	Oral Slope Factor (mg/kg-day)-1	Oral Absorption Efficiency	Reference	Dermal Slope Factor (mg/kg-day)-1
VOLATILES					
1,1-Dichloroethylene	C	6.00e-01	100%	Putcha et al., 1986	6.00e-01
1,2-Dichloroethane	B2	9.10e-02	100%	Reitz et al., 1980	9.10e-02
1,2-Dichloroethylene (total)	D	NE			NE
Benzene	A	2.90e-02		(1)	2.90e-02
Carbon Disulfide	D	NE			NE
Ethylbenzene	D	NE			NE
Trichloroethylene	B2	1.10e-02	100%	Prout et al., 1985	1.10e-02
Vinyl Chloride	A	1.90e+00	100%	Watanabe et al., 1976	1.90e+00
SEMIVOLATILES					
2-Methylnaphthalene	D	NE			NE
2-Methylphenol	D	NE			NE
4-Methylphenol	C	NE			NE
Acenaphthene	D	NE			NE
Benzo(a)Anthracene	B2	7.30e+00	91%	(2)	8.02e+00
Benzo(a)Pyrene	B2	7.30e+00	91%	Hecht et al., 1979	8.02e+00
Benzo(b)Fluoranthene	B2	7.30e+00	91%	(2)	8.02e+00
Benzo(k)Fluoranthene	B2	7.30e+00	91%	(2)	8.02e+00
bis(2-Ethylhexyl)phthalate	B2	1.40e-02	100%	Chadwick et al., 1982	1.40e-02

Table R-11.5
Dermal Dose-Response Data for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Compound	Weight of Evidence	Oral Slope Factor (mg/kg-day)-1	Oral Absorption Efficiency	Reference	Dermal Slope Factor (mg/kg-day)-1
Carbazole	B2	2.00e-02	50%	(3)	4.00e-02
Chrysene	B2	7.30e+00	91%	(2)	8.02e+00
Dibenzofuran	D	NE			NE
Dibenz(a,h)Anthracene	B2	7.30e+00	91%	(2)	8.02e+00
Fluoranthene	D	NE			NE
Indeno(1,2,3-c,d)Pyrene	B2	7.30e+00	91%	(2)	8.02e+00
Naphthalene	D	NE			NE
Phenanthrene	D	NE			NE
Phenol	D	NE			NE
Pyrene	D	NE			NE
PESTICIDES/PCBs					
4,4'-DDD	B2	2.40e-01	20%	(4)	1.20e+00
4,4'-DDE	B2	3.40e-01	20%	(4)	1.70e+00
4,4'-DDT	B2	3.40e-01	20%	Siebert, 1976	1.70e+00
alpha-Chlordane	B2	1.30e+00	80%	(5)	1.63e+00
Aroclor-1248	B2	7.70e+00	90%	Albro & Fishbein, 1972	8.56e+00
Aroclor-1254	B2	7.70e+00	90%	Albro & Fishbein, 1972	8.56e+00
Aroclor-1260	B2	7.70e+00	90%	Albro & Fishbein, 1972	8.56e+00
gamma-Chlordane	B2	1.30e+00	80%	Ohno et al., 1986	1.63e+00

Table R-11.5
Dermal Dose-Response Data for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Compound	Weight of Evidence	Oral Slope Factor (mg/kg-day)-1	Oral Absorption Efficiency	Reference	Dermal Slope Factor (mg/kg-day)-1
Heptachlor	B2	4.5e+00	49%	ATSDR, 1991f	9.18e+00
Heptachlor epoxide	B2	9.1e+00	49%	(6)	1.86e+01
DIOXINS/FURANS					
2,3,7,8-TCDD	B2	1.50e+05	50%	(3)	3.00e+05
INORGANICS					
Aluminum	D	NE			NE
Antimony	D	NE			NE
Arsenic	A	1.75e+00	98%	Vahter, 1983	1.79e+00
Barium	D	NE			NE
Beryllium	B2	4.30e+00	1%	Owen, 1990	4.30e+02
Cadmium	D	NE			NE
Chromium	D	NE			NE
Cobalt	D	NE			NE
Iron	D	NE			NE
Lead	B2	NE			NE
Manganese	D	NE			NE
Mercury	D	NE			NE
Nickel	D	NE			NE
Sodium	D	NE			NE

Table R-11.5
Dermal Dose-Response Data for Carcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

Compound	Weight of Evidence	Oral Slope Factor (mg/kg-day)-1	Oral Absorption Efficiency	Reference	Dermal Slope Factor (mg/kg-day)-1
Thallium	D	NE			NE
Vanadium	D	NE			NE

Notes:

NE = Not Evaluated
For documentation concerning oral slope factors, refer to Table 1.
(1) This toxicity values is based on absorbed dose. Therefore, no adjustment of this value is necessary.
(2) The oral absorption efficiency of all PAHs is assumed to be identical to that of benzo(a)pyrene, based on structural analogy.
(3) SVOCs lacking specific information on absorption efficency are assigned a default value of 50% (USEPA Region IV, 1993).
(4) The oral absorption efficiency of DDE and DDD is assumed to be identical to that of DDT, based on structural analogy.
(5) The oral absorption efficiency of alpha-chlordane is assumed to be identical to that of gamma-chlordane, based on structural analogy.
(6) The oral absorption efficency of heptachlor epoxide is assumed to be identical to that of hepatchlor, based on structural analogy.
Weight of Evidence (route-specific):
A = Human carcinogen
B = Probable human carcinogen (B1 = limited human evidence; B2 = sufficient human evidence)
C = Possible human carcinogen
D = Not classifiable as to human carcinogenicity

Table R-11.6
Dermal Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

	Chronic Oral RfD (mg/kg-day)	Subchronic Oral RfD (mg/kg-day)	Oral Absorption Efficiency	Reference	Dermal Chronic RfD (mg/kg-day)	Dermal Subchronic RfD (mg/kg-day)
VOLATILES						
1,1-Dichloroethylene	9.00e-03	9.00e-03	100%	Putcha et al., 1986	9.00e-03	9.00e-03
1,2-Dichloroethane	3.00e-01	ND	100%	Reitz et al., 1980	3.00e-01	ND
1,2-Dichloroethylene (total)	9.00e-03	9.00e-03	100%	(1)	9.00e-03	9.00e-03
Benzene	3.00e-04	ND	100%	ATSDR, 1993	3.00e-04	ND
Carbon Disulfide	1.00e-01	1.00e-01	100%	ATSDR, 1991e	1.00e-01	1.00e-01
Ethylbenzene	1.00e-01	ND	82%	ATSDR, 1989g	8.20e-02	ND
Trichloroethylene	6.00e-03	ND	100%	Prout et al., 1985	6.00e-03	ND
Vinyl Chloride	ND	ND	100%	Watanabe et al., 1976	ND	ND
SEMIVOLATILES						
2-Methylnaphthalene	ND	ND			ND	ND
2-Methylphenol	5.00e-02	5.00e-01	95%	(2)	4.75e-02	4.75e-01
4-Methylphenol	5.00e-03	5.00e-03	95%	(2)	4.75e-03	4.75e-03
Acenaphthene	6.00e-02	6.00e-01	91%	(3)	5.46e-02	5.46e-01
Benzo(a)Anthracene	ND	ND	91%	(3)	ND	ND
Benzo(a)Pyrene	ND	ND	91%	Hecht et al., 1979	ND	ND
Benzo(b)Fluoranthene	ND	ND	91%	(3)	ND	ND
Benzo(k)Fluoranthene	ND	ND	91%	(3)	ND	ND

Table R-11.6
Dermal Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

	Chronic Oral RfD (mg/kg-day)	Subchronic Oral RfD (mg/kg-day)	Oral Absorption Efficiency	Reference	Dermal Chronic RfD (mg/kg-day)	Dermal Subchronic RfD (mg/kg-day)
bis(2-Ethylhexyl)phthalate	2.00e-02	ND	100%	Chadwick et al., 1982	2.00e-02	ND
Carbazole	ND	ND	50%	(4)	ND	ND
Chrysene	ND	ND	91%	(3)	ND	ND
Dibenzofuran	ND	ND			ND	ND
Dibenz(a,h)Anthracene	ND	ND	91%	(3)	ND	ND
Fluoranthene	4.00e-02	4.00e-01	91%	(3)	3.64e-02	3.64e-01
Indeno(1,2,3-c,d)Pyrene	ND	ND	91%	(3)	ND	ND
Naphthalene	4.00e-02	ND	100%	Chang, 1943	4.00e-02	ND
Phenanthrene	ND	ND	91%	(3)	ND	ND
Phenol	6.00e-01	6.00e-01	95%	ATSDR, 1989e	5.70e-01	5.70e-01
Pyrene	3.00e-02	3.00e-01	91%	(3)	2.73e-02	2.73e-01
PESTICIDES/PCBs						
4,4'-DDD	ND	ND	20%	(5)	ND	ND
4,4'-DDE	ND	ND	20%	(5)	ND	ND
4,4'-DDT	5.00e-04	5.00e-04	20%	Siebert, 1976	1.00e-04	1.00e-04
alpha-Chlordane	6.00e-05	6.00e-05	80%	(6)	4.80e-05	4.80e-05
Aroclor-1248	2.00e-05	5.00e-05	90%	Albro & Fishbein, 1972	1.80e-05	4.50e-05
Aroclor-1254	2.00e-05	5.00e-05	90%	Albro & Fishbein, 1972	1.80e-05	4.50e-05

Table R-11.6
Dermal Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

	Chronic Oral RfD (mg/kg-day)	Subchronic Oral RfD (mg/kg-day)	Oral Absorption Efficiency	Reference	Dermal Chronic RfD (mg/kg-day)	Dermal Subchronic RfD (mg/kg-day)
Aroclor-1260	2.00e-05	5.00e-05	90%	Albro & Fishbein, 1972	1.80e-05	4.50e-05
gamma-Chlordane	6.00e-05	6.00e-05	80%	Ohno et al., 1986	4.80e-05	4.80e-05
Heptachlor	5.00e-04	5.00e-04	49%	ATSDR, 1991f	2.54e-04	2.54e-04
Heptachlor epoxide	1.30e-05	1.30e-05	49%	()	6.40e-06	6.40e-06
DIOXINS/FURANS						
2,3,7,8-TCDD	ND	ND			ND	ND
INORGANICS						
Aluminum	1.00e+00	ND	20%	(7)	2.00e-01	ND
Antimony	4.00e-04	4.00e-04	1%	ATSDR, 1991a	4.00e-06	4.00e-06
Arsenic	3.00e-04	3.00e-04	98%	Vahter, 1983	2.94e-04	2.94e-04
Barium	7.00e-02	7.00e-02	7%	ATSDR, 1991c	4.90e-03	4.90e-03
Beryllium	5.00e-03	5.00e-03	1%	Owen, 1990	5.00e-05	5.00e-05
Cadmium	1.00e-03	ND	1%	McLellan et al, 1978	1.00e-05	ND
Chromium	5.00e-03	2.00e-02	11%	Ogawa, 1976	5.50e-04	2.20e-03
Cobalt	6.00e-02	ND	30%	ATSDR, 1990b	1.80e-02	ND
Iron	3.00e-01	ND	2%	Goyer, 1991	6.00e-03	ND
Lead	ND	ND			ND	ND
Manganese	1.40e-01	1.40e-01	4%	ATSDR, 1991b	5.60e-03	5.60e-03

Table R-11.6
Dermal Dose-Response Data for Noncarcinogenic Effects

Remedial Investigation
NAS Jacksonville
Jacksonville, Florida

	Chronic Oral RfD (mg/kg-day)	Subchronic Oral RfD (mg/kg-day)	Oral Absorption Efficiency	Reference	Dermal Chronic RfD (mg/kg-day)	Dermal Subchronic RfD (mg/kg-day)
Mercury	3.00e-04	3.00e-04	20%	Nielsen, 1992	6.00e-05	6.00e-05
Nickel	2.00e-02	2.00e-02	5%	Christenson & Lagesson, 1981	1.00e-03	1.00e-03
Sodium	ND	ND			ND	ND
Thallium	8.00e-05	8.00e-04	100%	Lie et al., 1960	8.00e-05	8.00e-04
Vanadium	7.00e-03	7.00e-03	3%	ATSDR, 1991d	2.10e-04	2.10e-04

Notes:

ND = No Data
For documentation concerning chronic and subchronic oral RfDs, refer to Table 3.
(1) The oral absorption efficiency of 1,2-dichloroethylene is assumed to be identical to that of 1,1-dichloroethylene, based on structural analogy.
(2) The oral absorption efficiency of 2-methylphenol and 4-methylphenol is assumed to be identical to that of phenol, based on structural analogy.
(3) The oral absorption efficiency of all PAHs is assumed to be identical to that of benzo(a)pyrene, based on structural analogy.
(4) SVOCs lacking specific information on absorption efficiency are assigned a default value of 50% (USEPA Region IV, 1993).
(5) The oral absorption efficiency of DDE and DDD is assumed to be identical to that of DDT, based on structural analogy.
(6) The oral absorption efficiency of alpha-chlordane is assumed to be identical to that of gamma-chlordane, based on structural analogy.
(7) Inorganics lacking specific information on absorption efficiency are assigned a default value of 20% (USEPA Region IV, 1993)
(8) The oral absorption efficiency of heptachlor epoxide is assumed to be identical to that of heptachlor, based on structural analog.

APPENDIX R-12

HUMAN HEALTH TOXICITY PROFILES

1,1-Dichloroethene. 1,1-Dichloroethene is a man-made chlorinated solvent that is used to make polyvinylidene chloride copolymers, which are used as flexible films for packaging all types of materials, including food.

Data of 1,1-dichloroethene exposure in humans is limited. However, available evidence suggest that 1,1-dichloroethene causes central nervous system depression and liver toxicity in humans. Toxicity data on laboratory animals confirm this evidence, and also indicate that 1,1-dichloroethene may produce adverse effects on the kidney, heart, and lung. Pharmacokinetic data from laboratory animals suggest that 1,1-dichloroethene is metabolized to toxic metabolites, and that these metabolites are responsible for the adverse effects. Therefore, organs with high biotransformation enzyme activity, such as the liver, kidney, and lungs, are likely to be adversely impacted. Limited evidence in animals suggests that 1,1-dichloroethene may be carcinogenic. Therefore, the USEPA has place 1,1-dichloroethene in weight-of-evidence group C, possible human carcinogen.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Agency for Toxic Substances and Disease Registry (ATSDR), 1992. "Toxicological Profile for 1,1-Dichloroethene"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October 1992.

1,2-Dichloroethane. 1,2-dichloroethane is primarily used in the production of industrial solvents including vinyl chloride, vinylidene chloride, 1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene, and ethylene diamines. Acute exposure to 1,2-dichloroethane can cause CNS depression, nausea, vomiting, headache, lightheadedness, and disequilibrium. Long-term exposure to workers has been associated with loss of appetite, nausea, epigastric pain, neurologic changes, and liver and kidney damage. Liver effects have also been noted in animal studies. 1,2-Dichloroethane is carcinogenic to mice and rats causing hemangiosarcomas and stomach, mammary, spleen, and lung cancers. It has been classified as a Group B2, probable human carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1992. "Toxicological Profile for 1,2-Dichloroethane"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October, 1992.

1,2-Dichloroethene. 1,2-Dichloroethene is a volatile organic compound which exists as cis- and trans-isomers. The commercially used material is usually a mixture of the two isomers. In the past, it was used as a general inhalation anesthetic. It is currently used as an extraction solvent or as a component of dyes, perfume oils, waxes, resins, and plastics. It is also used as an intermediate in the synthesis of polymers.

1,2-Dichloroethene is absorbed by all routes of administration. Distribution is rapid and, due to its lipophilic nature, occurs to all organ systems. It is extensively metabolized to dichloroacetaldehyde and chloroacetic acids which are excreted primarily through urine.

Dermal contact to 1,2-dichloroethene may result in defatting of the skin and dermatitis. Exposure to airborne 1,2-dichloroethene causes irritation to eyes, mucous membranes and the upper respiratory tract. Systemically, the trans-isomer is believed to be more toxic than the cis-isomer. However, both have been reported to produce central nervous system depression and toxicity to liver and lungs. No data on the reproductive toxicity of 1,2-dichloroethene exists. Both isomers have tested negative for mutagenicity in vitro tests. Cancer effects have not been studied in humans or animals.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1990. "Toxicological Profile for 1,2-Dichloroethene"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, February 1990.

Mycroft, F.J., Jones, J.R., and Olson, K.R. 1990. Environmental and Occupational Toxicology. In: Poisoning and Drug Overdose. Ed. K.R. Olson. Appleton & Lange, CT. p. 397.

Acenaphthene. Acenaphthene is a member of the polycyclic aromatic hydrocarbons (PAH) class of organic compounds. Unlike a number of PAHs, which have no known use, acenaphthene has a use in the manufacture of plastics and as an insecticide and fungicide. Toxicological data are extremely limited for acenaphthene. However, as a two ring PAH, acenaphthene is a closer structural analog to naphthalene than it is to multi-ring PAHs such as benzo(a)pyrene, chrysene, or phenanthrene. Therefore, toxicities induced by acenaphthene may be similar to those induced by naphthalene. PAHs as a class of compounds are absorbed by inhalation, oral, and dermal routes, and have been associated with atherosclerosis, cancer, and reproductive effects in humans and animals. However, mutagenicity and cancer tests for acenaphthene were negative.

References:
ATSDR, 1989. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October, 1989.

International Agency for Research on Cancer, 1983. *Monograph on the evaluation of carcinogenic risk of chemicals to man: polynuclear aromatic hydrocarbons.* 32:33-43.

USEPA, 1981. An exposure and risk assessment for acenaphthene. U.S.EPA Contract No. 68-01-6017. Office of Water Regulations and Standards, Washington, D.C.

Aluminum. Aluminum occurs naturally in the soil and makes up approximately 8 percent of the earths crust. Higher soil concentrations are associated with industries which burn coal and aluminum mining and smelting. Human exposures to aluminum may occur through ingestion of foods grown in soil that contains aluminum and use of antacids, antiperspirants, and other drug store items. Aluminum in antiperspirants can cause skin rashes in some people. Factory workers who inhale large amounts of aluminum dust may develop lung problems. Aluminum has caused lower birth weights in some animals. Studies have shown that aluminum accumulates in the brains of people with Alzheimer's disease. However, any causal link between aluminum exposure and this disease is yet to be demonstrated. Both human

epidemiological studies and animal experiments strongly suggests that aluminum is not a carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1989. "Toxicological Profile for Aluminum"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October 1989.

Antimony. Antimony enters the environment during the mining and processing of its ores and other related compounds. Small amounts of antimony are also released into the environment by incinerators and coal burning power plants. Antimony will strongly adhere to soil which contains iron, manganese, or aluminum. Antimony was used for medicinal purposes to treat people infected with parasites. However, chronic exposure can cause eye, skin, and lung irritation, as well as heart problems, vomiting and diarrhea. The oral RfD, based on an oral drinking water study in rats, showed changes in glucose and cholesterol metabolism. Antimony has not been evaluated by the USEPA for evidence of human carcinogenic potential.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1991. "Toxicological Profile for Antimony"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, February 1991.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

Aroclors. Aroclors (polychlorinated biphenyls [PCBs]) are organic compounds composed of two chlorinated aromatic rings. The amount of chlorination of the rings determines the specific structure, or congener, of the aroclor and, subsequently, the specific chemical, physical, and toxicological properties. The excellent dielectric properties, thermal stability, and nonflamability of aroclors has made them ideal for use in electrical transformers and capacitors. Therefore, they have been used in these applications extensively in the past. Humans may be exposed to aroclors when an aroclor-containing electrical component burns or is dismantled. Although the production of aroclors in the U.S. was banned in 1977, aroclors do not readily breakdown, and they may still be present in older electrical equipment, and environmental media.

Following dermal exposure, aroclors have caused a skin rash called chloracne. Aroclors have also produced developmental defects in humans, which have mainly consisted of behavioral abnormalities. These effects have also been observed in animals. Epidemiological studies on occupationally-exposed humans do not conclusively link exposure to aroclors with an increased incidence of cancer. However, chronic oral exposure to aroclors has produced liver cancer in laboratory animals. The potency of the carcinogenic action of aroclors appears to increase as the chlorination of the aroclors increases. Although cancer in laboratory animals has only been conclusively demonstrated for aroclors with the highest percent chlorination (aroclors-1260 and 1254), the USEPA has classified all aroclor congeners as B2, probable human carcinogens.

References:

MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Arsenic. Arsenic has been used in pesticide formulations and has industrial uses in tanneries, as well as the glass and wine making industries. Toxicity depends on its chemical form. Arsenic is an irritant of the skin, mucous membranes, and gastrointestinal tract. Symptoms of acute toxicity include vomiting, diarrhea, convulsions, and a severe drop in blood pressure. Subchronic effects include hyperpigmentation, sensory-motor polyneuropathy, persistent headache, and lethargy. Chronic oral exposure has caused skin lesions, peripheral vascular disease, and peripheral neuropathy. The USEPA has classified arsenic in Group A, human carcinogen, based on increased incidence of lung cancer in occupational studies.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1992. "Toxicological Profile for Arsenic"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, February 1992.

Barium. Barium is used in paints, soap, paper, rubber, and in the manufacture of glass. Some compounds of barium have been used as insecticides. Acute exposure to barium through ingestion can cause gastroenteritis, muscular paralysis, as well as cardiovascular effects. Chronic inhalation of barium containing dust can cause a reversible, benign pneumoconiosis. There is no evidence for carcinogenicity for barium.

References:
Amdur, Mary O., John Doull, Curtis D. Klaassen, 1991. Toxicology: The Basic Science of Poisons, 4th edition; Pergamon Press, Inc. New York.

Benzene. Benzene is an organic solvent that is both naturally occurring and produced from petroleum. Benzene is used in the synthesis of many industrial chemicals and pharmaceuticals, for the extraction of fats and oils, in the manufacture of explosives, in is a major component of petroleum based fuels such as gasoline.

Benzene is readily absorbed orally, moderately absorbed by inhalation, and poorly absorbed dermally. Its toxic actions are primarily a result of its metabolites, which are largely produced in the liver, and to some extent, in the bone marrow. Acute exposure to benzene has produced central nervous system depression in humans and animals. Chronic exposures have produced adverse liver effects and hematological toxicity, including aplastic anemia and leukemia. Available evidence does not suggest that benzene is teratogenic in humans or animals. There is sufficient evidence of benzene-induced carcinogenicity in humans via inhalation exposure, placing it in USEPA weight-of-evidence group A, human carcinogen.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Benzo(a)anthracene. Benzo(a)anthracene is a member of the polycyclic aromatic hydrocarbons (PAH) class of compounds which contain two or more aromatic rings. PAHs are ubiquitous in nature and are also manmade. Benzo(a)anthracene occurs naturally in coal tar, crude oil, and is formed from incomplete combustion of organic material. It is also product of pyrolysis in tobacco smoke.

Benzo(a)anthracene has produced skin tumors in laboratory animals after dermal application. Benzo(a)anthracene produced mutations in bacteria and in mammalian cells, and transformed mammalian cells in culture. Although there are no human data that specifically link exposure to benzo(a)anthracene to human cancers, benzo(a)anthracene is a component of mixtures that have been associated with human cancer. As such, benzo(a)anthracene has been classified by USEPA as a B2, probable human carcinogen.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Benzo(a)pyrene. Benzo(a)pyrene is a member of the polycyclic aromatic hydrocarbons (PAH) class of compounds which contain two or more aromatic rings. They are ubiquitous in nature and are also man made. It occurs naturally in coal tar, crude oil, and is formed from incomplete combustion of organic material. Human data demonstrating a causal relationship linking benzo(a)pyrene to carcinogenicity are lacking. However, multiple animal studies in many species demonstrate benzo(a)pyrene to be carcinogenic following administration by a variety of routes. The mechanism through which benzo(a)pyrene elicits its carcinogenic potential is well understood. Benzo(a)pyrene has produced positive results in numerous genotoxicity assays. Benzo(a)pyrene has been classified by the EPA as a B2, probable human carcinogen.

References:
ATSDR, 1989. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October, 1989.

Clayton, George D. and Florence E. Clayton, editors, 1981. Patty's Industrial Hygiene and Toxicology, 3rd Revised Edition; John Wiley & Sons; New York.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

Benzo(b)fluoranthene. Benzo(b)fluoranthene is a member of the polycyclic aromatic hydrocarbons (PAH) class of compounds which contain two or more aromatic rings. PAHs are ubiquitous in nature and are also manmade. Benzo(b)fluoranthene occurs naturally in coal tar, crude oil, and is formed from incomplete combustion of organic material.

Although there are no human data that specifically link exposure to benzo(b)-fluoranthene to human cancers, benzo(b)fluoranthene is a component of mixtures that have been associated with human cancer. These include coal tar, soots, coke

oven emissions and cigarette smoke. Benzo(b)fluoranthene produced tumors in mice after lung implantation, intraperitoneal, or subcutaneous injection, and skin painting. Benzo(b)fluoranthene has produced positive results in several genotoxicity assays. It has been classified as a B2, probable human carcinogen, by the USEPA.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Benzo(k)fluoranthene. Benzo(k)fluoranthene is a member of the polycyclic aromatic hydrocarbons (PAH) class of compounds which contain two or more aromatic rings. PAHs are ubiquitous in nature and are also manmade. Benzo(k)fluoranthene occurs naturally in coal tar, crude oil, and is formed from incomplete combustion of organic material.

Although there are no human data that specifically link exposure to benzo(k)fluoranthene to human cancers, benzo(k)fluoranthene is a component of mixtures that have been associated with human cancer. These include coal tar, soots, coke oven emissions and cigarette smoke. Benzo(k)fluoranthene produced tumors after lung implantation in mice and when administered with a promoting agent in skin-painting studies. Benzo(k)fluoranthene is mutagenic in bacteria. Benzo(k)fluoranthene has been classified by USEPA as a B2, probable human carcinogen.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Beryllium. Beryllium is a trace element that is obtained by extraction from mineral ores. Most beryllium is contributed to the environment by the burning of fossil fuels which contain beryllium ore. Beryllium is generally incorporated into alloy metals that are used in jet engine parts and electrical components. Pure beryllium metal is used in parts for aircraft brakes, nuclear weapons, nuclear reactors, and precision instruments.

Available data on beryllium suggest that it is most toxic to the lung. Acute inhalation exposures to high concentrations of beryllium in the air can cause chemical pneumonitis, the symptoms of which include cough, shortness of breath, and fatigue. These symptoms can persist and even worsen after exposure to beryllium has been discontinued. Chronic inhalation exposures to low concentrations of beryllium can produce chronic beryllium disease, which results in inhibited breathing efficiency. Inhalation of beryllium has been shown to produce lung cancer in animals, and an increased incidence of lung cancer has been demonstrated in workers who are exposed to beryllium in the air. Therefore beryllium has been classified by the USEPA as a B2, probable human carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1991. "Toxicological Profile for Beryllium"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, February 1991.

Bis(2-ethylhexyl)phthalate (DEHP). DEHP is used industrially as a plasticizer for resins and is found in many plastic materials as it makes them more flexible. It is also used in manufacturing organic pump fluids in electrical capacitors. Acute exposure to DEHP has produced eye and mucous membrane irritation, nausea, and diarrhea. Chronic exposure of laboratory animals to DEHP indicate that the target organs are the liver, causing morphological and biochemical changes, as well as the testes, producing damage to the seminiferous tubules. DEHP has produced developmental and reproductive effects in laboratory animals including spina bifida and reduced fertility. DEHP has been shown to cause a dose-related increase in liver tumors in mice and rats. Thus, the USEPA has designated DEHP as a B2, probable human carcinogen.

References:
ATSDR, 1991. Toxicological Profile for Di(2-ethylhexyl)phthalate. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October, 1991.

Cadmium. Cadmium is commonly used in electroplating and galvanizing due to its non-corrosive properties. It is a local respiratory tract irritant following exposure to cadmium dust or fumes. Acute exposure to cadmium dust/fumes may produce an acute chemical pneumonitis. Acute, oral exposure to cadmium results in nausea, vomiting, salivation, abdominal pain, cramps, and diarrhea. Chronic exposure to cadmium results in osteomalacia and osteoporosis (Itai-Itai disease) secondary to renal damage. The USEPA has classified cadmium as a B1 carcinogen via inhalation based on epidemiological data from Japan and China.

References:
Amdur, Mary O., John Doull, Curtis D. Klaassen, 1991. Toxicology: The Basic Science of Poisons, 4th edition; Pergamon Press, Inc. New York.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

Carbon Disulfide. Carbon disulfide is used as a commercial fumigant and in the manufacture of soil disinfectants. It is also used as a polymerization inhibitor for vinyl chloride, and as a solvent for cleaning in the metal plating industry.

Epidemiological studies in occupationally-exposed workers suggest that carbon disulfide may produce minor neurological disfunction that does not appear to result in behavioral changes. Carbon disulfide administered orally and by inhalation produced reproductive toxicity, including increased fetal resorption rate and minor malformations, in laboratory animals. No data regarding the carcinogenicity of this chemical is available.

References:
Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

Carbazole. Carbazole is a dibenzopyrrole compound which is formed from the incomplete combustion of nitrogen-containing organic matter, such as tobacco in

cigarettes. Carbazole is also contained in crude oil and coal tars. Carbazole is used for making dyes, photographic plates, and in reagents.

Data on the adverse effects of carbazole exposure are limited. No data was available concerning human exposures. In animals, the oral LD_{50} has been reported as ranging from 500 to 5000 mg/kg, depending on the animal species tested. However, subcutaneous injections of 10 mg carbazole for one year did not produce any adverse effects in mice. In a carcinogenicity bioassay with mice, chronic oral administration of carbazole in the diet produced both hepatocellular carcinomas and forestomach papillomas in males and females. Limited *in vitro* genotoxicity data indicate that carbazole is not mutagenic, suggesting that a reactive metabolite is responsible for the carcinogenic effects. Based on the these data, carbazole has been ranked a group B2, probable human carcinogen.

References:
International Agency for Research on Cancer (1983) IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Polynuclear Aromatic Compounds, Part 1, Chemical, Environmental and Experimental Data. Volume 32 World Health Organization, France.

Chlorobenzene. Chlorobenzene is used industrially as a solvent and in the manufacture of other chemicals. It is an intermediate in the manufacture of dyestuffs and pesticides. Acute exposures have caused irritation of the eyes, nose, and skin, as well as CNS depression accompanied by drowsiness, numbness, nausea, and vomiting. Evidence from animal studies indicate that exposure via ingestion or inhalation can produce severe kidney and liver effects. The USEPA has classified chlorobenzene in Group D, inadequate evidence of carcinogenicity.

References:
Clayton, George D. and Florence E. Clayton, editors, 1981. Patty's Industrial Hygiene and Toxicology, 3rd Revised Edition; John Wiley & Sons; New York.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

alpha- and gamma-Chlordane. A mixture of the alpha and gamma isomers of chlordane constitute the technical-grade chemical, a chlorinated pesticide, which was extensively used in agriculture to control insects, and as a termite proofing agent, until its registry cancellation in 1988. Chlordane may persist in soils for up to 20 years, and readily bioaccumulates in the food chain. Humans may be exposed to chlordane through contact with soil, where it was intentionally applied for pest control reasons, and through consumption of contaminated agricultural products.

Chlordane is absorbed well through all routes, and is stored in body fat, where it may persist for long periods of time. Toxic effects from chlordane exposure result from its metabolites, which can bind to cellular macromolecules causing cellular disfunction, rather than the parent compound. Chlordane induces its own metabolism to toxic metabolites and, therefore, organs containing high metabolizing enzyme activities such as the liver, are at risk. Chlordane produces hepatotoxicity in animals and humans. Additionally, chlordane produces nervous system toxicity, which may include dizziness, nausea, muscle tremors, and

the induction of grand mal seizures. Additionally, chlordane is a developmental and reproductive toxicant in animals. Exposure to chlordane has not been positively associated with cancer in humans, and animal evidence is equivocal. However, animal data suggest that chlordane may act as a tumor promotor. For this reason, the USEPA has place chlordane in weight-of-evidence group B2, probable human carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1992. "Toxicological Profile for Chlordane"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October 1992.

Chromium. Chromium has been used in plating for corrosion resistance and decorative purposes, in the manufacture of alloys, and in printing, dying, and photography. The toxicity of chromium depends upon its valence state. Hexavalent chromium is more toxic via inhalation than trivalent chromium. The effects of inhalation exposure to hexavalent chromium include ulcers of the upper respiratory tract, nasal inflammation, perforation of the nasal septa and lung cancer. Most trivalent chromium compounds are inactive in short-term genotoxicity assays. Trivalent chromium compounds have not been found to be carcinogenic by any route of exposure. There is epidemiological evidence of an association between chromium and lung cancer. The USEPA has classified hexavalent chromium as an A, human carcinogen, by the inhalation route.

References:
Amdur, Mary O., John Doull, Curtis D. Klaassen, 1991. Toxicology: The Basic Science of Poisons, 4th edition; Pergamon Press, Inc. New York.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

Chrysene. Chrysene is one of the polycyclic aromatic hydrocarbons (PAH) compounds which are formed during the combustion of organic material. Although there are no human data that specifically link exposure to chrysene to human cancers, chrysene is a component of mixtures that have been associated with human cancer. These include coal tar, soots, coke oven emissions and cigarette smoke. Chrysene produced chromosomal abnormalities in hamsters and mouse germ cells after gavage exposure, positive responses in bacterial gene mutation assays and transformed mammalian cells exposed in culture. Due to its similarities with benzo(a)pyrene and other carcinogenic PAHs, chrysene has been classified as a B2, probable human carcinogen.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Cobalt. Cobalt is an essential metal as a component of Vitamin B_{12}. It is a relatively rare metal produced primarily as a by-product of other metals, chiefly copper. Cobalt has been used in the manufacture of cobalt salts, permanent magnets, tools, cars, electrical components, and aircraft; in alloys as dental

materials; in cutting materials, water-resistant materials, lacquers, varnishes, and paint driers; and in the production of inks, enamels, glazes, glass decolorizer, and catalysts.

Toxicity following excess therapeutic administration has been reported to include vomiting, diarrhea, increased blood pressure, slowed respirations, and tinnitus progressing to deafness. An epidemiological association between high endemic soil and water cobalt levels and goiter has been reported. Cardiomyopathy has been caused by excessive intake of cobalt in beer. Occupational exposure to airborne cobalt has produced irritation to the eyes and skin. Chronic exposure has resulted in human lung fibrosis in some cases. There is no evidence of carcinogenicity in humans or animals from any naturally occurring route of exposure.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1991. "Toxicological Profile for Cobalt"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, February 1991.

Friberg, L., Nordberg, G.F., Kessler, E. and Vouk, V.B. (eds), 1986. Handbook of the Toxicology of Metals. 2nd ed. Vol I, II.: Amsterdam: Elsevier Science Publishers B.V., p. V2 221.

Goyer, R.A., 1991. Toxic Effects of Metals. In: Casarett and Doull's Toxicology: The Basic Science of Poisons, 3rd edition. Eds. C.D. Klaassen, M.O. Amdur and J. Doull. Macmillan Publishing Co. N.Y.

<u>DDD, DDE, DDT</u>. DDT was one of the most highly used insecticides, and is now ubiquitous in the environment. It was used extensively in World War II to control lice (applied directly to human skin), and later used as an agricultural insecticide and as a public health tool to control insects which spread typhus and malaria. DDD and DDE were contained as impurities in DDT, and are also primary metabolites of DDT, and share similar toxicological properties. DDT, DDD, and DDE are highly persistent in the environment, and thus tend to bioconcentrate in the food chain. This, combined with its toxicological properties, has been attributed to the decline in population of several predatory bird species.

DDT is absorbed to a minor extent via inhalation and dermal routes, and to a large extent by the oral route. Exposure to humans is likely greatest through ingestion of mucous that was contaminated with DDT that had been inhaled. DDT is absorbed into the lymphatic system and distributed to fats throughout the body. In both humans and animals, DDT acts as a CNS stimulant by interfering with the movement of ions within neurons. DDT acts as an estrogenic compound in animals, and this has been attributed to numerous adverse reproductive effects observed in animals exposed to DDT. DDT also causes liver hypertrophy, hepatocyte degeneration, and induces the enzyme cytochrome P450, which can effect the metabolism of other xenobiotics. There is no conclusive evidence of DDT-induced carcinogenicity in humans. However, DDT has produced liver tumors in laboratory animals. DDD, DDE, and DDT have, therefore, been placed in USEPA's weight of evidence group B2, probable human carcinogen.

References:

Agency for Toxic Substances and Disease Registry (ATSDR), 1992. "Toxicological Profile for DDD, DDE, and DDT"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October 1992.

Dibenzo(a,h)anthracene. Dibenzo(a,h)anthracene is one of the polycyclic aromatic hydrocarbons (PAH) compounds which are formed during the combustion of organic material. This compound is found in tobacco smoke, food, and industrial emissions. Although there are no human data that specifically link exposure to dibenzo(a,h)anthracene to human cancers, dibenzo(a,h)anthracene is a component of mixtures that have been associated with human cancer. These include coal tar, soots, coke oven emissions and cigarette smoke. Dibenzo(a,h)anthracene is metabolized similarly to benzo(a)pyrene, and has produced skin tumors in laboratory animals following dermal exposure. Dibenzo(a,h)anthracene has also been shown to be mutagenic, producing DNA damage in human cell cultures. Due to its similarities with benzo(a)pyrene and other carcinogenic PAHs, dibenzo(a,h)-anthracene has been classified as a B2, probable human carcinogen.

MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Dibenzofuran. Dibenzofuran is an unsubstituted organic compound that contains two benzene rings fused to a central furan ring. Dibenzofuran is a manmade chemical which may be introduced into the environment as a contaminant of commonly used pesticides (e.g., 2,4,5-T). Extensive toxicological information exists on the chlorinated species of dibenzofuran (chlorodibenzofurans), but minimal information is available concerning the unsubstituted parent molecule. Dibenzofuran, with no chlorine substituents, is believed to have minimal toxicity compared to the chlorinated forms due to its lack of solubility and biological activity. A toxicity equivalency factor for dibenzofuran has been set by USEPA equal to zero, relative to the chlorinated isomers. Dibenzofuran is not mutagenic, with or without metabolic activation, in several in vitro mutagenicity tests. There are no data on the possible carcinogenicity of dibenzofuran alone in animals or humans.

References:

Agency for Toxic Substances and Disease Registry (ATSDR), 1993. "Toxicological Profile for Chlorodibenzofurans"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, February 1993.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

Dioxins/Furans. Chlorinated dioxins and furans are organic chemicals that comprise a group of approximately 210 mono- and polychlorinated congeners. Dioxins are produced as a byproduct in the manufacture of certain chlorinated herbicides, such as 2,4,5-trichlorophenoxy acids, and by the incineration of municipal wastes. Of the dioxin congeners known to exist, 2,3,7,8-tetrachlorodi-benzo-p-dioxin (2,3,7,8-TCDD) is generally believed to be the most toxic dioxin congener. Most research on dioxin compounds has focussed on this congener; little data concerning the potential adverse effects of other dioxin compounds are available. As a result, risk assessments for all dioxin congeners are based on

toxicological data for 2,3,7,8-TCDD. To compensate for the differences in toxicity, risk estimates for "non-2,3,7,8" congeners are adjusted with toxicity equivalency factors (TEFs).

2,3,7,8-TCDD has been positively correlated with only one effect, chloracne, in humans. Chloracne is a treatable skin disorder that can also result from exposure to other chemicals and chemical mixtures. Experiments with laboratory animals indicate that 2,3,7,8-TCDD is associated primarily with four types of effects: chloracne, hepatotoxicity, immunotoxicity, and the wasting syndrome, in which animals exposed to 2,3,7,8-TCDD spontaneously loose weight. Reproductive toxicity has been observed in monkeys exposed to low levels of 2,3,7,8-TCDD. The dose-response relationships of these effects varies substantially among laboratory animal species. Although many of these effects have either not been observed in humans or have not been positively correlated with dioxin exposure, the available animal evidence suggests that adverse effects in addition to chloracne could occur in humans. Available human epidemiology data are not conclusive enough to prove or disprove the association of exposures to dioxins with carcinogenicity. 2,3,7,8-TCDD has been shown to be carcinogenic to some laboratory animal species. Based on this evidence, 2,3,7,8-TCDD has been classified as a B2, possible human carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1987. "Toxicological Profile for 2,3,7,8-Tetrachlorodibenzo-p-dioxin"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, December, 1987.

Ethylbenzene. Ethylbenzene is a naturally occurring and synthetically produced volatile hydrocarbon which is used in the manufacture of styrene and other plastics, and in gasoline, which contains approximately 2% ethylbenzene.

Ethylbenzene is readily absorbed through inhalation, oral, and dermal routes, and is distributed throughout the body. Exposures to ethylbenzene have been associated with central nervous system depression in humans, and liver, kidney, and hematopoietic system toxicity in laboratory animals. No evidence of carcinogenicity has been reported in human epidemiological studies, and animal evidence is equivocal.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Heptachlor and Heptachlor epoxide. Heptachlor is an insecticide that was used extensively between 1953 and 1974 as a soil and seed treatment to control ants, worms and other agricultural pests, and as a residential termite-proofing agent. Heptachlor is highly persistent in the environment and can biomagnify through the food chain. Therefore, humans may be exposed to heptachlor by ingesting agricultural products that were exposed to soil that was once treated with heptachlor, or by drinking water or ingesting fish that are contaminated with heptachlor that leached from soil.

In humans and animals, heptachlor is rapidly metabolized to heptachlor epoxide, which is a more toxic and more persistent compound. Exposure to heptachlor has been associated with nervous system excitation, including irritability, salivation, muscle tremors, and convulsions in humans and animals. Heptachlor produces moderate to severe liver toxicity and liver cancer in laboratory animals. Available evidence suggests that heptachlor is a tumor promotor. However, epidemiological studies on humans are insufficient to determine if heptachlor is a human carcinogen. Therefore, the USEPA has placed heptachlor into weight-of-evidence group B2 probable human carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1991. "Toxicological Profile for Heptachlor/Heptachlor epoxide"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October 1991.

Indeno(1,2,3-cd)pyrene. Indeno(1,2,3-c,d)pyrene is one of the polycyclic aromatic hydrocarbons (PAH) compounds which are formed during the combustion of organic material and is a component of cigarette smoke and smoke stack emissions. No carcinogenicity data specifically for indeno(1,2,3-c,d)pyrene are available in humans, however, toxic effects are attributable to mixtures of PAHs. Animal studies indicate that indeno(1,2,3-c,d)pyrene can induce skin tumors in mice, and may have some immunosuppressive effects. In mammalian cell cultures, indeno-(1,2,3-c,d)pyrene was found to be genotoxic. It has been classified by the USEPA as a B2 carcinogen.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Iron. Iron is a metal which is required for a variety of physiological functions such as heme biosynthesis, oxidative phosphorylation and mixed-function oxidase-mediated metabolic reactions. Only divalent forms of iron are absorbed. As absorption occurs, divalent iron is biochemically converted to trivalent iron, the biologically active form. Under normal conditions, absorbed dietary iron is complexed to hemoglobin and transported to the liver for storage until needed for physiological reactions. The balance of iron is regulated only by the amount of dietary intake and the degree of intestinal absorption. Intestinal absorption tends to be low (2 - 15%) except during periods of increased iron need when absorption efficiency increases dramatically.

Acute iron toxicity has been well characterized following the accidental ingestion of iron-containing preparations by children. Shortly after ingestion, the corrosive effects of iron cause vomiting and diarrhea, often bloody. Later signs include shock, metabolic acidosis, seizures, liver and/or kidney failure, coma, and death. Chronic iron overload manifests as disturbances in liver function, diabetes mellitus, and endocrine and cardiovascular effects. Inhalation of iron containing dust or fumes in occupational settings may result in deposition of iron particles in the lungs leading to interstitial fibrosis. Autopsies of hematite miners noted an increase in lung cancer. However, the etiology of the lung cancer may be related to factors other than iron exposure such as cigarette, silica or PAH exposures.

References:
Aisen, P., Cohen, G. and Kang, J.O., 1990. Iron Toxicosis. Int. Rev. Exp. Pathol. 31:1-46.

Goyer, R.A., 1991. Toxic Effects of Metals. In: Casarett and Doull's Toxicology: The Basic Science of Poisons, 3rd edition. Eds. C.D. Klaassen, M.O. Amdur and J. Doull. Macmillan Publishing Co. N.Y.

Lead. Lead is used as a component in storage batteries and was widely used in gasoline and paints. It is the most ubiquitous toxic metal in the environment. The most serious effects of chronic exposure are encephalopathy, renal damage, and changes in the hematopoietic system which is the most sensitive indicator of lead exposure. Peripheral nerve dysfunction is observed in adults at blood lead levels of 30 to 50 μg/dL-blood. The nervous systems' of children are reported to be affected at levels of 15 μg/dL-blood (Benignus and others, 1981). Chronic lead exposure by workers through inhalation has resulted in statistically significant increases in tumors. Oral exposures of lead salts in animals has been shown to increase tumor formation.

References:
Amdur, Mary O., John Doull, Curtis D. Klaassen, 1991. Toxicology: The Basic Science of Poisons, 4th edition; Pergamon Press, Inc. New York.

Benignus, V.A., Otto, D.A., Muller, K.E., Seiple, K.J., 1981. "Effects of Age and Body Lead Burden on CNS Function in Young Children. II:EEG Spectra." Electroencephalograph. Clin. Neurophysiol. 52:240-248.

Manganese. Manganese is a naturally occurring substance found in many types of rock. It does not generally occur in the environment as the pure metal, rather, it is found combined with other chemicals such as sulfur, oxygen, and chlorine. Manganese is mixed with iron to make various types of steel. Manganese is a component of some ceramics, pesticides, fertilizers, and in nutritional supplements. In small doses manganese is beneficial to human health. Manganese miners and steel workers exposed to elevated concentrations of manganese have evidenced mental and emotional disturbances, and slow and clumsy body movements. Target organs of manganese are the lung and CNS. When inhaled, manganese dust can also cause lung irritation. EPA has classified manganese as a D, not classifiable as to human carcinogenicity.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1991. "Toxicological Profile for Manganese"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, February 1991.

Mercury. Mercury has been used in the past for medicinal purposes, however, occupational exposure to mercury can occur during mining, smelting, chloralkali production, and in the manufacturing of mercury containing products. There are three forms in which mercury can exist: elemental, inorganic, and organic. Its chemical form determines its toxicity. Metallic mercury causes behavioral effects and other nervous system damage. Inorganic mercury salts will produce kidney damage. Organic mercury compounds target the CNS. Most organic mercury compounds

that contaminate the environment produce a toxic neuroencephalopathy (paresthesias, ataxia, spasticity, tremor, mental status changes, learning defects and neurasthenic symptoms). Some organic mercury compounds readily break down in the body to inorganic compounds and thus produce toxicity similar to that produced by organic mercury compounds. Some studies have indicated that mercury is genotoxic. It has not been classified as to carcinogenicity by the USEPA.

References:
Amdur, Mary O., John Doull, Curtis D. Klaassen, 1991. Toxicology: The Basic Science of Poisons, 4th edition; Pergamon Press, Inc. New York.

Methylene Chloride. Methylene chloride, (also known as dichloromethane) is used as a solvent, paint stripper, and is component of pesticides and other aerosol products. Acute exposure to methylene chloride can cause nose, eyes, and throat irritation via inhalation. Chronic exposure to methylene chloride can cause CNS effects include irritability, nausea, and headaches. The primary targets of this chemical are the liver and the CNS. A USEPA assessment of one study concluded that methylene chloride ingested in drinking water by mice was associated with significant increases in liver carcinoma. It has classified it as a B2, probable human carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1989. "Toxicological Profile for Methylene Chloride"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, 1989.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

2-Methylnaphthalene. 2-Methylnaphthalene is a member of the polycyclic aromatic hydrocarbons (PAH) class of organic compounds, and is used in the synthesis of chemicals such as insecticides. Toxicological data on 2-methylnaphthalene is extremely limited. However, based on its structural similarity to naphthalene, it is likely to be metabolized through a similar process, and therefore is expected to exert effects similar to those induced by naphthalene. Humans can absorb naphthalene via the inhalation, oral, and dermal routes. Evidence from human and animal studies suggests that naphthalene is metabolized by the P450 mixed function oxidase system to form metabolites that exert toxic effects. The primary target organ for naphthalene metabolites in humans is the red blood cell. Various types and severities of anemias resulting from erythrocyte hemolysis have been documented in humans and animals exposed to naphthalene. Some evidence also suggests that naphthalene metabolites can induce cataracts in humans and animals. No studies were located investigating genotoxicity or cancer in humans.

References:
ATSDR, 1989. Toxicological Profile for Naphthalene and 2-Methylnaphthalene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October, 1989.

2- and 4-Methylphenol. 2- Methylphenol and 4-methylphenol, also called o-cresol and p-cresol, are both naturally occurring and synthetically produced organic

chemicals containing a single aromatic ring. M-cresol is another isomer of 2- and 4-methylphenol. 2- and 4-Methylphenol are often found together in mixtures, such as in disinfectants. Specific uses of 2-methylphenol include resins and pharmaceuticals. 4-Methylphenol is used in industry in the manufacture of antioxidants and in the manufacture of perfumes and dyes. 4-Methylphenol is also used in synthetic food flavors.

2- and 4-Methylphenol exhibit similar toxicities. They are highly irritating to the skin when contacted dermally, the lungs when inhaled, and the gastrointestinal tract when ingested, and can be readily absorbed by all three exposure routes. Neurological effects, including lethargy, incoordination, tremors, convulsions, and coma have been observed in humans that have been exposed to high concentrations of cresols. These effects have also been observed in laboratory animals, and can also result from long-term low-level exposure to cresols. There is no evidence of reproductive, developmental, or carcinogenic effects in humans or animals following exposure to cresols.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1990. "Toxicological Profile for Cresols"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October, 1990.

Naphthalene. Naphthalene is a member of the polycyclic aromatic hydrocarbons (PAH) class of compounds which contain two or more aromatic rings. PAHs are ubiquitous in nature and are also manmade. Naphthalene occurs naturally in coal tar, crude oil, and is formed from incomplete combustion of organic material. It is also product of pyrolysis in tobacco smoke. Naphthalene is used for the production of phthalic anhydride, which is used for the production of plasticizers. Naphthalene is also used in moth balls, for the production of the insecticide carbaryl, and in numerous resins, dyes, pharmaceuticals, and other organic materials.

Naphthalene is absorbed through the inhalation, oral, and dermal routes, and appears to be more toxic to humans than laboratory animals. The principal toxic effect of naphthalene in humans and animals is hemolysis of red blood cells, which can lead to anemia, decreased oxygen carrying capacity, and jaundice. Humans predisposed to anemia, such as those with G6DP enzyme deficiency, may be particularly sensitive to naphthalene toxicity. Exposure to naphthalene has also been correlated with increased risk of cataract formation. Animal studies were negative for naphthalene reproductive toxicity. Although no human epidemiological data are available for assessing naphthalene carcinogenicity, animal data investigating naphthalene toxicity are equivocal. The USEPA has placed naphthalene in weight-of-evidence Group D, not classifiable as to human carcinogenicity.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1990. "Toxicological Profile for Naphthalene"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October, 1990.

Nickel. Nickel is a natural element of the earth's crust. Toxic effects of nickel occur mainly through the inhalation route. Nickel is emitted into the air

through fossil fuel combustion, incinerators, metallurgy, chemical manufacturing, cement manufacturing, and nickel recovery. Nickel exposure can cause dermatitis and eczema-like lesions at high exposure levels likely to occur only in the work place. The major adverse effects seen in man are dermatitis, chemical pneumonitis, and lung and nasal cancers. Rats fed nickel in their diets showed on adverse effects in three generations infertility, gestation, viability, or lactation. Occupational studies indicate that nickel is a carcinogen via inhalation but there is no evidence that it is a carcinogen in mammals through ingestion or dermal exposure (USEPA, 1985).

References:
United States Environmental Protection Agency (USEPA), 1985. "Health Effect Assessment Document for Nickel." Office of Research and Development. Office of Emergency and Remedial Response.

Phenanthrene. Phenanthrene is a member of the polycyclic aromatic hydrocarbons (PAH) class of compounds which contain two or more aromatic rings. PAHs are ubiquitous in nature and are also man made. Phenanthrene occurs naturally in coal tar, crude oil, and is formed from incomplete combustion of organic material.

Phenanthrene has been shown to be a skin photosensitizer in humans. Intraperitoneally injection in rats produced liver effects. Although limited evidence exists that phenanthrene is a mutagen, the majority of tests have proved negative. Equivocal evidence exists for cancer after dermal application of phenanthrene in rats. Ingestion of 200 mg of phenanthrene produced no tumors in rats after two months.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Phenol. Phenol is a man-made aromatic chemical that is used extensively in the production of numerous products, including a wide variety of aromatic compounds, explosives, fertilizers, paints, rubber, plastic, and textiles.

Phenol is readily absorbed through ingestion, dermal, and inhalation exposures, and is rapidly distributed to tissues. Exposure to phenol can produce adverse effects on the central nervous system, including loss of consciousness and acute respiratory failure. Phenol can also cause severe burning of the mouth and throat if swallowed. Current genotoxicity and cancer studies on phenol are inadequate or inconclusive to allow a determination of the potential carcinogenicity of this chemical at this time.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Sodium. Sodium is an ubiquitous constituent of natural waters. Human activities also contribute sodium ions to natural waters. Sodium has been used in the

manufacture of other sodium compounds, tetraethyl lead, in organic synthesis, in alloys, and as a chemical intermediate. Sodium is a naturally occurring element and an essential nutrient to humans.

Sodium is toxic only at very high concentrations. Chronic ingestion of elevated sodium levels may result in or aggravate hypertension in humans. Hypertension has also been demonstrated in animals chronically exposed to sodium in their diets. Sodium can be an eye irritant. There is no evidence for carcinogenicity by sodium.

References:
National Academy of Sciences, 1977. "Drinking Water and Health"; Safe Drinking Water Committee, Washington, D.C.

Radionuclides. Radionuclides are substances which release radiation energy. Radioactive atoms from radionuclides undergo spontaneous nuclear transformations and release excess energy in the form of ionizing radiation. Radiation emitted by radioactive substances can transfer sufficient localized energy to atoms to remove electrons from the electric field of their nucleus (ionization). In living tissue, this energy transfer can destroy cellular constituents and produce electrically charged molecules (i.e., free radicals). Extensive biological damage can lead to adverse health effects. The type of ionizing radiation emitted by a particular radionuclide depends upon the exact nature of the nuclear transformation, and may include emission of alpha particles, electrons (beta particles or positions), and neutrons; each of these transformations may be accompanied by emission of photons (gamma radiation or x-rays). Each type of radiation differs in its physical characteristics, and in its ability to inflict damage to biological tissue.

References:
USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part A); EPA/540/1-89/002; December 1989.

Alpha particles. Alpha particles are doubly charged cations, composed of two protons and two neutrons, which are ejected monoenergetically from the nucleus of an atom when the neutron to proton ration is too low. Because of their relatively large mass and charge, alpha particles tend to ionize nearby atoms quite readily, expending their energy in short distances. Alpha particles will usually not penetrate an ordinary sheet of paper or the outer layer of skin. Consequently, alpha particles represent a significant hazard only when taken into the body, where their energy is completely absorbed by small volumes of tissues in contact with the alpha-emitting radionuclide.

References:
USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part A); EPA/540/1-89/002; December 1989.

Beta particles. Beta particles are electrons ejected at high speeds from the nucleus of an unstable atom when a neutron spontaneously converts to a proton and an electron. Unlike alpha particles, beta particles are not emitted with discrete energies but are ejected from the nucleus over a continuous energy spectrum. Beta particles are smaller than alpha particles, carry a single negative charge, and possess a lower specific ionization

potential. Unshielded beta sources can constitute external hazards if the beta radiation is within a few centimeters of exposed skin surfaces and if the beta energy is greater than 70 keV. Beta sources shielded with certain metallic materials may produce bremstrahlung (low energy x-ray) radiation which may also contribute to the external radiation exposure. Internally, beta particles have a much greater range than alpha particles in tissue. However, because they cause fewer ionizations per unit path length, beta particles deposit much less energy to small volumes of tissue and, consequently, inflict much less damage than alpha particles.

References:
USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part A); EPA/540/1-89/002; December 1989.

Positrons. Positrons are identical to beta particles except that they have a positive charge. A positron is emitted from the nucleus of a neutron-deficient atom when a proton spontaneously transforms into a neutron. Alternatively, in cases where positron emission is not energetically possible, the neutron deficiency may be overcome by electron capture, whereby one of the orbital electrons is captured by the nucleus and united with a proton to form a neutron, or by annihilation radiation, whereby the combined mass of a positron and electron is converted into photon energy. The damage inflicted by positrons to small volumes of tissue is similar to that of beta particles.

References:
USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part A); EPA/540/1-89/002; December 1989.

Gamma radiations. Gamma radiations are photons emitted from the nucleus of a radioactive atom. X-rays, which are extra-nuclear in origin, are identical in form to gamma rays, but have slightly lower energy ranges. There are three main ways in which x- and gamma rays interact with matter: the photoelectric effect, the Compton effect, and pair production. All three processes yield electrons which then ionize or excite other atoms of the substance. Because of their high penetration ability, x- and gamma radiations are of most concern as external hazards

References:
USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part A); EPA/540/1-89/002; December 1989.

Neutrons. Neutrons are emitted during nuclear fission reactions, along with two smaller nuclei, called fission fragments, and beta and gamma radiation. For radionuclides likely to be encountered at Superfund sites, the rate of spontaneous fission is minute and no significant neutron radiation is expected.

The adverse biological reactions associated with ionizing radiation, and hence with radioactive materials, are carcinogenicity, mutagenicity, and teratogenicity. The degree of biological damage caused by various types of radiation varies according to how close together the ionizations occur. Some ionizing radiations (e.g. , alpha particles) produce intense regions of ionization. For this reason, they are called high-LET (linear energy

transfer) particles. Other types of radiation (such as high energy photons--x-rays) that release electrons that cause ionization and beta particles are called low-LET radiations because of the sparse pattern of ionization that they produce. In equal doses, the carcinogenicity and mutagenicity of high-LET radiations are generally an order of magnitude or more for low-LET radiations.

References:
USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part A); EPA/540/1-89/002; December 1989.

Actinium. Little data are available for actinium. However, since actinium is in the same radionuclide group as uranium and thorium (actinides), it likely behaves in similar ways.

References:
Whicker, F. Ward, Ph.D. and Schultz, Vincent, Ph.D., Radioecology Nuclear Energy and the Environment, Volume I and II, 1982, CRC Press Inc., Boca Raton, Florida

Bismuth. Radioactive bismuth is found as a short-lived decay product in the decay chains of several principle radionuclide decay chains. As a result, bismuth isotopes decay with relatively high alpha and gamma emissions.

References:
Shleien, Bernard, The Health Physics and Radiological Health Handbook, 1992, Scinta, Inc. Sliver Spring, Maryland

Cesium. Cesium-137 is a primary component of fission products and, therefore, is found in nuclear fuel wastes and radioactive emissions from nuclear weapons detonations. Cesium radioisotopes are ubiquitous in the environment, and constitute a large portion of the natural background radiation level that humans are exposed to. Cesium behaves like potassium in the body. The uptake and distribution of cesium in the body appears to be controlled by potassium regulation. As a result, cesium possesses the tendency to bioaccumulate in the food chain.

References:
Whicker, F. Ward, Ph.D. and Schultz, Vincent, Ph.D., Radioecology Nuclear Energy and the Environment, Volume I and II, 1982, CRC Press Inc., Boca Raton, Florida

Lead. Lead isotopes are naturally occurring decay products of other radionuclides. Several lead isotopes are ultimate decay products. The most substantial decay of lead isotopes is by alpha and beta emissions, although some gamma radiation is also emitted. In general, the alpha radiation is of most biological concern. Like the other members of the uranium decay series, lead can replace calcium in the biological systems and can accumulate in bone.

References:

National Council on Radiation Protection and Measurements, Exposure from the Uranium Series with Emphasis on Radon and its Daughters, NCRP Report No. 77, 1984, Bethesda, Maryland

Potassium. Potassium-40 is a naturally occurring radionuclide that does not have any industrial applications. Potassium radioisotopes behave very similarly to stable potassium in the body. As a result, radioactive potassium is widely distributed in the body. The principal mode of potassium decay is by alpha and beta emission.

References:
Whicker, F. Ward, Ph.D. and Schultz, Vincent, Ph.D., Radioecology Nuclear Energy and the Environment, Volume I and II, 1982, CRC Press Inc., Boca Raton, Florida

Radium. Radium was used in radioluminescent paints, products and is used in medical administration, and fertilizer. The majority of the exposure was due to dial painting and medical administration. Radium is naturally occurring. Ra-226 and its daughter products are responsible for a major fraction of the radiation dose received by humans from the naturally occurring internal emitters. Radon-222 causes the most exposure to radiation. Radium is present in soil, rocks, and water.

Each isotope of radium gives rise to a series of radioactive daughter products that leads to a stable isotope of lead. In addition to the primary radiation (alpha, beta, or both) most isotopes emit other radiation such as x-rays, gamma rays, internal conversion electrons, and Auger electrons. In the analysis of radiation-effects data, the alpha particles emitted are considered to be the root cause of damage.

Following entry into the circulatory system from the gut or lungs, radium "is quickly distributed to body tissues and a rapid decrease in its content in blood occurs. It is eliminated from the body in urine and feces while tissue retention decreases. The loss is more rapid from soft than hard tissues, so there is a gradual shift in the distribution of body radium toward hard tissues, and ultimately, bone becomes the principal repository for radium in the body. Radium deposited in bone irradiates the cells of that tissue, eventually causing sarcomas in a large fraction of subjects exposed to high doses. Cancer of the paranasal sinuses and mastoid air cells has been associated with Ra-226,228 exposure since the late 1930s.

References:
Committee on the Biological Effects of Ionizing Radiation, Board on Radiation Effects Research Commission on Life Sciences, and National Research Council, Health Effects of Exposure to Low Levels of Ionizing Radiation, BEIR V, 1990, National Academy Press, Washington, D.C.

Thallium. Radioactive thallium is found as a short-lived decay product in the thorium decay series. Because it exists for only short periods (e.g., less than one hour) little data are available on the potential adverse effects of thallium exposure. However, as a result of its rapid decay, radioactive thallium emits high levels of alpha and gamma radiation.

References:

Shleien, Bernard, The Health Physics and Radiological Health Handbook, 1992, Scinta, Inc. Sliver Spring, Maryland

Thorium. Thorium is or was used in building materials, fertilizer, ceramics, glass, gas mantles, thoriated tungsten and welding rods. Thorium is naturally occurring. The most abundant thorium isotope is Th-232, which is the parent of the thorium series. Th-232 has a long half-life, but its decay products have short half-lives. Mobility of thorium in biological systems is extremely low.

Little data are available concerning the potential effects of thorium exposure. Like uranium, Thorium isotopes are alpha emitters and tend to be taken up by bone.

References:

National Council on Radiation Protection and Measurements, Exposure from the Uranium Series with Emphasis on Radon and its Daughters, NCRP Report No. 77, 1984, Bethesda, Maryland

Uranium. Uranium is used in the production and reprocessing of nuclear fuels, power reactors, nuclear weapons production, building materials, fertilizer, and in ceramics and glass. Uranium is naturally occurring in the earth's crust. Natural uranium by weight is made up of the following radioisotopes and their percentages: U-238, 99.28%; U-235, 0.72%; U-234, 0.0058%, and U-230 which has a short half-life. Uranium-238 is the parent of the uranium series. U-234 is a daughter product of U-238 and the two are usually in equilibrium with one another. U-235 is the parent isotope of the actinium series. The principal mode of decay for uranium isotopes is by alpha emitters.

The dietary uptake of uranium from food is the principal source of natural uranium in the general population. In the industrial environment, the respiratory tract is the most important route of entry. Soluble salts of uranium can be absorbed through the skin, but there are no data on the rate of such absorption in humans. Soluble uranium that is ingested is regarded as a chemical toxin affecting the kidney.

Uranium, like radium, behaves chemically like calcium due to its relatively long half-life, making the skeletal system the likely target organ for enriched uranium. Natural uranium targets the kidney. Uranium can induce bone sarcomas, but the likelihood is very small because of the low specific activity of natural uranium.

Uranium presents two separate potential risks due to its nephrotoxic action and as a result of alpha radiation. At present there is little convincing epidemiological evidence that serious renal disease or increased rates of malignant tumors has occurred in the human population as a result of chronic low-level exposure. However, this does not constitute reliable evidence of the absence of important health effects in occupationally exposed groups since the available epidemiological studies had limited power to detect increased rates of disease if these were present. It is for this reason that much weight has been given to inferences drawn from the results of animal studies and from tumor rates in human populations exposed to other alpha-emitting elements.

References:
National Council on Radiation Protection and Measurements, Radiological Assessment: Predicting the Transport, Bioaccumulation, and Uptake by Man of Radionuclides Released to the Environment, NCRP Report No. 76, 1984, Bethesda, Maryland

- National Council on Radiation Protection and Measurements, Exposure from the Uranium Series with Emphasis on Radon and its Daughters, NCRP Report No. 77, 1984, Bethesda, Maryland

Committee on the Biological Effects of Ionizing Radiation, Board on Radiation Effects Research Commission on Life Sciences, and National Research Council, Health Effects of Exposure to Low Levels of Ionizing Radiation, BEIR V, 1990, National Academy Press, Washington, D.C.

Thallium. Thallium is a naturally occurring soft metal that is a minor constituent in a variety of ores and is obtained as a by-product of the refining of iron, cadmium, and zinc. It is used as a catalyst, in certain alloys, jewelry, thermometers, semiconductors, dyes and pigments, and optical lenses. It has been used medically as a depilatory agent. Additionally, it is used as a rodenticide and insecticide.
Thallium is efficiently absorbed from the gastrointestinal tract. Excretion occurs primarily through urine and feces. Following absorption, distribution occurs to kidney tissue to a large extent, with lesser distribution to thyroid, intestines, testes, pancreas, skin, bone, and spleen.

Thallium is one of the more toxic metals. Acute toxicity results in gastrointestinal irritation, shock, ascending paralysis, seizures, and psychic disturbances. Signs of subacute or chronic thallium poisoning include hair loss, nail dystrophy, cataracts, peripheral muscular weakness and atrophy, chorea, peripheral neuropathy, and kidney damage. Loss of vision have been related to industrial thallium exposures. No information is available which addresses the carcinogenic potential of thallium.

References:
Goyer, R.A., 1991. Toxic Effects of Metals. In: Casarett and Doull's Toxicology: The Basic Science of Poisons, 3rd edition. Eds. C.D. Klaassen, M.O. Amdur and J. Doull. Macmillan Publishing Co. N.Y.

Tweig, M., 1990. Thallium. In: Poisoning and Drug Overdose. Ed. K.R. Olson. Appleton & Lange, CT. pps. 276-7.

Tetrachloroethene (Perchlorethene). Tetrachloroethene is a man-made volatile chlorinated solvent that is used extensively in the textile and dry cleaning industries as a cleanser and degreaser. Tetrachloroethene is also used as a degreaser in the electronics and metal industry. Since tetrachloroethene effectively cleans and decreases without adversely affecting what is being cleansed, tetrachloroethene is used extensively in a multitude of commercially available cleansers.

Tetrachloroethene is nearly completely absorbed via the inhalation and oral routes; dermal exposure represents a minor pathway. Oral and inhalation exposure to tetrachloroethene in humans and animals indicates that the liver, kidney, and nervous system are target organs. Long-term exposures to tetrachloroethene

produced proliferative changes in the mouse livers, renal nephropathy in animals and occupationally exposed workers, and irreversible nervous system damage in laboratory animals. Additionally, an increased incidence of menstrual disorders and spontaneous abortions have been observed in women occupationally exposed to tetrachloroethene in the dry cleaning business. Epidemiological data in humans is insufficient to make conclusions regarding the potential carcinogenicity of tetrachloroethene. However, tetrachloroethene has produced hepatic cancer in laboratory animals exposed orally and by inhalation. Therefore, the USEPA has placed tetrachloroethene in weight-of-evidence group B2, probable human carcinogen.

References:
Agency for Toxic Substances and Disease Registry (ATSDR), 1991. "Toxicological Profile for Tetrachloroethene"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October, 1991.

Trichloroethene. Trichloroethene is a man-made chlorinated solvent that is used extensively in industry as a metal decreasing agent. Trichloroethene is also used in dry cleaning and as a solvent in paints and adhesives.

Several human deaths and acute neurotoxic effects have been attributed to oral and inhalation exposure to trichloroethene. In animals, oral and inhalation exposure to trichloroethene have produce neurotoxic effects, including behavioral changes, and renal toxicity. Additionally, inhalation and oral exposures to trichloroethene in animals have produced lung, liver, and testicular cancers. Epidemiological data in humans is insufficient to conclude whether trichloroethene is a human carcinogen. However, studies on trichloroethene metabolism suggest that it is metabolized similarly in humans and laboratory animals. Therefore, the USEPA has place trichloroethene in weight-of-evidence group B2, probable human carcinogen.

References:
MADEP, 1992. "Risk Assessment Shortform Residential Exposure Scenario, Version 1.6"; Policy #WSC/ORS-142-92; Office of Research and Standards and the Bureau of Waste Site Cleanup, Boston, MA; September 1992.

Vanadium. Vanadium is widely, but sparsely, distributed in the earth's crust and in the environment. It is invaluable as an alloying agent with steel; ferrovanadium alloys are used in high-stress applications such as bearings, jet engines, and cutting tools. Human and animal studies indicate that vanadium is readily absorbed from the lungs and poorly absorbed from the gastrointestinal tract. It distributes primarily to the bone and kidney. Vanadium is a respiratory irritant. Inhalation of vanadium dusts in both animals and occupationally-exposed workers induces mild to moderate respiratory irritation. The effects are reversible and subside when exposure is discontinued. No studies were located regarding cancer in humans or animals following inhalation, oral, or dermal exposures. However, vanadium has been found to induce DNA damage in human cell cultures, suggesting that vanadium may have the potential to be genotoxic to humans.

References:
ATSDR, 1990. Toxicological Profile for Vanadium. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, October, 1990.

Vinyl Chloride. Most of the vinyl chloride produced in the United States is used in the manufacture of polyvinyl chloride and other vinyl polymers. Because vinyl chloride is a gas the only significant route of exposure is inhalation. It is highly flammable. Acute exposure to vinyl chloride causes CNS depression. Several epidemiologic studies have found associations between occupational exposure and impaired liver function to vinyl chloride. Symptoms of liver disease associated with occupational exposure include pain, hepatomegaly, portal hypertension, and thrombocytopenia. Carcinogenicity studies by inhalation and oral routes in rats, mice, and hamsters resulted in liver angiosarcomas in all animals tested. Vinyl chloride workers are at increased risk for developing liver angiosarcomas, brain, skin, and lung tumors, and tumors of the lymph and blood-forming systems. Vinyl chloride is classified in group A, a human carcinogen.

References:

Clayton, George D. and Florence E. Clayton, editors, 1981. Patty's Industrial Hygiene and Toxicology, 3rd Revised Edition; John Wiley & Sons; New York.

Integrated Risk Information System (IRIS), 1993. United States Environmental Protection Agency.

APPENDIX S

BASELINE ECOLOGICAL RISK ASSESSMENT SECTION

APPENDIX S-1

ECOLOGICAL RECEPTORS AT NAS JACKSONVILLE

TABLE S-1.1
CHARACTERISTIC FLORA OF MAJOR VEGETATIVE COVER TYPES[a]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

SCIENTIFIC NAME	COMMON NAME
PINE FLATWOODS COMMUNITY	
Acer rubrum	Red maple
Andropogon virginiana	Broom sedge
Arisaema triphyllum	Jack-in-the-pulpit
Aristida stricta	Pineland three-awn
Bignonia capreolata	Cross vine
Carya glabra	Pignut hickory
Cephalanthus occidentalis	Buttonbush
Crataegus sp.	Hawthorne
Ilex glabra	Gallberry
Ilex vomitoria	Yaupon
Liquidambar styraciflua	Sweet gum
Lonicera japonica	Japanese honeysuckle
Lonicera sp.	Honeysuckle
Lyonia lucida	Fetterbush
Lyonia mariana	Staggerbush
Magnolia grandiflora	Bigleaf magnolia
Osmunda cinnamonea	Cinnamon fern
Panicum sp.	Panic grass
Parthenocissus quinquefolia	Virginia creeper
Pinus elliottii	Slash pine
Pinus palustris	Longleaf pine
Polypodium polypoides	Resurrection fern
Pteridium aquilinum	Bracken fern
Quercus chapmanni	Chapman oak
Quercus laevis	Turkey oak
Quercus laurifolia	Diamond-leaf oak
Quercus nigra	Water oak
Quercus spp.	Oaks
Rhus coppalina	Shining sumac
Rubus trivialis	Dewberry
Rubus sp.	Bramble
Serenoa repens	Saw palmetto
Smilax bona-nox	Catbriar
Smilax glauca	Greenbriar
Smilax rotundifolia	Bullbriar
Smilax sp.	Greenbriar
Thelypteris kunthii	Fern
Tillandsia usneoides	Spanish moss
Toxicodendron radicans	Poison ivy
Vitis rotundifolia	Muscadine grape
Woodwardia virginica	Virginia chain fern

TABLE S-1.1
CHARACTERISTIC FLORA OF MAJOR VEGETATIVE COVER TYPES[a]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

SCIENTIFIC NAME	COMMON NAME
MESOPHYTIC HARDWOOD COMMUNITY	
Amphicarpa bracteata	Hog peanut
Aralia spinosa	Devil's Walking stick
Assimina triloba	Pawpaw
Asplenium sp.	Spleenwort
Athyrium filix-femina	Lady fern
Carpinus carolinensis	Hornbeam
Carya glabra	Pignut hickory
Centrosema virginiana	Butterfly pea
Cercis canadensis	Redbud
Cornus florida	Flowering dogwood
Erythrina herbacea	Coral bean
Gaylussacia frondosa	Dangleberry
Hamamelis virginiana	Witch-hazel
Hypericum hypericoides	St. John's-wort
Ilex glabra	Gallberry
Ilex opaca	American holly
Ligustrum lucidum	Wax-leaved ligustrum
Lonicera japonica	Japanese honeysuckle
Lycopodium sp.	Club moss
Lyonia lucida	Fetterbush
Magnolia grandiflora	Magnolia
Mitchella repens	Partridgeberry
Myrica cerifera	Bayberry
Nyssa sylvatica	Black gum
Parthenocissus quinquefolia	Virginia creeper
Pinus elliottii	Slash pine
Pinus palustris	Longleaf pine
Polypodium polypoides	Resurrection fern
Polypodium plumula	Comb fern
Prunus serotina	Black cherry
Pterocaulon pyenostachyum	Blackroot
Quercus hemisphaerica	Laurel oak
Quercus michauxii	Swamp chestnut oak
Quercus nigra	Water oak
Quercus virginiana	Live oak
Serenoa repens	Saw palmetto
Smilax bona-nox	Catbriar
Smilax sp.	Greenbriar
Smilax walterii	Coral greenbriar
Thelypteris quadrangularis	Fern
Ulmus alata	Winged elm
Vaccinium arboreum	Highbush blueberry
Vaccinium arboreum	Sparkleberry
Vaccinium sp.	Blueberry
Vitis aestivalis	Summer grape
Woodwardia areolata	Netted chain fern

TABLE S-1.1
CHARACTERISTIC FLORA OF MAJOR VEGETATIVE COVER TYPES[a]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

SCIENTIFIC NAME	COMMON NAME
HYDROPHYTIC HARDWOOD COMMUNITY	
Acer negundo	Box elder
Acer rubrum	Red maple
Amorpha fruticosa	False indigo
Ampelopsis arborea	Peppervine
Aralia spinosa	Devils walking stick
Arisaema triphyllum	Jack-in-the-pulpit
Asplenium resiliens	Black-stemmed spleenwort
Athyrium filix-femina	Lady fern
Betula nigra	River birch
Bignonia capreolata	Cross vine
Botrychium virginianum	Rattlesnake fern
Carpinus caroliniana	Hornbeam
Cephalanthus occidentalis	Buttonbush
Cicuta mexicana	Water hemlock
Cladium sp.	Twig rush
Cnidoscolus stimulosus	Nettle
Dichromena sp.	White top sedge
Fraxinus pennsylvanica	Green ash
Gallium sp.	Bedstraw.
Hydrocotyle umbellata	Water pennywort
Ilex coriacea	Gallberry
Ilex glabra	Inkberry
Ilex myrtifolia	Myrtle-leaved holly
Iris pseudacoris	Yellow flag
Liquidambar styraciflua	Sweet gum
Lyonia lucida	Fetterbush
Lyonia mariana	Staggerbush
Magnolia virginiana	Sweet bay magnolia
Myrica cerifera	Bayberry
Nyssa sylvatica	Black gum
Osmunda cinnamonea	Cinnamon fern
Osmunda regalis	Royal fern
Orontium aquaticum	Golden club
Peltandra virginica	Green arum
Persea burbonia	Red bay
Pinus elliottii	Slash pine
Polygonum sp.	Smartweed
Polypodium polypoides	Resurrection fern
Quercus nigra	Water oak
Quercus phellos	Willow oak
Quercus spp.	Oaks
Quercus virginiana	Live oak
Salix nigra	Black Willow
Sambucus canadensis	Elderberry
Sassafras albidum	Sassafras
Smilax sp.	Greenbriar
Sphagnum spp.	Sphagnum moss
Taxodium distichum	Bald cypress
Thelypteris kunthii	Fern

TABLE S-1.1
CHARACTERISTIC FLORA OF MAJOR VEGETATIVE COVER TYPES[a]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

SCIENTIFIC NAME	COMMON NAME
HYDROPHYTIC HARDWOOD COMMUNITY (cont.)	
Toxicodendron radicans	Poison ivy
Ulmus americana	American elm
Utricularia inflata	Bladderwort
Vaccinium arboreum	Sparkleberry
Vaccinium sp.	Blueberry
Vitis rotundifolia	Muscadine grape
Woodwardia areolata	Netted chain fern
Woodwardia virginica	Virginia chain fern
OLD FIELD COMMUNITY	
Albizia julibrissin	Mimosa
Allium canadense	Wild onion
Ambrosia artemissifolia	Ragweed
Ampelopsis arborea	Peppervine
Andropogon virginicus	Broom grass
Asplenium resiliens	Black-stemmed spleenwort
Aster sp.	Aster
Baccharis halmifolia	Groundsel-tree
Bidens pilosa	Spanish needles
Callicarpa americana	Beauty berry
Campsis radicans	Trumpet creeper
Carex sp.	Sedge
Centrosema virginianum	Butterfly pea
Circium sp.	Thistle
Cladium sp.	Twig rush
Clematis crispa	Leather flower
Cnidoscolus stimulosus	Nettle
Commelina erecta	Dayflower
Crotalaria sp.	Rattlebox
Cuscuta gronovii	Dodder
Daucus carota	Queen Anne's lace
Dichromena sp.	White-bracted sedge
Digitaria sp.	Crab grass
Dioscorea bulbifera	Air yam
Erigeron quercifolius	Fleabane
Eupatorium capillifolium	Dog fennel
Euthamia minor	Flat-topped goldenrod
Geranium carolinianum	Wild geranium
Hedyotis procumbens	Innocence
Hydrocotyle umbellata	Water pennywort
Hypericum gentianoides	St. Johns wort
Hypochoeris radicata	Cat's ear
Ipomoea sp.	Bindweed
Juniperus virginiana	Southern red cedar
Juncus canadensis	Canada rush
Juncus sp.	Rush
Lepidium virginicum	Field peppergrass
Lygodium japonicum	Japanese climbing fern

TABLE S-1.1
CHARACTERISTIC FLORA OF MAJOR VEGETATIVE COVER TYPES[a]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

SCIENTIFIC NAME	COMMON NAME
OLD FIELD COMMUNITY (cont.)	
Melia azedarach	Chinaberry
Meliota alba	Tall white clover
Morus alba	White mulberry
Oenothera laciniata	Primrose
Oxalis sp.	Sorrel
Panicum sp.	Panic grass
Passiflora incarnata	Passion flower
Phorodendron serotinum	Mistletoe
Phyla nodiflora	Capeweed
Prunus caroliniana	Carolina laurel cherry
Pteridium aquilinum	Bracken fern
Quercus myrtifolia	Myrtle oak
Robinia hispidus	Bristly locust
Rhus typhina	Staghorn sumac
Rubus trivialis	Southern dewberry
Rumex crispus	Dock
Sabal palmetto	Sabal palm
Salvia lyrata	Lyre-leaved mint
Sambucus canadensis	Elderberry
Sapium sebiferum	Chinese tallow tree
Sesbania sp.	Rattlebox
Solanum carolinense	Horse nettle
Sonchas asper	Sow thistle
Spiranthes sp.	Orchid
Stachys floridana	Hedge nettle
Tradescantia virginiana	Spiderwort
Trifolium spp.	Clovers
Ulmus alata	Winged Elm
Verbena brasiliensis	Vervain
Vitis rotundifolia	Muscadine grape
Xyris sp.	Yellow-eyed grass
Yucca aloifolia	Spanish bayonnet
Zanthoxylum clava-herculis	Southern prickly ash
PERIMETER DITCH (AND BANK) COMMUNITY	
Baccharis halmifolia	Groundsel-tree
Bacopa sp.	Water hyssop
Canna sp.	Canna
Carex spp.	Sedges
Cyperus sp.	Flat sedge
Eriocaulon sp.	Pipewort
Eupatorium capillifolium	Dog fennel
Fimbristylis sp.	Fringe rush
Ilex glabra	Gallberry
Iris pseudacorus	Yellow flag
Juncus spp.	Rushes
Myriophyllum sp.	Water milfoil
Myrica cerifera	Bayberry
Panicum repens	Torpedo grass

TABLE S-1.1
CHARACTERISTIC FLORA OF MAJOR VEGETATIVE COVER TYPES[a]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

SCIENTIFIC NAME	COMMON NAME
PERIMETER DITCH (AND BANK) COMMUNITY (cont.)	
Pinus elliotii	Slash pine
Polygonum spp.	Smartweeds
Populus deltoides	Poplar
Prunus carolina	Carolina laurel cherry
Salix nigra	Black willow
Sambucus canadensis	Elderberry
Scirpus cyperinus	Umbrella sedge
Scirpus sp.	Bulrush
Typha latifolia	Cattail
Utricularia inflata	Bladderwort
Verbena brasiliensis	Vervain
Xyris sp.	Yellow-eyed grass
ST. JOHNS RIVER ESTUARINE COMMUNITY	
Acer rubrum	Red maple
Amorpha fruticosa	False indigo
Bacopa sp.	Water hyssop
Brasenia sp.	Water shield
Cephalanthus occidentalis	Buttonbush
Cyperus sp.	Flat sedge
Eichhornia crassipes	Water hyacinth
Eleocharis sp.	Spike rush
Fraxinus pennsylvanicum	Green ash
Hibiscus grandiflorus	Big rose-mallow
Hydrocotyle umbellata	Water pennywort
Iris sp.	Iris
Juncus effusus	Soft rush
Juncus spp.	Rushes
Lemna minor	Duckweed
Myriophyllum sp.	Water milfoil
Orontium aquaticum	Golden club
Osmunda cinnamomea	Cinnamon fern
Osmunda regalis	Royal fern
Peltandra virginica	Green arum
Pistia stratiotes	Water lettuce
Polygonum sp.	Smartweed
Pontedaria cordata	Pickerel weed
Salix sp.	Willow
Sambucus canadensis	Elderberry
Scirpus californicus	Giant rush
Scirpus sp.	Bulrush
Taxodium distichum	Bald cypress
Toxicodendron radicans	Poison ivy
Typha angustifolia	Cattail
Ulmus americana	American elm
Utricularia inflata	Bladderwort
Vallisneria americana	Eelgrass
Wolffia sp.	Duckweed

Note:
[a] Sources: ABB-ES site inspection; Godfrey and Wooten (1981); Dressler et al. (1991); Mickel (1979).

TABLE S-1.2
AMPHIBIANS EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCE [a]	REFERENCE [b]
AMBYSTOMIDAE				
	Ambystoma talpoideum	Mole salamander		X
BUFONIDAE				
	Bufo quercicus	Oak toad	X	X
	Bufo terrestris	Southern toad	X	X
HYLIDAE				
	Acris gryllus dorsalis	Florida cricket frog		X
	Hyla chrysoscelis	Gray treefrog		X
	Hyla avivoca	Bird-voiced treefrog	*	X
	Hyla cinerea	Green treefrog	X	X
	Hyla crucifer bartramiana	Southern peeper	X	X
	Hyla femoralis	Pine woods treefrog		X
	Hyla gratiosa	Barking treefrog		X
	Hyla squirella	Squirrel treefrog	X	X
	Limnaeodus ocularis	Little grass frog	*	X
	Pseudacris nigrita nigrita	Southern chorus frog		X
	Pseudacris ornata	Ornate chorus frog		X
MICROHYLIDAE				
	Gastrophryne carolinensis	Eastern narrowmouth toad		X
PELOBATIDAE				
	Scaphiopus holbrooki	Eastern spadefoot		X
PLETHODONTIDAE				
	Desmognathus auriculatus	Southern dusky salamander		X
	Eurycea quadridigitata	Dwarf salamander	+	X
	Plethodon glutinosus	Slimy salamander	X	X
	Pseudotriton montanus floridanus	Rusty mud salamander		X
RANIDAE				
	Rana areolata aesopus	Florida gopher frog		X
	Rana catesbeiana	Bullfrog		X
	Rana clamitans clamitans	Green frog		X
	Rana grylio	Pig frog		X
	Rana heckscheri	River frog		X
	Rana sphenocephala	Southern leopard frog	X	X
SALAMANDRIDAE				
	Notophthalmus perstriatus	Striped newt		X
	Notopthalmus viridescens louisianensis	Central newt		X
SIRENIDAE				
	Pseudobranchus striatus	Narrow-striped dwarf siren		X
	Siren intermedia	Lesser siren	?	X

Notes:
[a] Observed at OU1 by ABB-ES personnel (tentative identifications were based on auditory (*) or casual siting (+), or examination of decomposed specimen (?)).
[b] Specimen records for Duval County, Florida (Ashton and Ashton, 1989).

TABLE S-1.3
REPTILES EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCES [a]	REFERENCES [b]
ALLIGATORIDAE	*Alligator mississippiensis*	American alligator		X
CHELYDRIDAE	*Chelydra serpentina*	Snapping turtle		X
COLUBRIDAE	*Cemophora coccinea copei*	Scarlet snake		X
	Coluber constrictor priapur	Southern black racer		X
	Diadophis punctatus punctatur	Southern ringneck snake		X
	Drymarchon corais	Indigo snake		X
	Elaphe guttata	Corn snake		X
	Elaphe obsoleta quadrivattata	Yellow rat snake		X
	Farancia abacura abacura	Mud snake		X
	Farancia erytrogramma	Rainbow snake		X
	Heterodon platyrhinos	Eastern hognose snake		X
	Heterodon simus	Southern hognose snake		X
	Lampropeltis getulus	Common kingsnake		X
	Lampropeltis triangulum	Eastern milk snake		X
	Lampropeltis triangulum elapsoides	Scarlet kingsnake		X
	Masticophis flagellum flagellum	Coachwhip		X
	Nerodia fasciata	Southern water snake		X
	Nerodia rhombifera	Diamondback water snake		X
	Opheodrys aestivus	Rough green snake		X
	Pituophis melanoleucus mugitur	Florida pine snake		X
	Regina alleni	Striped crayfish snake		
	Regina rigida rigida	Glossy crayfish snake		X
	Rhadinaea flavilata	Pine woods snake		X
	Seminatrix pygaea pygaea	North Florida swamp snake		X
	Storeria dekayi victa	Florida brown snake		X
	Storeria occipitomaculata obscura	Southern redbelly snake		X
	Tantilla relicta	Southeastern crowned snake		X
	Thamnophis sauritus sackeni	Southern ribbon snake		X
	Thamnophis sirtalis sirtalis	Eastern garter snake		X
ELAPIDAE	*Micrurus fulvius fulvius*	Eastern Coral snake		X
EMYDIDAE	*Clemmys guttata*	Spotted turtle		X
	Deirochelys reticularia chrysea	Chicken turtle		X
	Pseudemys nelsoni	Florida Redbelly Turtle	X	X
	Pseudemys floridana peninsylaris	Cooter		X
	Terrapene carolina	Eastern box turtle		X
IGUANIDAE	*Anolis carolinensis*	Green anole	X	X
	Sceloporus undulatus undulatus	Southern fence lizard		X
KINOSTERNIDAE	*Kinosternon subrubrum steindachneri*	Eastern mud turtle		X
	Sternotherus minor minor	Loggerhead musk turtle		X

TABLE S-1.3
REPTILES EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCES [a]	[b]
SCINCIDAE	*Eumeces egregius*	Peninsula mole skink		X
	Eumeces inexpectatus	Southeastern five-lined skink	X	
	Eumeces laticeps	Broadhead skink	X	X
	Scincella lateralis	Ground skink		X
TESTUDINIDAE	*Gopherus polyphemus*	Gopher tortoise	X	X
TETIDAE	*Cnemidophorus sexlineatus*	Six-lined racerunner		X
VIPERIDAE	*Agkistrodon piscivorus caramto*	Florida cottonmouth		X
	Crotalus adamanteus	Eastern diamondback		X
	Sistrurus miliarus barbouri	Pigmy rattlesnake		X

Notes:

[a] Observed at OU1 by ABB-ES personnel.

[b] Specimen records for Duval County, Florida (Ashton and Ashton, 1988 and 1991).

TABLE S-1.4
BIRDS EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCE [a]	REFERENCE [b]
ACCIPITRIDAE				
	Accipiter cooperii	Cooper's hawk		X
	Accipiter striatus	Sharp-shinned hawk	X*	X
	Buteo jamaicensis	Red-tailed hawk	X	X
	Buteo lineatus	Red-shouldered hawk	X	X
	Buteo platypterus	Broad-winged hawk		X
	Circus cyaneus	Northern harrier		X
	Elandides forficatus	American swallow-tailed kite		X
	Haliaeetus leucocephalus	Bald eagle		X
	Pandion haliaetus	Osprey	X	X
ALCEDINIDAE				
	Megaceryle alcyon	Belted kingfisher	X	X
ANATIDAE				
	Aix sponsa	Wood duck		X
	Anas americana	American wigeon		X
	Anas clypeata	Northern shoveler		X
	Anas crecca	Green-winged teal		X
	Anas discors	Blue-winged teal		X
	Anas platyrhynchos	Mallard		X
	Anas rubripes	American black duck		X
	Anas strepera	Gadwall		X
	Aythya affinis	Lesser scaup		X
	Aythya americana	Redhead		X
	Aythya collaris	Ring-necked duck		X
	Aythya marila	Greater scaup		X
	Bucephala albeola	Bufflehead	X	X
	Bucephala clangula	Common goldeneye		X
	Lophodytes cucullatus	Hooded merganser	X	X
	Mergus serrator	Red-breasted merganser		X
	Oxyura jamaicensis	Ruddy duck		X
ANHINGIDAE				
	Anhinga anhinga	Anhinga		X
APODIDAE				
	Chaetura pelagica	Chimney swift	X	X
ARAMIDAE				
	Aramus guarauna	Limpkin		X
ARDEIDAE				
	Ardea herodias	Great blue heron	X	X
	Bubulcus ibis	Cattle egret	X	X
	Butorides striatus	Green-backed heron	X	X
	Casmerodius albus	Great egret	X	X
	Egretta thula	Snowy egret	X	X
	Egretta tricolor	Tricolored heron		X
	Egretta caerulea	Little blue heron		X
	Nycticorax nycticorax	Black-crowned night heron		X
	Nycticorax violaceus	Yellow-crowned night heron		X
BOMBYCILLIDAE				
	Bombycilla cedrorum	Cedar waxwing		X
CAPRIMULGIDAE				
	Caprimulgus carolinensis	Chuck-will's-widow		X
	Caprimulgus vociferus	Whip-poor-will		X
	Chordeiles minor	Common nighthawk		X
CATHARTIDAE				
	Cathartes aura	Turkey vulture	X	X
	Coragyps atratus	Black vulture	X	X
CERTHIIDAE				
	Certhia americana	Brown creeper		X
CHARADRIIDAE				
	Charadrius semipalmatus	Semipalmated plover		X
	Charadrius vociferus	Killdeer	X	X
	Pluvialis squatarola	Black-bellied plover		X

TABLE S-1.4
BIRDS EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCE [a]	REFERENCE [b]
COLUMBIDAE				
	Columba livia	Rock dove	X	X
	Columbina passerina	Common ground-dove		X
	Zenaida macroura	Mourning dove	X	X
CORVIDAE				
	Corvus brachyrhynchos	Common crow	X	X
	Corvus ossifragus	Fish crow	X	X
	Cyanocitta cristata	Blue jay	X	X
CUCULIDAE				
	Coccyzus americanus	Yellow-billed cuckoo		X
EMBERIZIDAE				
	Ammodramus henslowii	Henslow's sparrow		X
	Ammodramus leconteii	Le Conte's sparrow		X
	Ammodramus savannarum	Grasshopper sparrow		X
	Cardinalis cardinalis	Northern cardinal	X	X
	Carduelis tristis	American goldfinch		X
	Carpodacus purpureus	Purple finch		X
	Guiraca caerulea	Blue grosbeak	X	X
	Junco hyemalis	Dark-eyed junco		X
	Melospiza georgiana	Swamp sparrow		X
	Melospiza melodia	Song sparrow	X	X
	Passerculus sandwichensis	Savannah sparrow		X
	Passerina ciris	Painted bunting		X
	Pipilo erythrophthalmus	Rufous-sided towhee	X	X
	Pooecetes gramineus	Vesper sparrow		X
	Spizella passerina	Chipping sparrow		X
	Spizella pusilla	Field sparrow		X
	Zonotrichia albicollis	White-throated sparrow		X
FALCONIDAE				
	Falco columbarius	Merlin		X
	Falco peregrinus	Peregrine falcon		X
	Falco sparverius	American kestrel	X	X
GAVIIDAE				
	Gavia immer	Common loon		X
	Gavia stellata	Red-throated loon		X
HIRUNDINIDAE				
	Hirundo rustica	Barn swallow		X
	Iridoprocne bicolor	Tree swallow		X
	Progne subis	Purple martin		X
	Stelgidopteryx seripennis	Northern rough-winged swallow		X
ICTERIDAE				
	Agelaius phoeniceus	Red-winged blackbird	X	X
	Euphagus carolinus	Rusty blackbird		X
	Euphagus cyanocephalus	Brewer's blackbird		X
	Icterus galbula	Northern oriole		X
	Icterus spurius	Orchard oriole	X	X
	Molothrus ater	Brown-headed cowbird		X
	Quiscalus major	Boat-tailed grackle	X	X
	Quiscalus quiscula	Common grackle	X	X
	Sturnella magna	Eastern meadowlark		X
LANIIDAE				
	Lanius ludovicianus	Loggerhead shrike	X	X
LARIDAE				
	Larus argentatus	Herring gull	X	X
	Larus atricilla	Laughing gull	X	X
	Larus delawarensis	Ring-billed gull	X	X
	Larus marinus	Great black-backed gull		X
	Larus philadelphia	Bonaparte's gull	X	X
	Sterna caspia	Caspian tern		X
	Sterna forsteri	Forster's tern		X
	Sterna hirundo	Common tern	X	X
	Sterna maxima	Royal tern		X

TABLE S-1.4
BIRDS EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCE [a]	REFERENCE [b]
MIMIDAE				
	Dumatella carolinensis	Gray catbird	X	X
	Mimus polyglottus	Northern mockingbird	X	X
	Toxostoma rufum	Brown thrasher	X	X
PARIDAE				
	Parus bicolor	Tufted titmouse	X	X
	Parus carolinensis	Carolina chickadee	X	X
PARULIDAE				
	Dendroica coronata	Yellow-rumped warbler	X	X
	Dendroica discolor	Prairie warbler		X
	Dendroica dominica	Yellow-throated warbler		X
	Dendroica palmarum	Palm warbler	X	X
	Dendroica pinus	Pine warbler	X	X
	Geothylpis trichas	Common yellowthroat		X
	Limnothlypis swainsonii	Swainson's warbler	?	X
	Mniotilta varia	Black-and-white warbler	X	X
	Parula americana	Northern parula		X
	Protondtaria citrea	Prothonotary warbler		X
	Seiuris aurocapillus	Ovenbird		X
	Vermivora celata	Orange-crowned warbler		X
PELECANIDAE				
	Pelecanus occidentalis	Brown pelican		X
PHALACROCORACIDAE				
	Phalacrocorax auritus	Double-crested cormorant	X	X
PHASIANIDAE				
	Colinus virginianus	Common bobwhite		X
	Melcagris gallopavo	Wild turkey	X	X
PICIDAE				
	Colaptes auratus	Yellow-shafted flicker	X	X
	Dryocopus pileatus	Pileated woodpecker	X	X
	Melanerpes carolinus	Red-bellied woodpecker	X	X
	Melanerpes erythrocephalus	Red-headed woodpecker		X
	Picoides pubescens	Downy woodpecker	X	X
	Picoides villosus	Hairy woodpecker		X
	Sphyrapicus varius	Yellow-bellied sapsucker	X	X
PLOCEIDAE				
	Passer domesticus	House sparrow	X	X
PODICIPEDIDAE				
	Podiceps auritus	Horned grebe		X
	Podilymbus podiceps	Pied-billed grebe		X
RALLIDAE				
	Fulica americana	American coot		X
	Gallinula chloropus	Common gallinule	X	X
	Porphyrula martinica	Purple gallinule		X
	Porzana carolina	Sora rail		X
	Rallus elegans	King rail		X
	Rallus limicola	Virginia rail		X
	Rallus longrostris	Clapper rail		X
SCOLOPACIDAE				
	Actitis macularis	Spotted sandpiper	X	X
	Arenaria interpres	Ruddy turnstone		X
	Calidris alpina	Dunlin		X
	Calidris canutus	Red knot		X
	Calidris melanotos	Pectoral sandpiper		X
	Calidris minutilla	Least sandpiper		X
	Calidris pusilla	Semipalmated sandpiper		X
	Capella gallinago	Common snipe		X
	Catoptrophorus semipalmatus	Willet		X
	Crocethia alba	Sanderling		X
	Limnodromus griseus	Short-billed dowitcher		X
	Limnodromus scolopaceus	Long-billed dowitcher		X
	Limosa fedoa	Marbled godwit		X

TABLE S-1.4
BIRDS EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCE [a]	REFERENCE [b]
	Numenius phaeopus	Whimbrel		X
	Scolopax minor	American woodcock		X
	Tringa flavipes	Lesser yellowlegs		X
	Tringa melanoleuca	Greater yellowlegs		X
	Tringa solitaria	Solitary sandpiper		X
SITTIDAE				
	Sitta canadensis	Red-breasted nuthatch		X
	Sitta carolinensis	White-breasted nuthatch		X
	Sitta pusilla	Brown-headed nuthatch		X
STRIGIDAE				
	Asio flammeus	Short-eared owl		X
	Bubo virginianus	Great horned owl		X
	Otus asio	Eastern screech owl		X
	Strix varia	Barred owl		X
STURNIDAE				
	Sturnus vulgaris	European starling	X	X
SYLVIIDAE				
	Polioptila caerulea	Blue-gray gnatcatcher	X	X
	Regulus calendula	Ruby-crowned kinglet	X	X
	Regulus satrapa	Golden-crowned kinglet		X
THRAUPIDAE				
	Piranga rubra	Summer tanager		X
THRESKIORNITHIDAE				
	Eudocimus albus	White ibis	?	X
	Plegadis falcinellus	Glossy ibis		X
TROCHILIDAE				
	Archilochus colubris	Ruby-throated hummingbird		X
TROGLODYTIDAE				
	Cistothorus palustris	Marsh wren		X
	Cistothorus platensis	Sedge wren		X
	Thryothorus ludovicianus	Carolina wren		X
	Troglodytes aedon	House wren	X	X
	Troglodytes troglodytes	Winter wren		X
TURDIDAE				
	Catharus guttata	Hermit thrush		X
	Sialia sialis	Eastern bluebird		X
	Turdus migratorius	American robin	X	X
TYRANNIDAE				
	Contopus virens	Eastern wood pewee		X
	Empidonax sp.	Flycatcher	X	
	Empidonax virescens	Acadian flycatcher		X
	Myiarchus crinitus	Great crested flycatcher	X	X
	Sayornis phoebe	Eastern phoebe		X
	Tyrannus tyrannus	Eastern kingbird		X
TYTONIDAE				
	Tyto alba	Common barn owl		X
VIREONIDAE				
	Vireo flavifrons	Yellow-throated vireo		X
	Vireo griseus	White-eyed vireo	X	X
	Vireo olivaceus	Red-eyed vireo		X
	Vireo solitarius	Solitary vireo	X	

Notes:
[a] Observed (or signs observed) at OU1 by ABB-ES ("?" indicates tentative identification).
[b] Regional distribution for northeastern Florida (Peterson, 1980). Many of these birds are regular or occasional visitors during spring and/or fall migration, and are not resident species.

* - A dead specimen found at OU1 adjacent to the golf course on January 28, 1992 by ABB-ES personnel.

TABLE S-1.5
MAMMALS EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCE [a]	REFERENCE [b]
CANIDAE				
	Urocyon cinereoargenteus	Gray fox		X
	Canis familiarus	Dog		X
CAPROMYIDAE				
	Myocastor coypus	Nutria		X
CERVIDAE				
	Odocoileus virginianus	White-tailed deer	X	X
CRICETIDAE				
	Neotoma floridana	Eastern wood rat		X
	Oryzomys palustris	Marsh rice rat		X
	Peromyscus gossypinus	Cotton mouse		X
	Peromyscus nuttalli	Golden mouse		X
	Peromyscus polionotus	Old field mouse		X
	Reithrodontomys humulis	Eastern harvest mouse		X
	Sigmodon hispidus	Hispid cotton rat	X	X
DASYPODIDAE				
	Dasypus novemcinctus	Nine-banded armadillo	X*	
DIDELPHIDAE				
	Didelphis virginiana	Virginia oppossum	X*	
FELIDAE				
	Lynx rufus	Bobcat		X
	Felis domesticus	Cat		X
GEOMYIDAE				
	Geomys pinetis	Southeastern pocket gopher		X
LEPORIDAE				
	Sylvilagus floridanus	Eastern cottontail	X	X
	Sylvilagus palustris	Marsh rabbit		X
MURIDAE				
	Mus musculus	House mouse		X
	Rattus norvegicus	Norway rat		X
MUSTELIDAE				
	Lutra canadensis	River otter	X*	X
	Mephitis mephitis	Striped skunk		X
	Mustela vison	Mink		X
	Spilogale putorius	Eastern spotted skunk		X
PROCYONIDAE				
	Procyon lotor	Raccoon	X	X
SCIURIDAE				
	Glaucomys volans	Southern flying squirrel		X
	Sciurus carolinensis	Gray squirrel	X	X
	Sciurus niger shermani	Sherman's fox squirrel	X	X
SORICIDAE				
	Blarina brevicauda	Short-tailed shrew		X
	Cryptotis parva	Least shrew		X
	Sorex longirostris	Southeastern shrew		X
TALPIDAE				
	Scalopus aquaticus	Eastern mole		X
TRICHECHIDAE				
	Trichechus manatus	West Indian manatee	X+	X

TABLE S-1.5
MAMMALS EXPECTED OR OBSERVED IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCE [a]	REFERENCE [b]
VESPERTILIONIDAE				
	Eptesicus fuscus	Big brown bat		X
	Lasiurus borealis	Red bat		X
	Lasiurus cinereus	Hoary bat		X
	Lasiurus intermedius	Northern yellow bat		X
	Lasiurus seminolus	Semiole bat		X
	Myotis austroriparius	Southeastern bat		X
	Pipistrellus subflavus	Eastern pipistrelle		X
	Plecotus rafinesquii	Eastern big-eared bat		X

Notes:
[a] Observed (or signs observed) at OU1 by ABB-ES personnel.
[b] Regional distribution for northeastern Florida (Burt and Grossenheider, 1976).
• = Only a dead specimen observed (the armadillo and otter were probably roadkills).
+ = Manatee observed in the vicinity of the Captain's pier on June 2, 1992 by ABB-ES personnel.

TABLE S-1.6
FISH EXPECTED IN THE ST. JOHNS RIVER IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCES [a]	REFERENCES [b]
ACIPENSERIDAE				
	Acipenser oxyrhynchus	Atlantic sturgeon	X	
	Acipenser brevirostrum	Shortnose sturgeon	X	
AMMIIDAE				
	Amia calva	Bowfin		X
ANGUILLIDAE				
	Anguilla rostrata	American eel	X	X
ARIIDAE				
	Ariopsis felis	Hardhead catfish		X
	Galeichthys felis	Sea catfish	X	
	Bagre marinus	Gafftop	X	X
ATHERINIDAE				
	Labidesthes sicculus	Brook silverside		X
	Menidia beryllina	Inland silverside		X
BALISTIDAE				
	Balistes carolinensis	Gray triggerfish		X
BELONIDAE				
	Strongylura marina	Atlantic needlefish	X	X
BLENNIIDAE				
	Chasmodes bosquianus	Striped blenny		X
BOTHIDAE				
	Citharichthys spilopterus	Bay whiff		X
	Paralichthyes lethostigma	Southern flounder		X
CARANGIDAE				
	Caranx hippos	Jackfish		X
	Oligoplites saurus	Leatherjacket		X
CATOSTOMIDAE				
	Erimyzon sucetta	Lake chubsucker		X
CENTRARCHIDAE				
	Enneacanthus gloriosus	Bluespotted sunfish		X
	Lepomis auritus	Redbreast sunfish		X
	Lepomis gulosus	Warmouth		X
	Lepomis macrochirus	Bluegill		X
	Lepomis microlophus	Redear sunfish		X
	Lepomis punctatus	Spotted sunfish		X
	Micropterus salmoides	Largemouth bass		X
CLUPEIDAE				
	Brevoortia smithi	Yellow menhaden		X
	Dorosoma cepedianum	Gizzard shad		X
	Dorosoma petenense	Threadfin shad		X
CYNOGLOSSIDAE				
	Symphurus plagiosa	Tonguefish		X
CYPRINIDAE				
	Notemigonus crysoleucas	Golden shiner		X
CYPRINODONTIDAE				
	Fundulus seminolis	Seminole killifish		X
	Lucania parva	Rainwater killifish		X
DASYATIDAE				
	Dasyatis sabina	Atlantic stingray	X	X
ELOPIDAE				
	Elops saurus	Ladyfish	X	X
ENGRAULIDAE				
	Anchoa hepsetus	Striped anchovy	X	X
	Anchoa mitchilli	Bay anchovy	X	X

TABLE S-1.6
FISH EXPECTED IN THE ST. JOHNS RIVER IN THE VICINITY OF NAS JACKSONVILLE

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

FAMILY	SCIENTIFIC NAME	COMMON NAME	REFERENCES [a]	REFERENCES [b]
ESOCIDAE				
	Esox americanus	Grass pickerel		X
GERREIDAE				
	Diapterus auratus	Mojarra		X
	Eucinostomus argenteus	Spotfin mojarra		
	Eucinostomus harengulus	Mojarra		X
	Eucinostomus melanopterus	Mojarra		X
	Gerres cinereus	Yellowfin mojarra		X
GOBIIDAE				
	Awaous banana	River goby	X	
	Gobionellus beleosoma	Darter goby	X	
	Gobionellus oceanicus	Sharptail goby		X
	Gobionellus shefeldti	Freshwater goby	X	X
	Gobiosoma bosci	Naked goby	X	
	Gobiosoma robustum	Code goby	X	
	Microgobius gulosus	Clown goby		X
ICTALURIDAE				
	Ictalurus catus	White catfish		X
	Ictalurus natalis	Yellow bullhead		X
	Ictalurus nebulosus	Brown bullhead		X
LEPISOSTEIDAE				
	Lepisosteus osseus	Longnose gar		X
	Lepisosteus platyrhincus	Spotted gar		X
LUTJANIDAE				
	Lutjanus griseus	Gray snapper		X
MUGILIDAE				
	Mugil cerema	White mullet		X
	Mugil cephalus	Striped mullet		X
PETROMYZONTIDAE				
	Petromyzon marinus	Sea lamprey	X	X
POECILIIDAE				
	Gambusia affinis	Mosquitofish		X
	Gambusia holbrooki	Killifish		X
	Heterandria formosa	Least killfish		X
	Poecilia latipinna	Sailfin mully		X
SCIANENIDAE				
	Bairdiella chrysura	Silver perch		X
	Cynoscion nebulosus	Spotted seatrout		X
	Cynoscion regalis	Atlantic weakfish		X
	Leiostomus xanthurus	Spot		X
	Micropogonias undulatus	Atlantic croaker		X
	Sciaenops ocellata	Red drum		X
SOLEIDAE				
	Trinectes maculatus	Hogchoker		X
SPARIDAE				
	Lagodon rhomboides	Pinfish		X
SYGNATHIDAE				
	Sygnathus scovelli	Southern pipefish		X
	Sygnathus lousiana	Louisiana pipefish		X

Notes:

[a] Source: USFWS, 1988. This sources does not present a complete list of St. Johns River fish, but provides indicator species of the estuarine environment in the vicinity of Black Point (approximately) 2 miles north of OU1.

[b] Source: St. Johns River Water Management District (1992); 1990 and 1991 fish sampling results from Julington Creek and Doctors Lake, St. Johns River.

TABLE S-1.7
PHYLOGENETIC LISTING OF ALL TAXA COLLECTED FROM THE PERIMETER DITCH, ASSOCIATED DRAINAGE AREAS, AND THE ST. JOHNS RIVER [a,b]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

Phylum / Class / Order / Family / *Genus species*	Tolerance Values [c]
Nematoda	-
Bryozoa	
Phylactolaemata	
Plumatellidae	-
Annelida	
Oligochaeta	
Plesiopora	
Enchytraeidae	
Naididae	
Dero digitata	10
D. nivea	10
D. pectinata	10
Nais communis	8
N. variabilis	10
Pristina sp.	8
Tubificidae	
Aulodrilus pigueti	-
Haber cf. *speciosus*	-
Ilyodrilus templetoni	-
Limnodrilus sp.	10
L. angustipenis	10
L. hoffmeisteri	10
Monopylephorus helobius	-
Immature with Capil.Setae	8-10
Immature w/o Capil. Setae	8-10
Unknown Oligochaeta	-
Prosopora	
Lumbriculidae	
Eclipidrilus sp.	-
Polychaeta	
Unknown Polychaeta	-

TABLE S-1.7
PHYLOGENETIC LISTING OF ALL TAXA COLLECTED FROM THE PERIMETER DITCH, ASSOCIATED DRAINAGE AREAS, AND THE ST. JOHNS RIVER [a,b]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

Phylum / Class / Order / Family / *Genus species*	Tolerance Values [c]
Arthropoda	
Crustacea	
Amphipoda	
Gammaridae	
Gammarus (nr. *tigrinus*)	4
Isopoda	
Anthuridae	
Cyathura polita	-
Decapoda	
Cambaridae (female)	-
Portunidae	
Callinectes sapidus	-
Xanthidae	
Rhithropanopeus harrisii	-
Insecta	
Ephemeroptera	
Caenidae	
Caenis diminuta	7
Odonata	
Zygoptera	
Coenagrionidae	
Enallagma signatum	8 [d]
Anisoptera	
Libellulidae	
Erythemis sp.	5
Pachydiplax longipennis	9
Trichoptera	
Leptoceridae	
Oecetis inconspicua	8
Polycentropidae	
Phylocentropus sp.	6
Coleoptera	
Haliplidae	
Peltodytes sp.	-
Hydrophilidae	
Berosus sp.	-

TABLE S-1.7
PHYLOGENETIC LISTING OF ALL TAXA COLLECTED FROM THE PERIMETER DITCH, ASSOCIATED DRAINAGE AREAS, AND THE ST. JOHNS RIVER [a,b]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

Phylum / Class / Order / Family / *Genus species*	Tolerance Values [c]
Diptera	
Ceratopogonidae	
Chironomidae	
Ablabesmyia parajanta	8
Chironomus decorus grp.	10
C. stigmaterus	10
Clinotanypus pigueti	8
Cricotopus bicinctus grp.	7
Cryptochironomus fulvus grp.	8
Dicrotendipes fumidus	8
D. modestus	8
Glyptotendipes lobiferous	10
Goeldichironomus holoprasinus	-
G. natans grp.	-
Kiefferulus dux	10
Larsia decolorata	6
Paramerina sp.	-
Polypedilum halterale	6
P. illinoense	6
Procladius (Holotanypus) sp.	9
Pseudochironomus richardson	5
Rheotanytarsus exiguus	6
Stenochironomus hilaris	5
Tanypus carinatus	10
T. *neopunctipennis*	10
T. *punctipennis*	10
Tanytarsus glabrescens	6
T. sp. IV Rutter	6
T. sp. I Cantrell	6
Thienemanniella nr. *fusca*	6
Tribelos jucundum	5

TABLE S-1.7
PHYLOGENETIC LISTING OF ALL TAXA COLLECTED FROM THE PERIMETER DITCH, ASSOCIATED DRAINAGE AREAS, AND THE ST. JOHNS RIVER [a,b]

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

Phylum / Class / Order / Family / *Genus species*	Tolerance Values [c]
Mollusca	
Gastropoda	
Ancylidae	
Ferrissia hendersoni	6
Laevapex peninsulae	-
Planorbidae	
Gyraulus parvus	8
Planorbella duryi	-
Physidae	
Physella cubensis	8
P. cubensis peninsula	8
Lymnaeidae	
Pseudosuccinea columella	-
Pelecypoda	
Corbiculidae	
Polymesoda caroliniana	-
Mactridae	
Rangia cuneata	-

Notes:

[a] Samples collected via Ekman dredge in January and February, 1992.
[b] Samples identified by Phyllis Guthrie, Invertebrate Taxonomist, Gainsville, FL under subcontract to ABB-ES.
[c] Tolerance values as provided by Plafkin et al., (1989); and Hilsenhoff (1988).
[d] Enallagma congener value.

TABLE S–1.8
ABUNDANCE DATA FOR BENTHIC MACROINVERTEBRATES COLLECTED FROM THE PERIMETER DITCH, ASSOCIATED DRAINAGE AREAS, AND THE ST. JOHNS RIVER

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

	SAMPLE LOCATION [c]																			
TAXA	CBCIL (ref)	JC (ref)	2	5	6	7	9	10	11	12	13	15	16	20	23	28	29	30	32 (ref)	33 (ref)
Nematoda		215							1335		474		43				215		129	
Plumatellidae																	43			
Enchytraeidae		43															86			
Dero nivea			43						560			43	86							
D. digitata									388	86			1120							
D. pectinata									258	215			904							
Nais communis									43											
Nais variabilis				172					43	517		43								
Pristina sp.													43							
Aulodrilus pigueti		388							474						86					
Haber cf. speciosus													388					258	344	
Ilyodrilus templetoni													388		43					
Limnodrilus sp.																215				
L. angustipenis		215											689			4909	431	388	129	301
Limnodrilus hoffmeisteri		603							1938		129				129	2368			86	
Monopylephorus helobius		43											129			517	86	215	474	86
Tubificid Immat. w/o capil.		1378							1895		86	86	646			1895	172	258	1206	172
Tubificid Immat. w/ capil.									43								129			
Unknown Oligochaeta																	43			
Eclipidrilus sp.						43	86	129						301						
Unknown Polychaeta																	86			129
Gammarus (nr. tigrinus)																43			431	
Cyathura polita																43	43	129	129	86
Cambarinae (female)														43	43					
Callinectes sapidus																	43			
Rithropanopeus harrisii																	43			

TABLE S–1.8
ABUNDANCE DATA FOR BENTHIC MACROINVERTEBRATES COLLECTED FROM THE PERIMETER DITCH, ASSOCIATED DRAINAGE AREAS, AND THE ST. JOHNS RIVER

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

	SAMPLE LOCATION [c]																			
TAXA	CECIL (ref)	JC (ref)	2	5	6	7	9	10	11	12	13	15	16	20	23	28	29	30	32 (ref)	33 (ref)
Caenis diminuta		172																		
Enallagma signatum										43										
Libellulidae									43						86					
Erythemis sp.									43											
Pachydiaplax longipennis			86							129	43									
Oecetis inconspicua		43																		
Phylocentropus sp.	86																			
Peltodytes sp.									43											
Berosus sp.									43											
Ceratopogonidae	43	43							43			43	172							
Ablabesmyia parajanta						86						43								
Chironomus decorus gr.	43	172	215		43	129			2024	431	172	474	1507	43	43	172				
Chironomus stigmaterus			129	2971	86	172			1421	517	1852	1507	431							
Clinotanypus pigueti																				
Cricotopus bicinctus grp.													86			43	560	43		129
Cryptochironomus fulvus grp		86														172			43	
Dicrotendipes modestus			129								560	129	43							
Dicrotendipes fumidus																	86			
Glyptotendipes lobiferous				86																
Goeldichironomus holoprasin			646	517							129									
Goeldichironomus natans gr.			172	646	43					86										
Kiefferulus dux			1335	215	258	388					43	86								
Larsia decolorata									388				43							
Paramerina sp.											43									
Polypedilum halterale		258																		
Polypedilum illinoense																	43			
Procladius (Holotanypus) sp.		86							43				43			129		43		258
Pseudochironomus richardson			86										43				43			

TABLE S–1.8
ABUNDANCE DATA FOR BENTHIC MACROINVERTEBRATES COLLECTED FROM THE PERIMETER DITCH, ASSOCIATED DRAINAGE AREAS, AND THE ST. JOHNS RIVER

BASELINE RISK ASSESSMENT
OPERABLE UNIT 1
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

			SAMPLE LOCATION [c]																	
TAXA	CBCIL (ref)	JC (ref)	2	5	6	7	9	10	11	12	13	15	16	20	23	28	29	30	32 (ref)	33 (ref)
Rheotanytarsus exiguus grp.													172				2713	344	172	43
Stenochironomus hilaris		43																		
Tanypus carinatus				560					431	86	129		301							
T. neopunctipennis									43											
T. punctipennis										172										
Tanytarsus glabrescens													43							
Tanytarsus sp. IV Rutter			388	86	86					215	43	86	86							
Tanytarsus sp. I Cantrell													215							
Thienemanniella nr. fusca																	43			
Tribelos jucundum	904	1249																		
Ferrissia hendersoni															43		560			
Gyraulus parvus			43									258								
Physella cubensis			215			301				129	775	86								
Physella cubensis peninsula									43											
Pseudosuccinea columella						43														
Polynesoda caroliniana																	43	86	86	
Rangia cuneata																		43		
Cacidotea sp.															474					
TOTAL NUMBER OF SPECIES 4	4	16	12	8	5	7	1	1	22	12	13	12	23	3	8	11	20	10	11	8
TOTAL # OF INDIVIDUALS [d]	1077	5038	3488	5253	517	1163	86	129	11583	2627	4478	2885	7622	388	947	10507	5512	1809	3230	1206
DIVERSITY [e]	0.87	3.1	2.82	2.06	1.96	2.42	0	0	3.39	3.21	2.67	2.4	3.71	0.99	2.33	2.14	2.79	2.97	2.81	2.78

Notes[a] Samples collected by ABB–ES ecologists during January and February 1992.

[b] Samples identified by Phyllis Guthrie, Invertebrate Taxonomist, Gainesville, Florida.

[c] Locations as presented in Figure 6–2 and described in Chapter 7 of the NAS Jacksonville Preliminary Ecological Assessment.

[d] Total individuals expressed per square meter

[e] Shannon–Wiener Diversity Index (H')

Appendix S-1 Reference List
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

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APPENDIX S-2

BIOACCUMULATION, BIOCONCENTRATION, AND TOXICITY DATA

Table S-2.1
Exposure Parameters for Representative Wildlife Species

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Representative Wildlife Species	Body Weight (kg)	Reported Diet	Soil/Sediment Ingestion (% of diet)	Assumed Diet for Exposure Assessment (% of diet)	Food Ingestion Rate (kg/day)	Water Intake Rate (l/day)	Home Range (acres)	Population Density (N/acre)
Cotton Mouse [a] (*Peromyscus gossypinus*)	0.021 [b]	Seeds and some insects [c]	2% soil [d] 1% sed [e]	88% Plants 10% Invertebrates	0.0029 [f]	0.0031 [g]	0.147 [h]	6.92 - 29.65 [c]
Short-tailed Shrew (*Blarina brevicauda*)	0.017[i]	Earthworms, slugs and snails, fungi, insects, and vegetation [c]	10% soil [d] 5% sed [e]	78% Invertebrates 12% Plants	0.0024 [f]	0.0039 [g]	0.96 ± 0.09 [c]	0.15 to 299[c]
Meadowlark (*Sturnella magna*)	0.087[j]	Insects, weed seeds and grass seeds. 75% of diet is invertebrates (beetles, grubs, bugs, grasshoppers, crickets, ants and spiders [j]	5% soil [j] 2.5% sed [e]	75% Invertebrates 20% Plants	0.0119 [k]	0.011 [l]	5 [j]	NA
Red fox (*Vulpes vulpes*)	4.69 [n]	Small mammals, birds, and invertebrates, as well as berries and other fruits. [c]	2.8% soil [c]	57% Small mammals 20% Invertebrates 10% Birds 10% Plants	0.24 [f]	--	1,727 ± 339 [c]	0.114 - 0.190 [c]
Raccoon (*Procyon lotor*)	3.99 [o]	Mostly fleshy fruits, nuts acorns, corn; also frogs, crayfish, and insects [c]	7% sed. [e]	93% Aquatic organisms	0.214 [f]	0.344 [g]	385 [p]	3.6 [c]
American Woodcock (*Scolopax minor*)	0.197 [q]	Primarily earthworms and insects with some plants [c]	10% soil [c] 5% sed [e]	80% Invertebrates 10% Plants	0.02 [k]	0.019 [l]	80.1 ± 68.2 [c]	0.52 nests/ac [c]
Spotted Sandpiper (*Actitis macularia*)	0.042 [c]	Primarily terrestrial and marine insects, with occasional crustaceans, leeches, molluscs, eggs, small fish, and carrion [c].	7% sed [c]	93% aquatic organisms	0.0074 [k]	0.0071 [l]	5 [c]	4.84 [c]

Table S-2.1
Exposure Parameters for Representative Wildlife Species

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Representative Wildlife Species	Body Weight (kg)	Reported Diet	Soil/Sediment Ingestion (% of diet)	Assumed Diet for Exposure Assessment (% of diet)	Food Ingestion Rate (kg/day)	Water Intake Rate (l/day)	Home Range (acres)	Population Density (N/acre)
Great horned owl (*Bubo virginianus*)	1.59 median [r]	Mostly rabbits; also mice, rats, chipmunks, weasels, squirrels, skunks, birds, bats, snakes, frogs, crayfish, perch, grasshoppers [r].	1% soil [d] 0.5% sed [e]	80% Small mammals 19% Birds	0.079 [k]	0.081 [l]	15 [s]	NA
Great blue heron (*Ardea herodias*)	2.23 ± 0.76 [c]	Mostly fish; some amphibians, crustaceans, and birds [c]	<2% sed. [e]	>98% Aquatic organisms	0.401 [t]	0.101 [l]	1.5 [u]	60.2 ± 21 (nests/ac) [v]
Muskrat (*Ondatra zibethicus*)	1.27 [w]	Cattails, reeds, pondweeds, bulrushes, water lilies, freshwater clams, and other small aquatic animals [m].	10% sed [m]	80% Plants 10% Invertebrates	0.084 [f]	0.12 [g]	0.20 [x]	11.5 [y]
Osprey (*Pandion haliaetus*)	1.36 [c]	Fish [c].	<1% sed.	100% fish [c]	0.61 [z]	0.072 [l]	10 [aa]	0.01 nests/acre [ab]

See notes at end of table

Table S-2.1
Exposure Parameters for Representative Wildlife Species

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Representative Wildlife Species	Body Weight (kg)	Reported Diet	Soil/Sediment Ingestion (% of diet)	Assumed Diet for Exposure Assessment (% of diet)	Food Ingestion Rate (kg/day)	Water Intake Rate (l/day)	Home Range (acres)	Population Density (N/acre)

References:
[a] Values for the deer mouse were used for the cotton mouse (USEPA, 1993a).
[b] Average of adult male and female deer mice in North America (USEPA, 1993a).
[c] Wildlife Exposure Factors Handbook (USEPA, 1993a).
[d] Deer mouse value used for cotton mouse. Surrogates were chosen based on similarities in diet. Other values were based on diet composition. USEPA (1993a). Rufous-sided towhee value from Beyer et al. (1991).
[e] Wildlife exposures from CPCs in surface water and sediment are assumed to be incidental for receptors that do not commonly forage in an aquatic environment, therefore the surface water and sediment ingestion models do not calculate risk based on 100 percent of a receptor's diet. Sediment ingestion is assumed to be 50% of soil ingestion, except for the raccoon and the heron.
[f] Calculated using the mammal equation based on body weight (Wt.) in kg. Food ingestion (kg/day) = $0.0687 \times Wt^{0.822}$ (USEPA, 1993a).
[g] Calculated using the mammal equation based on body weight (Wt.) in kg. Water ingestion (l/day) = $0.099 \times Wt^{0.90}$ (USEPA, 1993a).
[h] Average for male and female deer mice, Virginia/mixed deciduous forest (USEPA, 1993a).
[i] Mean of means reported for male and female shrews in summer and fall (USEPA, 1993a).
[j] Terres (1980).
[k] Calculated using the all bird equation based on body weight (Wt.) in kg. Food ingestion (kg/day) = $0.0582 \times Wt^{0.651}$ (USEPA, 1993a).
[l] Calculated using the all bird equation based on body weight (Wt.) in kg. Water ingestion (l/day) = $0.059 \times Wt^{0.67}$ (USEPA, 1993a).
[m] DeGraaf & Rudis (1986). Rufous-sided towhee home range taken from savanna sparrow average (similar species).
[n] Average of adult male and female foxes in spring (USEPA, 1993a).
[o] Median of mean weights for male and female raccoons in Alabama (USEPA, 1993a).
[p] Average of adult male and female raccoons from May to December (USEPA, 1993a).
[q] Median of mean weights reported for adult male and female American woodcocks (USEPA, 1993a).
[r] Terres (1991).
[s] Great horned owl home range taken from low end of range in SE Madison County, NY (Hager, 1957).
[t] As reported estimating from allometric equation for wading birds, assuming a body weight of 2,230 g (USEPA, 1993a).
[u] Size of heron feeding territory in summer (USEPA, 1993a).
[v] Reported population density of herons for Maine/coastal islands in summer (USEPA, 1993a).
[w] Average of male and female muskrat body weights during winter in Tennessee (USEPA, 1993a).
[x] Average of mean home range values for muskrats in early and late summer in Ontario bay (USEPA, 1993a).
[y] Population density of breeding muskrats in Louisiana marshes (USEPA, 1993a).
[z] Calculated using the seabird bird equation based on body weight (Wt.) in kg. Food ingestion (kg/day) = $0.495 \times Wt^{0.704}$ (USEPA, 1993a).
[aa] Foraging radius for adult male and female ospreys in Nova Scotia coastal waters (USEPA, 1993a).
[ab] Population density for adult male and female ospreys in Florida wetlands (USEPA, 1993a).

Table S-2.2
Summary of Bioaccumulation and Bioconcentration Data for Non-Radiological Analytes

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Analyte	log K_{ow}	[b]	Bioaccumulation Factor [a]					Bioconcentration Factor [a]
			Invertebrate [c]	Plant [d]	Mammal [e]	Bird [f]	Aquatic [g]	Fish
SEMIVOLATILES								
Acenaphthene	3.9	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	3.9E+02 [h]
Acenaphthylene	4.1	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	6.9E+02 [i]
Anthracene	4.5	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	1.4E+03 [i]
Benzo(a)anthracene	5.7	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	1.3E+04 [i]
Benzo(a)pyrene	6	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	3.0E+01 [h]
Benzo(b)fluoranthene	6.1	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	2.6E+04 [i]
Benzo(g,h,i)perylene	6.6	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	6.5E+04 [i]
Benzo(k)fluoranthene	6.1	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	2.6E+04 [i]
Benzoic acid	1.9	1.9	5.0E-02	6.2E-01	1.5E-01	1.5E-01	1.5E-01	NA
Butylbenzylphthalate	4.9	6.1	5.0E-02	2.3E-03	1.9E+00	1.9E+00	1.9E+00	6.6E+02 [h]
Carbazole	3.76 [j]	3.76	5.0E-02	5.2E-02	1.5E-01	1.5E-01	1.5E-01	3.7E+02 [i]
Chrysene	5.7	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	1.3E+04 [i]
Dibenz(a,h)anthracene	6.5	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	5.4E+04 [i]
Dibenzofuran	4.1	4.1	5.0E-02	3.3E-02	1.5E-01	1.5E-01	1.5E-01	6.9E+02 [i]
Di-n-butylphthalate	5.2	6.1	5.0E-02	2.3E-03	1.9E+00	1.9E+00	1.9E+00	5.1E+03 [i]
Di-n-octylphthalate	9.2	6.1	5.0E-02	2.3E-03	1.9E+00	1.9E+00	1.9E+00	9.3E+03 [h]
bis(2-Ethylhexyl)phthalate	5.1	6.1	5.0E-02	2.3E-03	1.9E+00	1.9E+00	1.9E+00	3.1E+02 [h]
Fluoranthene	4.95 [k]	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	3.2E+03 [i]
Fluorene	4.2	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	8.3E+02 [i]
Indeno(1,2,3-c,d)pyrene	6.6	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	6.5E+04 [i]
2-Methylnaphthalene	3.86 [l]	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	4.3E+02 [h]
4-Methyphenol	1.9	1.7	5.0E-02	8.1E-01	1.5E-01	1.5E-01	1.5E-01	1.3E+01 [i]
Naphthalene	3.6	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	4.3E+02 [h]
Phenanthrene	4.5	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	1.4E+03 [i]
Phenol	1.5	1.7	5.0E-02	8.1E-01	1.5E-01	1.5E-01	1.5E-01	7.8E+02 [h]
Pyrene	5.3	5.2	5.0E-02	7.6E-03	2.4E-01	2.4E-01	2.4E-01	6.1E+03 [i]
1,2,4-Trichlorobenzene	4.3	4.3	5.0E-02	2.5E-02	1.5E-01	1.5E-01	1.5E-01	NA
PESTICIDES/PCBs								
Aldrin	3		5.6E-01 [m]	1.4E-01	2.3E-01 [n]	1.2E+00 [n]	2.3E-01	1.1E+04 [n]
Aroclor-1248	5.7 [o]		5.8E+00 [p]	1.2E-01 [q]	3.8E+00 [r]	3.2E-01 [s]	1.2E+01 [t]	7.1E+03 [n]
Aroclor-1254	6 [o]		5.8E+00 [p]	1.2E-01 [q]	3.8E+00 [r]	3.2E-01 [s]	1.2E+01 [t]	5.0E+04 [n]
Aroclor-1260	7.1 [o]		5.8E+00 [p]	1.2E-01 [q]	3.8E+00 [r]	3.2E-01 [s]	1.2E+01 [t]	1.0E+07 [h]
alpha-BHC	3.8		2.6E+00 [u]	4.9E-02	1.5E-06	2.1E-01 [n]	1.5E-06	6.2E+02 [n]
gamma-BHC (Lindane)	4.1		2.6E+00 [m]	3.3E-02	1.3E-01 [n]	1.5E-01 [n]	1.3E-01	4.5E+02 [n]
alpha-Chlordane	5.5		1.6E+00 [v]	5.1E-03	5.5E-01 [w]	1.8E+00 [x]	5.5E-01	3.8E+04 [n]
gamma-Chlordane	5.5		1.6E+00 [y]	5.1E-03	5.5E-01 [w]	1.8E+00 [x]	5.5E-01	3.8E+04 [n]
4,4'-DDD	6		3.3E+00 [z]	1.0E-02 [aa]	1.2E+00 [ab]	2.9E+00 [ac]	2.1E+01 [ad]	1.7E+05 [h]
4,4'-DDE	5.7		1.7E+00 [z]	1.0E-02 [aa]	1.2E+00 [ab]	2.9E+00 [ac]	2.1E+01 [ad]	5.1E+04 [n]
4,4'-DDT	6.4		5.7E-01 [z]	1.0E-02 [aa]	1.2E+00 [ab]	2.9E+00 [ac]	2.1E+01 [ad]	3.4E+03 [ae]
Dieldrin	4.6		5.5E+00 [m]	1.7E-02	1.5E+00 [af]	4.4E-01 [ag]	1.5E+00	1.4E+04 [n]
Heptachlor	4.3		1.0E+00 [ah]	2.5E-02	4.7E-02 [n]	6.0E-01 [n]	4.7E-02	1.4E+04 [n]
Heptachlor epoxide	5.4		1.0E+00 [y]	5.9E-03	3.5E-01 [n]	1.4E+00 [n]	3.5E-01	1.4E+04 [n]
INORGANICS								
Aluminum	NA		7.5E-02 [ai]	8.0E-04 [aj]	7.5E-02 [ak]	7.5E-02	7.5E-02	9.5E+01 [h]
Antimony	NA		5.0E-02 [ai]	4.0E-02 [aj]	5.0E-02 [ak]	5.0E-02	5.0E-02	1.0E+00 [h]
Arsenic	NA		6.6E-03 [al]	3.0E-01 [am]	1.0E-01 [ak]	1.0E-01	1.0E-01	2.8E+02 [h]
Barium	NA		7.5E-03 [ai]	3.0E-02 [aj]	7.5E-03 [ak]	7.5E-03	7.5E-03	4.0E+00 [h]
Beryllium	NA		5.0E-02 [ai]	2.0E-03 [aj]	5.0E-02 [an]	5.0E-02	5.0E-02	2.0E+00 [h]
Cadmium	NA		1.4E+00 [ao]	3.3E+01 [ap]	2.1E+00 [ak]	3.8E-01 [aq]	2.1E+00	2.5E+01 [ae]
Chromium	NA		1.6E-01 [p]	1.5E-03 [aj]	2.8E-01 [ak]	2.8E-01	2.8E-01	2.0E+02 [h]
Cobalt	NA		1.0E+00 [ai]	4.0E-03 [aj]	1.0E+00 [ak]	1.0E+00	1.0E+00	3.0E+02 [h]
Copper	NA		1.6E-01 [p]	7.8E-01 [ar]	6.0E-01 [ai]	6.0E-01	6.0E-01	1.0E+01 [ae]
Cyanide	NA		0.0E+00 [as]	1.0E+00 [at]	0.0E+00 [as]	0.0E+00	0.0E+00	0.0E+00 [h]
Iron	NA		NA	NA	NA	NA	NA	2.7E+03 [ae]
Lead	NA		7.8E-02 [au]	NA [an]	1.5E-02 [ak]	1.5E-02	1.5E-02	4.0E+00 [ae]

Table S−2.2
Summary of Bioaccumulation and Bioconcentration Data for Non−Radiological Analytes

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Analyte	log K_{ow} [b]	Bioaccumulation Factor [a]					Bioconcentration Factor [a]
		Invertebrate [c]	Plant [d]	Mammal [e]	Bird [f]	Aquatic [g]	Fish
Manganese	NA	2.0E−02 [ai]	5.0E−02 [aj]	2.0E−02 [ak]	2.0E−02	2.0E−02	1.5E+03 [ae]
Mercury	NA	6.8E−02 [av]	1.8E−01 [aj]	1.0E−02 [aw]	2.3E+00 [aw]	1.7E+01 [ax]	6.3E+04 [h]
Nickel	NA	2.3E−01 [ay]	1.2E−02 [aj]	3.0E−01 [ak]	3.0E−01	3.0E−01	1.0E+02 [h]
Selenium	NA	7.6E−01 [ak]	9.0E−03 [az]	7.5E−01 [ak]	5.1E−01 [ba]	7.5E−01	8.0E+00 [h]
Silver	NA	1.5E−01 [ai]	8.0E−02 [aj]	1.5E−01 [ak]	1.5E−01	1.5E−01	2.0E+00 [h]
Thallium	NA	2.0E+00 [ai]	8.0E−04 [aj]	2.0E+00 [ak]	2.0E+00	2.0E+00	NA
Vanadium	NA	1.3E−01 [ai]	1.1E−03 [aj]	1.3E−01 [ak]	1.3E−01	1.3E−01	1.0E−02 [h]
Zinc	NA	1.8E+00 [p]	6.1E−01 [ar]	2.1E+00 [ak]	2.1E+00	2.1E+00	1.6E+02 [ae]
DIOXINS							
1,2,3,4,6,7,8−HpCDD	NA	1.4E−02 [bb]	0.0E+00	1.3E−02 [bc]	1.3E−02 [bd]	8.1E−03 [be]	NA
1,2,3,4,6,7,8−HpCDF	NA	1.4E−03 [bb]	0.0E+00	1.3E−03 [bc]	1.3E−03 [bd]	8.1E−04 [be]	NA
OCDD	NA	9.6E−03 [bb]	0.0E+00	8.6E−03 [bc]	8.6E−03 [bd]	5.4E−03 [be]	NA
OCDF	NA	2.4E−03 [bb]	0.0E+00	2.2E−03 [bc]	2.2E−03 [bd]	1.4E−03 [be]	NA
2,3,7,8−TCDF	NA	5.8E−01 [bb]	0.0E+00	5.2E−01 [bc]	5.2E−01 [bd]	3.2E−01 [be]	NA

NOTES:

[a] Units for bioaccumulation factors (BAFs) are mg/kg fresh wt tissue over mg/kg dry wt soil for invertebrates and plants, and mg/kg fresh wt tissue over mg/kg fresh wt. food for small mammals and small birds. No BAFs were calculated for VOAs since available evidence suggests that these analytes do not bioaccumulate. Units for bioconcentration factors (BCFs) are μg/kg fresh wt. tissue over μg/L water.

[b] From Superfund Chemical Data Matrix (USEPA, 1993b) unless otherwise noted. Log K_{ow}s for classes of semivolatile compounds were averaged to provide an average BAF value. Compounds were grouped accordingly: PAHs (5.2), phthalates (6.1), phenols (1.7), dibenzofuran (4.1), carbazole (3.76), 1,2,4−trichlorobenzene (4.3), and benzoic acid (1.9).

[c] Average of earthworm BAFs (Beyer, 1990) converted from dry weight to wet weight assuming earthworm is 80% water, unless otherwise noted.

[d] Plant BAF calclulated using the following equation presented by Travis and Arms (1988) unless otherwise noted: log (Plant Uptake Factor)=1.588−0.578 (log Kow). Converted from dry weight to wet weight plant concentration assuming 80% water content of earthworms

[e] Calculated using the following equation in Travis and Arms (1988) for semivolatile organic analytes with log K_{ow}s >5: log BTF (biotransfer factor) = log K_{ow} − 7.6; result multiplied by average ingestion rates for non−lactating and lactating test animals to convert from BTFs to BAFs, and divided by a factor of 0.2 to convert from dry feed to fresh feed. There is an uncertainty involved in using this equation for PAHs because this study did not use any PAHs in the regression analysis. When no literature values were available, BAFs were calculated for pesticides and PCBs, regardless of the log K_{ow}, due to the tendancy of these lipophylic compounds to bioaccumulate. With the exception of pesticides and PCBs, BAFs for analytes with log K_{ow}s < 5 are assumed to be 0.15 because they are unlikely to bioaccumulate in animal tissue (Maughan, 1993).

[f] Small mammal BAF used unless otherwise noted.

[g] Used to represent bioaccumulation from sediment to fish and aquatic invertebrates, however, unless otherwise noted mammalian BAFs are used for aquatic BAFs.

[h] From Barnthouse et al. (1988) unless otherwise noted. The value for naphthalene was used as a surrogate for 2−methylnaphthalene.

[i] Fish BCFs calculated from Veith et al. (1985) using the following regression equation: log (BCF) = 0.79 log K_{ow} − 0.40

[j] Hansch and Leo (1979)

[k] USEPA (1992), Dermal Exposure Guidance.

[l] ATSDR, 1993a (Toxicological Profile for Naphthalene).

[m] Geometric mean of reported BAFs for earthworms (Edwards & Thompson, 1973). Values provided by Gish (1970) were converted from dry weight to wet weight by multiplying by a conversion factor of 0.2 assuming 80% water composition of earthworms.

[n] BAFs from Garten & Trabalka (1983) were converted from (mg/kg of fat)/(mg/kg of diet) to (mg/kg fresh wt.)/(mg/kg diet) by multiplying the value by an assumed fat content of 10%. Poultry and small bird values were used for bird BAFs, and rodent, dog, swine, and cow values were used for mammal BAFs. Dog values were used for endrin and it's derivatives. Rodent values were used for endosulfan (and it's derivatives) and gamma−BHC. Swine values were used for methoxychlor, aldrin, and heptachlor. Cow values were used for heptachlor epoxide. Small bird values were used for 4,4'−DDD, 4,4'−DDE, and 4,4'−DDT. Poultry values were used for endrin, alpha−BHC, beta−BHC, gamma−BHC, aldrin, endrin, heptachlor, and heptachlor epoxide.

[o] USEPA (1990a) − Basics of Pump−and−Treat Ground−Water Remediation Technology

[p] BCF for earthworms from Diercxsens et al. (1985).

[q] Arithmetic mean BAF for corn, leaves, carrots, beets, surgarbeets, radishes, and soybeans (tops, roots, and whole plants) from USEPA (1985a) and Webber et al. (1983).

[r] BAF calculated from discussion in Eisler (1986) stating that Aroclor 1254 residues in subcutaneous fat of adult minks were up to 38 times dietary levels. Converted to whole body concentrations assuming 10% lipid content.

[s] BAF calculated from data presented in Eisler, 1986. Kestrels fed 33 mg PCB/kg diet for 62−69 days accumulated 107 mg PCB/kg lipid weight in muscle. Assuming muscle is 10% lipid content, the muscle concentration is about 10.7 mg/kg.

[t] Amphipod to sediment mean biomagnification factor for total PCBs in Lake Michigan and Lake Ontario (Evans et al., 1991).

[u] Value for gamma−BHC used as a surrogate

[v] Value for gamma−chlordane used as a surrogate

[w] BAF calculated from data presented in Eisler, 1990. Rats fed 20 mg/kg diet technical chlordane (equivalent to 3.6 mg/kg diet cis− and trans−chlordane) for 350 days accumulated 20 mg/kg in lipids. Assuming 10% lipid content, the whole body concentration is

Table S–2.2
Summary of Bioaccumulation and Bioconcentration Data for Non–Radiological Analytes

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

		Bioaccumulation Factor [a]					Bioconcentration Factor [a]
Analyte	log K_{ow} [b]	Invertebrate [c]	Plant [d]	Mammal [e]	Bird [f]	Aquatic [g]	Fish

about 2 mg/kg.

[x] BAF calculated from data presented in Eisler, 1990. Red–winged blackbirds fed 10 mg/kg diet technical chlordane (equivalent to 1.8 mg/kg diet cis– and trans– chlordane) for 84 days accumulated 1.8 mg/kg wet weight whole body residue.

[y] Geometric mean of reported BAFs for earthworms (Gish, 1970) converted from dry weight to wet weight assuming 80% water composition of earthworms.

[z] Geometric means of 4,4'–DDT [Davis (1968), Davis & Harrison (1966), Wheatley & Hardman (1968), Bailey et al. (1970), Cramp & Olney (1967), and Beyer & Gish (1980)], 4,4'–DDE [Davis (1968), Davis & Harrison (1966), Cramp & Olney (1967), Collett & Harrison (1968), Hunt & Sacho (1969), and Gish (1970)], and 4,4–DDD [Barker (1958), Davis (1968), Davis & Harrison (1966), Cramp & Olney (1967), Collett & Harrison (1968), Wheatley & Hardman (1968), Hunt & Sacho (1969), Bailey et al. (1970), Dimond et al. (1970), Gish (1970), and Beyer & Gish (1980)] reported for earthworms. Dry soil concentrations calculated assuming 10% moisture content in sandy–loam soils (Donahue et al., 1977).

[aa] Geometric mean of 4,4'–DDT, 4,4'–DDD, and 4,4'–DDE BAFs (fresh wt/dry wt) reported for roots (carrot, potato, sugar beet), grains (corn, oats), and legumes (alfalfa) derived from USEPA (1985b) converted from dry weight to wet–weight per values provided by Suter (1993).

[ab] BAF for shrews and voles calculated using measured concentrations of DDT_R in stomach content and in whole body (Forsyth & Petrle, 1984).

[ac] Whole–body pheasant BAF for 4,4'–DDT presented in USEPA (1985b); derived from Kenaga (1973).

[ad] Amphipod to sediment mean biomagnification factor for total DDT in Lake Michigan and Lake Ontario (Evans et al., 1991).

[ae] Geometric mean of BCFs obtained from AQUIRE (1994) and AWQC documents (calculated in Appendix S–2, Table S–2.4).

[af] BAF calculated from data presented by Potter et al (1974). Based on an average dieldrin concentration in cow muscle and fat of 0.17 mg/kg (dry weight) and a dieldrin concentration of 0.11 mg/kg in the diet (dry weight).

[ag] Jeffries and Davis (1968).

[ah] Value for heptachlor epoxide used as a surrogate.

[ai] Prey–specific value not available; value shown is small mammal BAF for this chemical.

[aj] Value from Baes et al. (1984) for leafy portions of plants multiplied by 0.2 to represent 80% water composition of plants.

[ak] Value derived from biotransfer factors (BTFs), presented in Baes et al. (1984) for uptake into cattle. BTF converted to BAF by multiplying by food ingestion rate of 50 kg/day wet weight.

[al] Average of values for industrial soils from Beyer and Cromartie (1987) multiplied by 0.2 to represent 80% water composition in earthworms.

[am] Average of BAF values reported from Wang et al. (1984), Sheppard et al. (1985), and Merry et al. (1986).

[an] Mean of values reported for *Sorex araneus* in MacFadyen (1980).

[ao] Mean of values reported for soil invertebrates in MacFadyen (1980) converted from dry weight to wet weight.

[ap] Mammal value for copper and plant value for cadmium from Levine et al., 1989. Lead does not accumulate in plant tissue, therefore, a BAF of zero was assigned.

[aq] Based on accumulation of cadmium in kidneys of European quail in Pimentel et al. (1984).

[ar] Median of values reported from Levine et al. (1989).

[as] Cyanide has not been shown to bioaccumulate in any organisms.

[at] Cyanide is naturally occurring in some plants; the extent to which it is taken up from soil is unknown and therefore a BAF of 1 is conservatively assumed.

[au] Geometric mean of BAF values (fresh wt./dry wts) for worms and woodlice (USEPA, 1985c). Fresh weight tissue concentrations calculated assuming 80% body water content.

[av] Uptake value (fresh wt./dry wt.) for earthworms from USEPA (1985d) sludge document. Fresh weight tissue concentrations calculated assuming 80% body water content.

[aw] USEPA, 1985d.

[ax] Based on the ranges of mercury concentrations in sediment and macroinvertebrates in an eight lake ecosystem in Sweden. Sediment concentrations ranged from 0.05 to 0.3 μg/g dry weight (mid point = 0.18 μg/g) and macroinvertebrate concentrations ranged from 0.02 to 6 μg/g dry weight (mid point = 3.01 μg/g). Based on these midpoints, a bioaccumulation factor of 16.7 was obtained.

[ay] Value from nickel sludge document (USEPA, 1985e) multiplied by 0.2 to represent 80% water composition of earthworms.

[az] Based on reported ratio of selenium in plant tissue and iron fly ash amended soil (Stoewsand et al., 1978).

[ba] Based on average of reported ratio of selenium in diet to liver, kidney, and breast tissue of chickens (Eisler, 1985a).

[bb] Invertebrate BAF obtained from USEPA (1993b) by multiplying the TCDD Biota–Sediment Accumulation Factor (BSAF) for the sandworm by the congener–specific Bioaccumulation Equivalency Factor (BEF).

[bc] Bird value used as a surrogate.

[bd] Bird BAF obtained from USEPA (1993b) by multiplying the TCDD Biota–Sediment Accumulation Factor (BSAF) for the herring gull by the congener–specific Bioaccumulation Equivalency Factor (BEF).

[be] Aquatic BAF obtained from USEPA (1993b) by multiplying the TCDD Biota–Sediment Accumulation Factor (BSAF) for the carp by the congener–specific Bioaccumulation Equivalency Factor (BEF).

NA = Not Available

Table S-2.3
Summary of Bioaccumulation and Bioconcentration Data for Radiological Analytes

Baseline Ecological Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

RADIONUCLIDE	BIOACCUMULATION FACTOR [a]		BIOCONCENTRATION FACTOR [b]			
			Freshwater		Marine	
	Soil/Plant [c]	Plant/Animal [d]	Invertebrates	Fish	Invertebrates	Fish
Actinium-228	5.2E-04	1.3E-03	1.0E+00 [e]	2.5E-02 [e]	1.0E+00 [e]	2.5E-02 [e]
Bismuth-212	5.3E-03	2.0E-02	1.0E+02	1.5E-02	1.0E+02	1.5E-02
Bismuth-212	5.3E-03	2.0E-02	1.0E+02	1.5E-02	1.0E+02	1.5E-02
Cesium-137	1.2E-02	1.0E+00	1.0E-01	4.0E-01	1.0E+02	3.0E-02
Lead-212	6.7E-03	1.5E-02	1.0E-01	3.0E-01	1.0E+02	3.0E-01
Lead-214	6.7E-03	1.5E-02	1.0E-01	3.0E-01	1.0E+02	3.0E-01
Potassium-40	1.5E-01	1.0E+00	8.3E-01 [e]	1.0E+00 [e]	6.6E-03 [e]	1.1E-02 [e]
Radium-226	2.2E-03	1.3E-02	2.5E-01	5.0E-02	1.0E-01	5.0E-02
Radium-228	2.2E-03	1.3E-02	2.5E-01	5.0E-02	1.0E-01	5.0E-02
Thallium-208	6.0E-04	2.0E+00	1.5E+01 [e]	1.0E+01 [e]	1.5E+02 [e]	1.0E+01 [e]
Uranium-235	1.3E-03	1.0E-02	1.0E-01	1.0E-02	1.0E-02	1.0E-02

NOTES:

[a] Units for bioaccumulation factors (BAFs) are mg/kg fresh wt tissue over mg/kg dry wt soil for invertebrates and plants, and mg/kg fresh wt tissue over mg/kg fresh wt. food for small mammals and small birds.

[b] Units for bioconcentration factors (BCFs) are μg/g fresh wt. tissue over μg/L water. Values provided in ORNL, 1976 unless otherwise noted. Units reported in uCi/gram tissue over uCi/ml water and were converted to liters per gram by dividing by 1000.

[c] Elemental soil-to-plant concentration factors (unitless) provided in Baes et al., 1984; adjusted to a wet-weight basis assuming a water content of 85% in plants

[d] Elemental forage-to-beef transfer coefficients provided in Baes et al., 1984; converted to a unitless BAF (wet weight basis) assuming a cow consumes 50 kg wet feed per day.

[e] Values provided by UCRL, 1972. Units in ppm wet weight/ppm water concentration and were converted to liters per gram by dividing by 1000.

Table S–2.4
Bioconcentration Data

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
Pesticides								
4,4'–DDT	Pimephales promelas; Fathead minnow	ADULT	32 days	6.5	29,400	10.2887499	AQUIRE, 1994 210616	79
	Ulva rigida; Green algae	NR	7 days	1,000	152	5.02388052	AQUIRE, 1994 217588	74
	Ulva rigida; Green algae	NR	7 days	1,000	159	5.06890420	AQUIRE, 1994 217588	74
	Ulva rigida; Green algae	NR	7 days	1,000	1,983	7.59236612	AQUIRE, 1994 217588	74
	Ulva rigida; Green algae	NR	7 days	1,000	319	5.76519110	AQUIRE, 1994 217588	74
	Ulva rigida; Green algae	NR	7 days	1,000	1,062	6.96790920	AQUIRE, 1994 217588	74
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	24 hours	0.761	440	6.08677472	AQUIRE, 1994 212045	73
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	48 hours	0.761	610	6.41345895	AQUIRE, 1994 212045	73
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	72 hours	0.761	2,230	7.70975686	AQUIRE, 1994 212045	73
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	96 hours	0.761	1,980	7.59085212	AQUIRE, 1994 212045	73
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	5 days	0.761	3,060	8.02617019	AQUIRE, 1994 212045	73
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	7 days	0.761	2,900	7.97246601	AQUIRE, 1994 212045	73
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	8 days	0.761	8,250	9.01796847	AQUIRE, 1994 212045	73
	Ephemera danica; Mayfly	1.5 YR, 21–23 MM, NYMPH	9 days	0.761	2,860	7.95857690	AQUIRE, 1994 212045	73
	Calanus sp; Calanoid copepod	STAGES IV AND V	24 hours	0.212	20,000	9.90348755	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	24 hours	0.15	30,000	10.3089526	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	7 days	0.195	129,000	11.7675676	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	7 days	0.213	115,000	11.6526874	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	10 days	0.199	259,000	12.4645833	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	14 days	0.21	182,000	12.1117619	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	14 days	0.178	304,000	12.6247829	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	14 days	0.247	194,000	12.1756134	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	21 days	0.277	228,000	12.3371009	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	21 days	0.223	230,000	12.3458345	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	21 days	0.239	267,000	12.4950039	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	28 days	0.267	397,000	12.8916915	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	28 days	0.271	255,000	12.4490188	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	28 days	0.346	134,000	11.8055950	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	35 days	0.131	73,600	11.2064003	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	35 days	0.211	402,000	12.9042073	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	35 days	0.34	154,000	11.9447078	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	42 days	0.211	475,000	13.0710700	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	42 days	0.385	178,000	12.0895388	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	49 days	0.449	161,000	11.9891596	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	49 days	0.43	114,000	11.6439537	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	56 days	0.382	196,000	12.1858699	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	56 days	0.392	220,000	12.3013828	AQUIRE, 1994 210427	75
	Calanus sp; Calanoid copepod	STAGES IV AND V	56 days	0.458	60,900	11.0169884	AQUIRE, 1994 210427	75
	Culex pipiens quinquefasciata; Mosquito	NR	72 hours	2	110	4.70048036	AQUIRE, 1994 210740	73
	Gambusia affinis; Mosquitofish	NR	24 hours	2	300	5.70378247	AQUIRE, 1994 210740	73
	Gambusia affinis; Mosquitofish	NR	48 hours	2	300	5.70378247	AQUIRE, 1994 210740	73
	Gambusia affinis; Mosquitofish	NR	72 hours	2	344	5.84064165	AQUIRE, 1994 210740	73
	Daphnia magna; Water flea	NR	24 hours	2	1,170	7.06475902	AQUIRE, 1994 210740	73
	Daphnia magna; Water flea	NR	48 hours	2	1,570	7.35883089	AQUIRE, 1994 210740	73

Table S-2.4
Bioconcentration Data

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
4,4'-DDT (cont.)	Daphnia magna; Water flea	NR	72 hours	2	1,330	7.19293422	AQUIRE, 1994 210740	73
	Culex pipiens quinquefasciata; Mosquito	NR	24 hours	2	515	6.24416690	AQUIRE, 1994 210740	73
	Culex pipiens quinquefasciata; Mosquito	NR	48 hours	2	165	5.10594547	AQUIRE, 1994 210740	73
	Lepomis macrochirus; Bluegill	0.49 G, 3.0-5.1 CM, JUVENILE	5 days	0.249	23,000	10.0432494	AQUIRE, 1994 216498	80
	Lepomis macrochirus; Bluegill	0.49 G, 3.0-5.1 CM, JUVENILE	5 days	0.028	25,000	10.1266311	AQUIRE, 1994 216498	80
	Lepomis macrochirus; Bluegill	0.49 G, 3.0-5.1 CM, JUVENILE	28 days	0.249	24,000	10.0858091	AQUIRE, 1994 216498	80
	Lepomis macrochirus; Bluegill	0.49 G, 3.0-5.1 CM, JUVENILE	28 days	0.028	25,000	10.1266311	AQUIRE, 1994 216498	80
	Salvelinus namaycush; Lake trout, siscowet	YEARLING, 29.5 G	90 days	0.006 to 0.009	52,750	10.8733190	AQUIRE, 1994 212049	74
	Salvelinus namaycush; Lake trout, siscowet	YEARLING, 29.5 G	120 days	0.006 to 0.009	44,286	10.6984238	AQUIRE, 1994 212049	74
	Salvelinus namaycush; Lake trout, siscowet	YEARLING, 29.5 G	152 days	0.006 to 0.009	45,250	10.7199579	AQUIRE, 1994 212049	74
	Pimephales promelas; Fathead minnow	45 D	266 days	1.48	1.2	0.18232155	AQUIRE, 1994 210534	77
	Pimephales promelas; Fathead minnow	45 D	266 days	1.53	99,000	11.5028751	AQUIRE, 1994 210534	77
	Crassostrea gigas; Pacific oyster	JUVENILE	7 days	10	15,100	9.62245002	AQUIRE, 1994 210646	64
	Crassostrea gigas; Pacific oyster	JUVENILE	40 days	1	30,000	10.3089526	AQUIRE, 1994 210646	64
	Crassostrea gigas; Pacific oyster	JUVENILE	40 days	0.1	70,000	11.1562505	AQUIRE, 1994 210646	64
	Astacus leptodactylus; Crayfish	6.8 G	NR	50	242	5.48893772	AQUIRE, 1994 218908	73
	Styela plicata; Sea squirt	NR	10 days	100	200	5.29831736	AQUIRE, 1994 210646	64
	Styela plicata; Sea squirt	NR	10 days	10	1,000	6.90775527	AQUIRE, 1994 210646	64
	Lanice conchilega; Polychaete	NR	67 hours	0.06	208	5.33897934	AQUIRE, 1994 219232	72
	Lanice conchilega; Polychaete	NR	67 hours	0.11	273	5.60837228	AQUIRE, 1994 219232	72
	Lanice conchilega; Polychaete	NR	48 hours	1.12	75	4.31748811	AQUIRE, 1994 219232	72
	Lanice conchilega; Polychaete	NR	48 hours	2.24	83.5	4.42484663	AQUIRE, 1994 219232	72
	Lanice conchilega; Polychaete	NR	48 hours	11.2	70.4	4.25419326	AQUIRE, 1994 219232	72
	Lanice conchilega; Polychaete	NR	31 days	2.24	2,286	7.73455884	AQUIRE, 1994 219232	72
	Lanice conchilega; Polychaete	NR	31 days	2.24	4,643	8.44311598	AQUIRE, 1994 219232	72
	Nereis diversicolor; Polychaete	NR	7 hours	30	283	5.64544689	AQUIRE, 1994 219232	72
	Nereis diversicolor; Polychaete	NR	24 hours	30	490	6.19440539	AQUIRE, 1994 219232	72
	Nereis diversicolor; Polychaete	NR	5 days	0.3	2,033	7.61726781	AQUIRE, 1994 219232	72
	Nereis diversicolor; Polychaete	NR	5 days	0.75	1,653	7.41034709	AQUIRE, 1994 219232	72
	Nereis diversicolor; Polychaete	NR	5 days	3	1,400	7.24422751	AQUIRE, 1994 219232	72
	Siphlonurus sp; Mayfly	NYMPH	24 hours	0.047	10,200	9.23014299	AQUIRE, 1994 219364	71
	Siphlonurus sp; Mayfly	NYMPH	48 hours	0.047	20,000	9.90348755	AQUIRE, 1994 219364	71
	Siphlonurus sp; Mayfly	NYMPH	72 hours	0.047	22,900	10.0388921	AQUIRE, 1994 219364	71
	Ischnura verticalis; Damselfly	NAIAD	48 hours	0.1013	3,500	8.16051824	AQUIRE, 1994 219364	71
	Libellula sp; Dragonfly	NAIAD	48 hours	0.0793	910	6.81344459	AQUIRE, 1994 219364	71
	Palaemonetes kadiakensis; Grass shrimp	MATURE ADULT	48 hours	0.1	3,700	8.21608809	AQUIRE, 1994 219364	71
	Palaemonetes kadiakensis; Grass shrimp	MATURE ADULT	72 hours	0.1	5,000	8.51719319	AQUIRE, 1994 219364	71
	Hexagenia bilineata; Mayfly	Hexagenia bilineata; Mayfly	24 hours	0.0521	9,400	9.14846496	AQUIRE, 1994 219364	71
	Hexagenia bilineata; Mayfly	Hexagenia bilineata; Mayfly	48 hours	0.0521	16,700	9.72316399	AQUIRE, 1994 219364	71
	Hexagenia bilineata; Mayfly	Hexagenia bilineata; Mayfly	72 hours	0.0521	32,600	10.3920675	AQUIRE, 1994 219364	71
	Gammarus fasciatus; Scud	MATURE ADULT	72 hours	0.0813	20,600	9.93304635	AQUIRE, 1994 219364	71
	Orconectes nais; Crayfish	MATURE ADULT	24 hours	0.0803	880	6.77992190	AQUIRE, 1994 219364	71
	Orconectes nais; Crayfish	MATURE ADULT	48 hours	0.0803	2,100	7.64969262	AQUIRE, 1994 219364	71
	Orconectes nais; Crayfish	MATURE ADULT	72 hours	0.0803	2,900	7.97246601	AQUIRE, 1994 219364	71
	Palaemonetes kadiakensis; Grass shrimp	MATURE ADULT	24 hours	0.1	1,500	7.31322038	AQUIRE, 1994 219364	71

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
4,4'-DDT (cont.)	Daphnia magna; Water flea	MATURE ADULT	24 hours	0.0803	25,400	10.1425044	AQUIRE, 1994 219364	71
	Daphnia magna; Water flea	MATURE ADULT	48 hours	0.0803	69,100	11.1433100	AQUIRE, 1994 219364	71
	Daphnia magna; Water flea	MATURE ADULT	72 hours	0.0803	114,100	11.6448305	AQUIRE, 1994 219364	71
	Gammarus fasciatus; Scud	MATURE ADULT	24 hours	0.0813	4,600	8.43381158	AQUIRE, 1994 219364	71
	Gammarus fasciatus; Scud	MATURE ADULT	48 hours	0.0813	12,100	9.40096073	AQUIRE, 1994 219364	71
	Chironomus sp; Midge	LARVAE	24 hours	0.0463	7,800	8.96187901	AQUIRE, 1994 219364	71
	Chironomus sp; Midge	LARVAE	48 hours	0.0463	24,500	10.1064283	AQUIRE, 1994 219364	71
	Chironomus sp; Midge	LARVAE	72 hours	0.0463	47,800	10.7747809	AQUIRE, 1994 219364	71
	Culex pipiens; Mosquito	LARVAE	48 hours	0.1046	133,600	11.8026055	AQUIRE, 1994 219364	71
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	24 hours	0.14	71.4	4.26829786	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	96 hours	0.14	143	4.96284463	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	7 days	0.14	429	6.06145691	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	10 days	0.14	1,214	7.10167597	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	13 days	0.14	1,500	7.31322038	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	16 days	0.14	1,143	7.04141166	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	19 days	0.14	1,000	6.90775527	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	22 days	0.14	857	6.75343791	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	7.6 CM, 3.8 G	56 days	0.05	8,600	9.05951748	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	7.6 CM, 3.8 G	56 days	0.05	6,800	8.82467789	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	56 days	0.05	2,600	7.86326672	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	56 days	0.05	1,200	7.09007683	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	56 days	0.05	1,000	6.90775527	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	56 days	0.05	400	5.99146454	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	56 days	0.05	200	5.29831736	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	56 days	0.05	800	6.68461172	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 13.3 CM, 21.1 G	28 days	0.12	336,667	12.7268495	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 13.3 CM, 21.1 G	28 days	0.12	18,333	9.81645799	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 13.3 CM, 21.1 G	28 days	0.12	16,417	9.70607266	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 13.3 CM, 21.1 G	28 days	0.12	15,500	9.64859530	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	28 days	0.12	14,083	9.55272367	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	28 days	0.12	5,500	8.61250337	AQUIRE, 1994 219655	70
	Penaeus duorarum; Pink shrimp (america)	ADULT, 6.4 CM, 3.6 G	28 days	0.12	1,583	7.36707705	AQUIRE, 1994 219655	70
	Penaeus setiferus; White shrimp (america)	ADULT, 16.2 CM, 28.0 G	18 days	0.2	55,000	10.9150884	AQUIRE, 1994 219655	70
	Penaeus setiferus; White shrimp (america)	ADULT, 16.2 CM, 28.0 G	18 days	0.2	1,800	7.49554194	AQUIRE, 1994 219655	70
	Penaeus setiferus; White shrimp (america)	ADULT, 16.2 CM, 28.0 G	18 days	0.2	200	5.29831736	AQUIRE, 1994 219655	70
	Penaeus setiferus; White shrimp (america)	ADULT, 16.2 CM, 28.0 G	18 days	0.2	2,750	7.91935619	AQUIRE, 1994 219655	70
	Penaeus setiferus; White shrimp (america)	ADULT, 16.2 CM, 28.0 G	18 days	0.2	2,300	7.74066440	AQUIRE, 1994 219655	70
	Penaeus setiferus; White shrimp (america)	ADULT, 16.2 CM, 28.0 G	18 days	0.2	4,300	8.36637030	AQUIRE, 1994 219655	70
	Penaeus setiferus; White shrimp (america)	ADULT, 16.2 CM, 28.0 G	18 days	0.2	100	4.60517018	AQUIRE, 1994 219655	70
	Indonaia caerulea; Unionid clam	30-40 MM	24 hours	5	273	5.60947179	AQUIRE, 1994 219493	80
	Indonaia caerulea; Unionid clam	30-40 MM	24 hours	10	236	5.46383180	AQUIRE, 1994 219493	80
	Indonaia caerulea; Unionid clam	30-40 MM	24 hours	50	40	3.68887945	AQUIRE, 1994 219493	80
	Indonaia caerulea; Unionid clam	30-40 MM	19 days	5	684	6.52795791	AQUIRE, 1994 219493	80
	Indonaia caerulea; Unionid clam	30-40 MM	19 days	10	329	5.79605775	AQUIRE, 1994 219493	80
	Indonaia caerulea; Unionid clam	30-40 MM	7 days	50	195	5.27299955	AQUIRE, 1994 219493	80

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
4,4'-DDT (cont.)	Indonaia caerulea; Unionid clam	30-40 MM	7 days	10	329	5.79605775	AQUIRE, 1994 219493	80
	Indonaia caerulea; Unionid clam	30-40 MM	7 days	5	495	6.20455776	AQUIRE, 1994 219493	80
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 hours •	8	16,000	9.68034400	AQUIRE, 1994 219303	71
	Daphnia magna; Water flea	1ST INSTAR, 9 UG	24 hours •	50	23,000	10.0432494	AQUIRE, 1994 219303	71
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	12 hours	2	87	4.46590811	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	24 hours	1.5	730	6.59304453	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	72 hours	1.4	2,100	7.64969262	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	7 days	1.2	730	6.59304453	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	14 days	1.2	1,900	7.54960916	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	12 hours	2	110	4.70048036	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	24 hours	1.5	37	3.61091791	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	72 hours	1.4	38	3.63758615	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	7 days	1.2	23	3.13549421	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	12 hours	2	3	1.09861228	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	24 hours	1.5	4	1.38629436	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	72 hours	1.4	21	3.04452243	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	7 days	1.2	7	1.94591014	AQUIRE, 1994 219737	80
	Pollachius virens; Coalfish or saithe	YEARLING, 11.5 CM, 14 G	14 days	1.2	26	3.25809653	AQUIRE, 1994 219737	80
	Gambusia affinis; Mosquitofish	NR	24 hours	0.16 to 4	10	2.30258509	AQUIRE, 1994 216978	77
	Gambusia affinis; Mosquitofish	NR	to 16 days	0.064	25,293	10.1382829	AQUIRE, 1994 216978	77
	Simocephalus sp; Water flea	NR	3 hours	0.1	61,545	11.0275238	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	3 hours	0.5	19,847	9.89580814	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	3 hours	1	8,813	9.08398318	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	12 hours	0.1	63,194	11.0539646	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	48 hours	0.1	148,842	11.9106406	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	5 days	0.1	138,311	11.8372600	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	12 hours	0.5	24,998	10.1265511	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	72 hours	0.5	15,890	9.67344525	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	48 hours	1	10,107	9.22098353	AQUIRE, 1994 219859	80
	Simocephalus sp; Water flea	NR	7 days	1	13,407	9.50353223	AQUIRE, 1994 219859	80
	Rana temporaria; Frog	TADPOLE	24 hours	36.2	1,522	7.32778053	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	36.2	221	5.39816270	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	10.5	371	5.91620206	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	10.5	552	6.31354804	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	2.7	2,593	7.86057078	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	2.7	1,852	7.52402141	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	17.5	3,149	8.05484022	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	17.5	457	6.12468339	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	4.9	796	6.67959918	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	4.9	1,184	7.07665381	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	1.9	3,684	8.21175439	AQUIRE, 1994 218802	73
	Rana temporaria; Frog	TADPOLE	24 hours	1.9	2,632	7.87549929	AQUIRE, 1994 218802	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	FRY, 0.1-0.3 G	5 days	0.106	92,790	11.4380941	AQUIRE, 1994 219383	85
	Nereis arenaceodentata; Polychaete	NR	96 hours	1,000	1.5	0.40546510	AQUIRE, 1994 213785	91
	Neanthes grubei; Polychaete	NR	96 hours	1,000	9	2.19722457	AQUIRE, 1994 213785	91

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference		Year of Publication
4,4'-DDT (cont.)	Blepharisma intermedium; Ciliate	NR	1 hours	1,000	861.6	6.75879112	AQUIRE, 1994	311618	82
	Blepharisma intermedium; Ciliate	NR	6 hours	1,000	15,080	9.62112464	AQUIRE, 1994	311618	82
	Blepharisma intermedium; Ciliate	NR	12 hours	1,000	29,857	10.3041846	AQUIRE, 1994	311618	82
	Blepharisma intermedium; Ciliate	NR	24 hours	1,000	28,501	10.2576944	AQUIRE, 1994	311618	82
	Blepharisma intermedium; Ciliate	NR	48 hours	1,000	29,042	10.2764983	AQUIRE, 1994	311618	82
	Blepharisma intermedium; Ciliate	NR	72 hours	1,000	36,210	10.4970906	AQUIRE, 1994	311618	82
	Blepharisma intermedium; Ciliate	NR	120 hours	1,000	33,607	10.4224985	AQUIRE, 1994	311618	82
	Blepharisma intermedium; Ciliate	NR	240 hours	1,000	59,999	11.0020831	AQUIRE, 1994	311618	82
	Anodonta grandis; Floater, mussel	NR	3 weeks	0.14 to 0.62	2,400	7.78322401	AQUIRE, 1994	212073	73
	Mussel				2,400	7.78322401	USEPA, 1980a		
	Clams				12,500	9.43348392	USEPA, 1980a		
	Cladoceran				9,923	9.20261057	USEPA, 1980a		
	Freshwater prawn				7,000	8.85366542	USEPA, 1980a		
	Crayfish				5,060	8.52912176	USEPA, 1980a		
	Crayfish				1,947	7.57404500	USEPA, 1980a		
	Mayfly				4,075	8.31262602	USEPA, 1980a		
	Dragonfly				2,700	7.90100705	USEPA, 1980a		
	Bloodworm				4,750	8.46589989	USEPA, 1980a		
	Red leech				7,520	8.92532141	USEPA, 1980a		
							3,406 = Geometric Mean BCF for 4,4'-DDT		
Inorganics									
Aluminum	Salvelinus fontinalis; Brook trout	0.2 grams, 30 days	56 days	268	36	3.58351893	AQUIRE, 1994	213592	91
Aluminum chloride	Unio pictorum; Mussel;	9.4 (7.7-10.18) cm	3 weeks	166.8 to 414.3	250	5.52146091	AQUIRE, 1994	210076	90
							95 = Geometric Mean BCF for Aluminum		
Cadmium	Spirulina platensis; Blue-green algae	NR	12 hours	100	14.61	2.68170622	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	100	18.3	2.90690105	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	100	18	2.89037175	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	100	16.1	2.77881927	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	500	7.81	2.05540496	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	500	8.77	2.17133680	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	500	8.56	2.14710019	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	500	7.42	2.00417905	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	1000	6.22	1.82776990	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	1000	7.04	1.95160817	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	1000	7.14	1.96571277	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	1000	6.77	1.91250108	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	5000	3.06	1.11841491	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	5000	2.79	1.02604159	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	5000	2.63	0.96698384	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	5000	2.1	0.74193734	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	10000	2.42	0.88376754	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	10000	1.85	0.61518563	AQUIRE, 1994	312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	10000	1.69	0.52472852	AQUIRE, 1994	312317	86

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
Cadmium (cont.)	Spirulina platensis; Blue-green algae	NR	48 hours	10000	1.55	0.43825493	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	100	16.76	2.81899509	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	100	14.02	2.64048488	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	100	13.04	2.56802155	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	100	13.41	2.59600069	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	500	8.56	2.14710019	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	500	7.64	2.03339760	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	500	7.36	1.99605993	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	500	6.5	1.87180217	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	1000	6.13	1.81319474	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	1000	6	1.79175946	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	1000	6.16	1.81807677	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	1000	4.13	1.41827740	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	5000	3.38	1.21787570	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	5000	3.08	1.12492959	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	5000	3.03	1.10856261	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	5000	2.63	0.96698384	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	12 hours	10000	2.63	0.96698384	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	24 hours	10000	2.31	0.83724752	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	36 hours	10000	2.21	0.79299251	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae	NR	48 hours	10000	2.2	0.78845736	AQUIRE, 1994 312317	86
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	46.21 grams	72 days	0.00127	55	4.00733318	AQUIRE, 1994 210688	89
	Coregonus clupeaformis; Lake whitefish	26.63 grams	72 days	0.00125	42.1	3.74004774	AQUIRE, 1994 210688	89
	Cladoceran				320	5.76832099	USEPA, 1980b	
	Crayfish				184	5.21493575	USEPA, 1980b	
	Stonefly				373	5.92157841	USEPA, 1980b	
	Mayfly				1,630	7.39633529	USEPA, 1980b	
	Mayfly				3,520	8.16621626	USEPA, 1980b	
	Dragonfly				736	6.60123011	USEPA, 1980b	
	Dragonfly				680	6.52209279	USEPA, 1980b	
	Dragonfly				1,300	7.17011954	USEPA, 1980b	
	Dragonfly				928	6.83303173	USEPA, 1980b	
	Caddisfly				4,190	8.34045601	USEPA, 1980b	
	Beetle				164	5.09986642	USEPA, 1980b	
	Beetle				260	5.56068163	USEPA, 1980b	
	Midge				2,220	7.70526247	USEPA, 1980b	
	Midge				1,830	7.51207124	USEPA, 1980b	
	Biting midge				936	6.84161547	USEPA, 1980b	
	Biting midge				662	6.49526555	USEPA, 1980b	
	Snail				1,750	7.46737106	USEPA, 1980b	
							25 = Geometric Mean BCF for Cadmium	
Copper	Spirulina platensis; Blue-green algae;	NR	12 hours	100	36.65	3.60141342	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	100	39.51	3.67655380	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	100	31.2	3.44041809	AQUIRE, 1994 312317	86

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
Copper (cont.)	Spirulina platensis; Blue-green algae;	NR	48 hours	100	25.38	3.23396146	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	500	12.5	2.52572864	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	500	17	2.83321334	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	500	12.7	2.54160199	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	500	11.4	2.43361335	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	1000	8.13	2.09556092	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	1000	12.2	2.50143595	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	1000	9.53	2.25444471	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	1000	8.13	2.09556092	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	5000	2.6	0.95551144	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	5000	4.99	1.60743590	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	5000	4.27	1.45161382	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	5000	3.68	1.30291275	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	10000	1.46	0.37843643	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	10000	3.4	1.22377543	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	10000	3.07	1.12167756	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	10000	2.68	0.98581679	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	100	28.31	3.34321509	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	100	36.01	3.58379667	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	100	35.39	3.56642929	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	100	31.18	3.43977686	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	500	9.37	2.23751309	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	500	11.02	2.39971180	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	500	12	2.48490664	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	500	11.47	2.43973493	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	1000	5.76	1.75093747	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	1000	6.22	1.82776990	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	1000	7.81	2.05540496	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	1000	8.58	2.14943391	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	5000	1.93	0.65752000	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	5000	2.12	0.75141608	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	5000	2.45	0.89608802	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	5000	2.41	0.87962674	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	12 hours	10000	1.2	0.18232155	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	24 hours	10000	1.35	0.30010459	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	36 hours	10000	1.49	0.39877612	AQUIRE, 1994 312317	86
	Spirulina platensis; Blue-green algae;	NR	48 hours	10000	1.38	0.32208349	AQUIRE, 1994 312317	86
	Asiatic clam				19,800	9.89343721	USEPA, 1985f	
	Cladoceran				471	6.15485809	USEPA, 1985f	
	Stonefly				203	5.31320597	USEPA, 1985f	
							10 = Geometric Mean BCF for Copper	
Iron	Oyster				2,740	7.91571319	Vasquez et al., 1994	
							2,740 = BCF for Iron	

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
Lead	Salvelinus fontinalis; Brook trout	FINGERLING, 7.3–10 cm	3 weeks	4.1 to 88	1,400	7.24422751	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7.3–10 cm	3 weeks	135	41.9	3.73528582	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7.3–10 cm	3 weeks	135	7.78	2.05155633	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	4.3	160	5.07517381	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	5.7	140	4.94164242	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	12.5	73	4.29045944	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	12.5	32	3.46573590	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	12.5	24	3.17805383	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	12.5	48	3.87120101	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	12.5	160	5.07517381	AQUIRE, 1994 315675	75
	Salvelinus fontinalis; Brook trout	FINGERLING, 7–10 cm	3 weeks	12.5	16	2.77258872	AQUIRE, 1994 315675	75
	Colisa fasciata; Giant gourami	NR	8 hours	902	2.9	1.06471073	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	8 hours	902	0.8	−0.2231435	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	0.860	3.4	1.22377543	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	0.860	0.4	−0.9162907	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	0.860	1	0	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	801	3.4	1.22377543	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	801	0.3	−1.2039728	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	801	1.1	0.09531017	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	1000	5	1.60943791	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	1000	0.5	−0.6931471	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	1000	3.9	1.36097655	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	701	6.9	1.93152141	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	701	0.7	−0.3566749	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	701	6.1	1.80828877	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	586	5.3	1.66770682	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	586	0.8	−0.2231435	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	586	5.7	1.74046617	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	621	7.2	1.97408102	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	621	0.7	−0.3566749	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	621	6.5	1.87180217	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	601	8	2.07944154	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	601	0.9	−0.1053605	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	601	7.1	1.96009478	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	8 hours	1799	0.9	−0.1053605	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	8 hours	1799	0.6	−0.5108256	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	8 hours	1799	0.8	−0.2231435	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	1602	1.8	0.58778666	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	1602	0.8	−0.2231435	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	1602	1.8	0.58778666	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	1523	1.7	0.53062825	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	1523	0.8	−0.2231435	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	1523	2.1	0.74193734	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	1544	3.1	1.13140211	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	1544	1.2	0.18232155	AQUIRE, 1994 213784	91

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
Lead (cont.)	Colisa fasciata; Giant gourami	NR	5 days	1544	3.2	1.16315080	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	1368	2.8	1.02961941	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	1368	2.1	0.74193734	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	1368	4.2	1.43508452	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	1402	4.5	1.50407739	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	1402	1.5	0.40546510	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	1402	3.7	1.30833281	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	1301	6.8	1.91692261	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	1301	1.9	0.64185388	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	1301	4.9	1.58923520	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	1300	4.9	1.58923520	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	1300	1.8	0.58778666	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	1300	5	1.60943791	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	8 hours	4324	0.8	−0.2231435	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	8 hours	4324	0.4	−0.9162907	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	8 hours	4324	1	0	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	4300	1.7	0.53062825	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	4300	0.6	−0.5108256	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	16 hours	4300	1	0	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	4285	1.4	0.33647223	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	4285	0.5	−0.6931471	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	24 hours	4285	1.6	0.47000362	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	4188	4.2	1.43508452	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	4188	0.9	−0.1053605	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	5 days	4188	2.2	0.78845736	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	4180	4.2	1.43508452	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	4180	1	0	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	10 days	4180	3.8	1.33500106	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	4060	4.5	1.50407739	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	4060	1.1	0.09531017	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	15 days	4060	3.9	1.36097655	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	4000	4.9	1.58923520	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	4000	1.4	0.33647223	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	20 days	4000	4.4	1.48160454	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	4000	4.5	1.50407739	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	4000	1.4	0.33647223	AQUIRE, 1994 213784	91
	Colisa fasciata; Giant gourami	NR	25 days	4000	4.3	1.45861502	AQUIRE, 1994 213784	91
	Snail				1,700	7.43838353	USEPA, 1985c	
	Snail				738	6.60394382	USEPA, 1985c	
	Stonefly				1,120	7.02108396	USEPA, 1985c	
	Caddisfly				499	6.21260609	USEPA, 1985c	
							4 = Geometric Mean BCF for Lead	
Manganese	Physa sp; Pouch snail;	NR	NR	165.1	1,300	7.17011954	AQUIRE, 1994 212745	77
	Physa sp; Pouch snail;	NR	NR	142.9	800	6.68461172	AQUIRE, 1994 212745	77

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Chemical Name	Species	Age	Exposure	Concentration (µg/L)	BCF	ln (BCF)	Reference	Year of Publication
Manganese (cont.)	Corbicula fluminea; Asiatic clam	NR	NR	60	470	6.15273269	AQUIRE, 1994 218433	80
	Corbicula fluminea; Asiatic clam	NR	NR	60	1,800	7.49554194	AQUIRE, 1994 218433	80
	Corbicula fluminea; Asiatic clam	NR	NR	70	470	6.15273269	AQUIRE, 1994 218433	80
	Corbicula fluminea; Asiatic clam	NR	NR	70	2,100	7.64969262	AQUIRE, 1994 218433	80
	Plankton; Plankton;	NR	NR	32	690	6.53669159	AQUIRE, 1994 212830	78
	Oligochaeta; Annelid worm class	NR	NR	32	88	4.47733681	AQUIRE, 1994 212830	78
	Insecta; Insect class;	NR	NR	32	28	3.33220451	AQUIRE, 1994 212830	78
	Osteichthyes; Class – bony fishes	661–824 grams	NR	32	84	4.43081679	AQUIRE, 1994 212830	78
	Lemna minor; Duckweed;	NR	NR	148.5	10,900	9.29651806	AQUIRE, 1994 218581	75
	Chironomidae; Midge family;	LARVAE	NR	< 30	3,900	8.26873183	AQUIRE, 1994 315437	82
	Crustacea; Crustacean class;	NR	NR	< 30	1,100	7.00306545	AQUIRE, 1994 315437	82
	Unio pictorum; Mussel;	12.5 grams	NR	< 30	160,000	11.9829290	AQUIRE, 1994 315437	82
	Anodonta cygnea; Swan mussel;	28.5 grams	NR	< 30	350,000	12.7656884	AQUIRE, 1994 315437	82
	Abramis brama; Bream;	350 grams	NR	< 30	600	6.39692965	AQUIRE, 1994 315437	82
	Abramis brama; Bream;	350 grams	NR	< 30	240	5.48063892	AQUIRE, 1994 315437	82
	Abramis brama; Bream;	350 grams	NR	< 30	170	5.13579843	AQUIRE, 1994 315437	82
	Stizostedion lucioperca; Pikeperch	500 grams	NR	< 30	260	5.56068163	AQUIRE, 1994 315437	82
	Stizostedion lucioperca; Pikeperch	500 grams	NR	< 30	210	5.34710753	AQUIRE, 1994 315437	82
	Stizostedion lucioperca; Pikeperch	500 grams	NR	< 30	70	4.24849524	AQUIRE, 1994 315437	82
	Melosira varians; Diatom;	NR	NR	16.66 to 23.23	59,052	10.9861736	AQUIRE, 1994 215512	80
	Elodea sp; Waterweed;	NR	NR	16.66 to 23.23	12,465	9.43067999	AQUIRE, 1994 215512	80
	Lemna sp; Duckweed;	NR	NR	16.66 to 23.23	46,647	10.7503638	AQUIRE, 1994 215512	80
	Planaria sp; Planarian, flatworm	NR	NR	16.66 to 23.23	2,255	7.72090525	AQUIRE, 1994 215512	80
	Tubifex sp; Tubificid worm;	NR	NR	16.66 to 23.23	14,583	9.58761174	AQUIRE, 1994 215512	80
							1,494 = Geometric Mean BCF for Manganese	
Zinc	Asiatic clam				126.2	4.83786795	USEPA, 1987a	
	Asiatic clam				71.6	4.27109507	USEPA, 1987a	
	Asiatic clam				102.2	4.62693167	USEPA, 1987a	
	Mayfly				1,130	7.02997291	USEPA, 1987a	
	Stonefly				106	4.66343909	USEPA, 1987a	
							162 = Geometric Mean BCF for Zinc	

NOTES:

NR = Not Reported
cm = centimeters

Table S–2.5
Ingestion Toxicity Information for Terrestrial and Semi–Aquatic Wildlife

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Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW–day Oral LD50	Lethal RTV mg/kgBW–day LOAEL	Sublethal RTV mg/kgBW–day LOAEL	Sublethal RTV mg/kgBW–day NOAEL	Reference
VOLATILE ORGANIC COMPOUNDS									
Acetone	Rat	Oral	NR	Reproductive effects			273,000		RTECS, 1993
	Rat	Oral LD_{50}	NR	Mortality	5,800				RTECS, 1993
	Rat	Oral LD_{50}		Mortality	9,750				Sax, 1984
	Mouse	Oral LD_{50}	NR	Mortality	3,000				RTECS, 1993
	Rabbit	Oral LD_{50}	NR	Mortality	5,340				RTECS, 1993
Benzene	Rat	Oral LD_{50}	1 dose	Mortality	3,800				TBD, 1984
	Rat	Oral (chronic)	187 days	Hematopoietic effects			10		USEPA, 1984a
2–Butanone (surrogate for 2–hexanone)	Rat	Oral LD_{50}	NR	Mortality	2,737				RTECS, 1994
	Mouse	Oral LD_{50}	NR	Mortality	4,050				RTECS, 1994
	Rat	Oral (subchronic)	13 weeks	NOAEL for neurological effects				173	ATSDR, 1991a
Carbon disulfide	Rabbit	Converted inhalation	34 weeks	NOAEL for Fetotoxicity/malformations				11	IRIS, 1991
Chlorobenzene	Rat	Oral (subchronic)	93 – 99 days	Increased liver and kidney weight			100		USEPA, 1984b
	Dog	Oral (subchronic)	13 weeks	Histopathological changes in liver			136		IRIS, 1991
	Mouse	Oral (subchronic)	13 weeks	Increased liver weight, hepatic necrosis			89		USEPA, 1984b
	Rat	Oral LD_{50}	Single dose	Mortality	1,000				ATSDR, 1989
1,2–Dichloroethane (surrogate for 1,1–Dichloroethane)	Rat	Single oral dose	NR	Mortality	670				NIOSH, 1985
	Mouse	Single oral dose	NR	Mortality	489				NIOSH, 1985
	Rat	Oral (subchronic)	13 weeks	NOAEL for reproductive effects				120	ATSDR, 1992a
1,1–Dichloroethylene (surrogate for 1,2–Dichloroethylene)	Rat	Single oral dose	NR	Mortality	200				IRIS, 1988
	Rat	Oral (chronic)	2 years	Liver lesions			9		IRIS, 1988
Ethylbenzene	Rat	Oral (subchronic)	182 days	Liver and kidney toxicity			291	97.1	IRIS, 1991
	Rat	Oral LD_{50}		Mortality	3,500				NIOSH, 1985
Methylene chloride	Rat	Oral LD_{50}	NR	Mortality	1,600				RTECS, 1994
	Dog	Oral LD_{50}	NR	Mortality	3,000				RTECS, 1994
	Rabbit	Oral LD_{50}	NR	Mortality	1,900				RTECS, 1994
	Rat	Oral (chronic)	2 years	Liver toxicity			52.6	5.9	IRIS, 1991
	Rat	Oral (subchronic)	3 months	Mortality, blood chemistry, histopathology				12.5	USEPA, 1984c
1,1,2,2–Tetrachloroethane	Rat	Single oral dose		Mortality		250			ATSDR, 1989a
	Rat	Oral (subchronic)	27 weeks	Irreversible testicular damage			3.2		ATSDR, 1989a
Tetrachloroethylene	Rat	Single oral dose		Mortality	8,850				NIOSH, 1985
	Mouse	Single oral dose		Mortality	8,100				TBD, 1984
	Mouse	Oral (subchronic)	6 weeks	Hepatotoxicity			100		Buben and O'Flaherty, 1985
Toluene	Rat	Oral (subchronic)	13 weeks	Increased liver and kidney weight			446		IRIS, 1991
	Rat	Oral LD_{50}		Mortality	5,000				NIOSH, 1985
	Mouse	Oral (subchronic)	76 days	Decreased open field activity			76		ATSDR, 1992b
Trichloroethene	Mouse	Single oral dose		Mortality	2,402				NIOSH, 1985
	Rat	Single oral dose		Mortality	7,193				NIOSH, 1985
	Mouse	Oral (multi–generational)	12 weeks	Decreased dam and fetal weights			750		ATSDR, 1991b
Vinyl chloride	Rat	Oral (subchronic)	13 weeks	Hematological/biochemical/organ weight effects			130		USEPA, 1980d
	Rat	Single oral dose		Mortality	500				NIOSH, 1985
Xylenes (total)	Rat	Oral LD_{50}		Mortality	4,300				NIOSH, 1985
	Rat	Oral (chronic)	103 weeks	Hyperactivity, decreased BW, mortality			500	250	IRIS, 1991
	Japanese quail	Oral (acute)	5 days	Mortality	20,000	2,014			Hill and Camardese, 1986
SEMIVOLATILE ORGANIC COMPOUNDS									
Acenaphthene	Mouse	Oral (chronic)	90 days	Liver weight increase				175	IRIS, 1990
	Rat	Oral (chronic)	32 days	Physiological changes			2,000		USEPA, 1984d
Acenaphthylene	Rat	Oral (chronic)	40 days	Physiological changes			600		USEPA, 1984d
Anthracene	Mouse	Oral LD_{50}	NR	Mortality	17,000				RTECS, 1993
	Rodents	Oral (chronic)	NS	Carcinogenicity			3,300		Eisler, 1987a
	Mouse	Oral (chronic)	90 days	Clinical and pathological effects				1,000	IRIS, 1990
Benzo(a)anthracene	Rodents	Oral (chronic)	NS	Carcinogenicity			2		Eisler, 1987a
Benzo(a)pyrene (surrogate for Dibenz(a,h)anthracene)	Rat	Oral (chronic)	Pregnancy	Sterility in offspring			40		USEPA, 1984e
	Rat	Oral (chronic)	3.5 months	Reproductive			50		USEPA, 1984e
	Mouse	Oral	Multi–generational	Decreased fertility of F1 progeny; decreased F2 litter size.			10 [a]		MacKenzie and Angevine, 1981
	Mouse	Oral (subchronic)	6 months	Mortality	120				ATSDR, 1993b
Benzo(b)fluoranthene and Benzo(k)fluoranthene	Rodents	Oral (chronic)	NS	Carcinogenicity			40		Eisler, 1987a
Benzo(g,h,i)perylene	Rodents	Oral (chronic)	NS	Carcinogenicity			99		Eisler, 1987a

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Benzoic acid	Rat	Oral (chronic)	17 months	Decreased resistance to stress			40		IRIS, 1990
Butylbenzylphthalate	Rat	Oral LD_{50}	NR	Mortality	2,330				RTECS, 1994
	Rat	Oral	NR	Reproductive effects			21,000		RTECS, 1994
	Rat	Oral	NR	Reproductive effects			16,400		RTECS, 1994
	Rat	Oral	NR	Reproductive effects			16,400		RTECS, 1994
	Rat	Oral	NR	Reproductive effects			4,900		RTECS, 1994
	Mouse	Oral LD_{50}	NR	Mortality	4,170				RTECS, 1994
	Guinea Pig	Oral LD_{50}	NR	Mortality	13,750				RTECS, 1994
Carbazole	Rat	Oral LD_{50}		Mortality	500				USEPA, 1986
Chrysene	Rodents	Oral (chronic)	NS	Carcinogenicity			99		Eisler, 1987a
Dibenzofuran	Rodents	Single oral dose		LC 20		500			ATSDR, 1991c
	Rodents	Oral (chronic)	13 weeks	LC 10			125		ATSDR, 1991c
	Mouse	Oral (chronic)	103 weeks	Multinuclear hepatocytes				60	ATSDR, 1991c
Di-n-butylphthalate (surrogate for di-n-octylphthalate)	Rat	Oral (subchronic)	48 days	LOAEL for reproductive effects			125		ATSDR, 1989b
	Rat	Oral (chronic)	1 year	Mortality			600		IRIS, 1991
	Mouse	Single oral dose		Mortality	6,513				Sax, 1984
bis(2-Ethylhexyl)phthalate	Rat	Oral LD_{50}	NR	Mortality	30,600				RTECS, 1993
	Rat	Oral	NR	Reproductive effects			7,140		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			35		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			6,000		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			17,200		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			10,000		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			9,766		RTECS, 1993
	Mouse	Oral LD_{50}	NR	Mortality	30,000				RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			78,880		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			4,200		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			50		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			1,000		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			2,040		RTECS, 1993
	Rabbit	Oral LD_{50}	NR	Mortality	34,000				RTECS, 1993
	Guinea pig	Oral LD_{50}	NR	Mortality	26,000				RTECS, 1993
	Guinea pig	Oral	NR	Reproductive effects			20,000		RTECS, 1993
	Mammal	Oral	NR	Reproductive effects			20,000		RTECS, 1993
	Mammal	Oral	NR	Reproductive effects			509,000		RTECS, 1993
	Mouse	Oral LD_{50}		Mortality	800				RTECS, 1993 and NIOSH, 1985
	Mouse	Oral (subchronic)	13 weeks	Renal effects			125		RTECS, 1993
Fluoranthene	Rat	Oral LD_{50}	NR	Mortality	2,000				RTECS, 1994
	Mouse	Oral (subchronic)	90 days	Nephropathy; clinical and pathological effects			250	125	IRIS, 1990
Fluorene	Mouse	Oral (chronic)	13 weeks	Hematological changes			250	125	IRIS, 1990
Indeno(1,2,3-cd)pyrene	Rodents	Oral (chronic)	NS	Carcinogenicity			72		Eisler, 1987a
2-Methylnaphthalene	Rat	Oral LD_{50}		Mortality	1,630				NIOSH, 1985
4-Methylphenol	Rat	Oral LD_{50}		Mortality	1,800				Verschueren, 1983
	Rat	Oral		Decreased RBC counts			175		ATSDR, 1990b
	Rabbit	Oral LD_{50}		Mortality	1,100				Verschueren, 1983
	Rat	Oral (subchronic)	13 weeks	CNS stimulation			50		ATSDR, 1990b
	Rat	Single oral dose	90 days	Loss in body weight/neurotoxicity				50	IRIS, 1991
Naphthalene	Rat	Oral (chronic)	100 weeks	Ocular lesions			41		USEPA, 1990b
	Rat	Oral (subchronic)	13 weeks	Decreased body weight gain			35.7		USEPA, 1990b
	Mouse	Oral LD_{50}		Mortality	533				ATSDR, 1990c
Phenanthrene	Mouse	Oral LD_{50}	NR	Mortality	700				RTECS, 1994
	Mouse	Oral (subchronic)	6 months	Increased liver weight			120		ATSDR, 1989c
Phenol	Rat	Oral LD_{50}	NR	Mortality	530				USEPA, 1980b
	Rat	Oral LD_{50}	NR	Mortality	414				TDB, 1984
	Rat	Oral LD_{50}	NR	Mortality	340				USEPA, 1980b
	Rabbit	Oral LD_{50}	NR	Mortality	600				USEPA, 1980b
	Rabbit	Oral LD_{50}	NR	Mortality	400				USEPA, 1980b
	Dog	Oral LD_{50}	NR	Mortality	500				USEPA, 1980b
	Cat	Oral LD_{50}	NR	Mortality	100				USEPA, 1980b
	Rat	Oral (subchronic)	Gestational	Reduced fetal body weights			120		IRIS, 1993

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Pyrene	Rat	Oral LD_{50}	NR	Mortality	2,700				RTECS, 1993 and NIOSH, 1985
	Mouse	Oral LD_{50}	NR	Mortality	800				RTECS, 1993 and NIOSH, 1985
	Mouse	Oral (chronic)	13 weeks	Renal effects			125	75	IRIS, 1990
1,2,4-Trichlorobenzene (used 1,4-Dichlorobenzene as surrogate)	Rat	Oral LD_{50}	Single oral dose	Death	3,800				ATSDR, 1991d
	Mouse	Oral	NR	Hepatocellular degeneration, nephropathy, tubular degeneration			300		ATSDR, 1991d
PESTICIDES/PCBs									
Aroclor 1254 (surrogate for Aroclor 1248 and 1260)	Mouse	Oral	NR	Reproductive			1.53		USEPA, 1993a
	Chicken	Oral (chronic)	NR	Embryonic mortality			0.9		USEPA, 1976
	Rock dove	Oral (chronic)	NR	Parental incubation behavior			0.9		Peakall and Peakall, 1973
	American kestrel	Oral (chronic)	69 days	Reduced sperm concentration			9		Eisler, 1986
	Mink	Oral dose	160 days	Reproductive			0.096		USEPA, 1993a
	Mink	Oral	NR	Kit growth			0.15		USEPA, 1993a
	Mink	Oral	12.5 days	Reproductive			0.375		USEPA, 1993a
	Chicken	Oral	39 weeks	Egg production and fertility			2.44		USEPA, 1993a
	Chicken	Oral	NR	Egg production and hatchability			9.8		USEPA, 1993a
	Chicken	Maternal diet	NR	Chick growth			0.98		USEPA, 1993a
	Pheasant	Oral	16 weeks	Egg hatchability			1.8		USEPA, 1993a
Aroclor 1260 (surrogate for Aroclor 1248 and 1254)	Rat	Oral LD_{50}	NR	Mortality	1,315				RTECS, 1993
	Rat	Oral LD_{50}	NR	Mortality	500				Eisler, 1986
	Rat	Oral LD_{50}	NR	Mortality	1,300				Eisler, 1986
	Rat	Oral	NR	Reproductive effects			1,674		RTECS, 1993
	Rat	Oral (chronic)	2 generations	Reduced litter size			7.6		USEPA, 1985b
	Rat	Oral (subchronic)	9 weeks	Fetal mortality; maternal toxicity			6.4		ATSDR, 1987a
	Mouse	Oral	NR	Reproductive effects			74		RTECS, 1993
	Mink	Oral LD_{50}		Mortality	4,000				Eisler, 1986
	Mink	Oral LD_{50}		Mortality	3,000				Eisler, 1986
	Mink	Oral LD_{50}		Mortality	750				Eisler, 1986
	Mink	Oral (subchronic)	4 months	Impaired reproduction			0.0075		Newell et al., 1987
	Dog (beagle)	Oral (chronic)	2 years	LOAEL			0.37		USEPA, 1976
	Bobwhite	Oral LD_{50}	8 days	Mortality	80 [b]				Eisler, 1986
	Mallard	Oral LD_{50}	8 days	Mortality	111				Eisler, 1986
alpha-BHC	Rat	Single oral dose	NR	Mortality	177				Sax, 1984
gamma-BHC (Lindane)	Rat	Oral (chronic)	56 weeks	NOAEL for reproductive effects				5.0 [c]	ATSDR, 1988a
	Bobwhite	Oral (acute)	5 days	Mortality	78				Hill et al., 1975
	Mallard	Oral (acute)	5 days	Mortality	360				Hill et al., 1975
Chlordane (alpha and gamma)	Rat	Oral LD_{50}	NR	Mortality	283				RTECS, 1993
	Rat	Oral LD_{50}		Mortality	430				Allen et al., 1979
	Rat	Oral LD_{50}		Mortality	335				Allen et al., 1979
	Rabbit	Oral LD_{50}		Mortality	300				Allen et al., 1979
	Rabbit	Oral LD_{50}		Mortality	100				Allen et al., 1979
	Dog	Oral LD_{50}		Mortality	200				Allen et al., 1979
	Goat	Oral LD_{50}		Mortality	180				Allen et al., 1979
	Rat	Oral(subchronic)	Multi-generational	Decreased fertility			16		ATSDR, 1992c
	Japanese quail	Oral LD_{50}	5 days	Mortality	35				Hill et al., 1975
	Bobwhite	Oral LD_{50}	5 days	Mortality	29				Hill et al., 1975
	Mallard	Oral LD_{50}	5 days	Mortality	62				Hill et al., 1975
	Pheasant	Oral LD_{50}		Mortality	24				USFWS, 1984
	Mouse	Oral (chronic)	2 years	Hepatocellular hypertrophy and necrosis			0.47		ATSDR, 1992c
	Mouse	Oral (chronic)	30 months	Regional liver hypertrophy (females)			0.273	0.055	ATSDR, 1992c
	Dog	Oral (chronic)	2 years	Histologic changes			0.375		USEPA, 1988a
	Young chicken	Chronic	4 week	NOAEL for egg hatchability and growth				0.031 [b]	Eisler, 1990
4,4'-DDE	Rat	Oral LD_{50}	NR	Mortality	800				RTECS, 1993
	Mouse	Oral LD_{50}	NR	Mortality	700				RTECS, 1993
	Hamster	Oral LD_{50}	NR	Mortality	>5,000				RTECS, 1993
	Mallard	Oral	NR	Eggshell thinning			2.91		USEPA, 1993b
	Mallard	Oral	2 years	Reproductive; embryo mortality, cracked eggs			0.58		USEPA, 1993b
	Kestrel	Oral	NR	Eggshell thinning			0.39		USEPA, 1993b

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4,4'–DDT (surrogate for 4,4'–DDD and 4,4'–DDE)	Rat	Oral LD_{50}	NR	Mortality	87				RTECS, 1993
	Rat	Oral LD_{50}		Mortality	100				USEPA, 1985a
	Rat	Oral	NR	Reproductive			112		RTECS, 1993
	Rat	Oral	NR	Reproductive			100		RTECS, 1993
	Rat	Oral	NR	Reproductive			430		RTECS, 1993
	Rat	Oral	NR	Reproductive			1,890		RTECS, 1993
	Rat	Oral	NR	Reproductive			250		RTECS, 1993
	Rat	Oral	NR	Reproductive			50		RTECS, 1993
	Rat	Oral (chronic)	3 generations	Reproductive			0.2		IRIS, 1991
	Rat	Oral	2 years	Reproductive			2.5		USEPA, 1993b
	Mouse	Oral LD_{50}	NR	Mortality	135				RTECS, 1993
	Mouse	Oral LD_{50}		Mortality	200				USEPA, 1985a
	Mouse	Oral	NR	Reproductive			504		RTECS, 1993
	Mouse	Oral	NR	Reproductive			81		RTECS, 1993
	Mouse	Oral	NR	Reproductive			124		RTECS, 1993
	Mouse	Oral	NR	Reproductive			148		RTECS, 1993
	Rabbit	Oral LD_{50}	NR	Mortality	250				RTECS, 1993
	Rabbit	Oral	NR	Reproductive			150		RTECS, 1993
	Guinea pig	Oral LD_{50}	NR	Mortality	150				RTECS, 1993
	Hamster	Oral LD_{50}	NR	Mortality	>5,000				RTECS, 1993
	Dog	Oral LD_{50}	NR	Mortality	150				RTECS, 1993
	Dog	Oral LD_{50}		Mortality	60				USEPA, 1985a
	Dog	Oral	NR	Reproductive			3,540		RTECS, 1993
	Monkey	Oral LD_{50}	NR	Mortality	200				RTECS, 1993
	Chicken	Oral (subchronic)	10 weeks	Decreased reproductive success; toxic symptoms			91.4 [b]		USEPA, 1985a
	Rock dove	Oral LD_{50}		Mortality	4,000				USFWS, 1984
	Black duck	Oral (chronic)	2 years	Reduced eggshell thickness			0.14 [b]		Longcore and Stendell, 1977
	Mallard	Oral LD_{50}		Mortality	2,240				USFWS, 1984
	Mallard	Oral (subchronic)	96 days	Reduced eggshell thickness			2.8		Longcore and Stendell, 1977
	Mallard	Oral	NR	Eggshell thinning			1.16		USEPA, 1993b
	Mallard	Oral	NR	Eggshell thinning			2.91		USEPA, 1993b
	Mallard	Oral	2 years	Reproductive			1.45		USEPA, 1993b
	California quail	Oral LD_{50}		Mortality	595				USFWS, 1984
	Japanese quail	Oral LD_{50}		Mortality	841				USFWS, 1984
	Pheasant	Oral LD_{50}		Mortality	1,334				USFWS, 1984
	Sandhill crane	Oral LD_{50}		Mortality	1,200				USFWS, 1984
	Kestrel	Oral (chronic)	7 wk – 1 yr	Reduced eggshell thickness			0.56a		USEPA, 1985a
	Kestrel	Oral (chronic)	1 year	Reduced eggshell thickness			0.16a		Wiemeyer, et al., 1986
	Barn owl	Oral (chronic)	2 years	Reduced eggshell thickness			0.14 [b]		Longcore and Stendell, 1977
Dieldrin (used as a surrogate for Aldrin)	Mouse	Oral LD_{50}	NR	Mortality	38				Allen et al., 1979
	Mouse	Oral (chronic)	80 weeks	Body tremors			0.33		NCI, 1978
	Mouse	Oral (chronic)	2 year	Liver enlargement w/ histopathology			0.1		IRIS, 1991
	Mouse	Oral (chronic)	2 year	Hepatic cancer			1.3		ATSDR, 1991e
	Rat	Oral (chronic)	2 year	Histologic changes			2		ATSDR, 1987b
	Rat	Oral (chronic)	2 year	Liver lesions			0.05	0.005	IRIS, 1991
	Dog	Oral (chronic)	2 year	Increased liver weight; liver/body weight			0.05	0.005	IRIS, 1991
	Dog	Oral (chronic)	25 months	Hepatocyte degeneration			0.5		ATSDR, 1987b
	Monkey	Oral (chronic)	120 days	Tremors and Convulsions			0.1		Smith et al., 1976
	Mouse	Oral (subchronic)	4 wks	Decreased pup survival			0.65		Virgo & Bellward, 1975
	Rat	Oral (subchronic)	120 days	Operant behavior				0.025	Smith et al., 1976
	Rat	Oral LD_{50}	NR	Mortality	46				Allen et al., 1979
	Guinea pig	Oral LD_{50}	NR	Mortality	25				Allen et al., 1979
	Rabbit	Oral LD_{50}	NR	Mortality	45				Allen et al., 1979
	House sparrow	Oral LD_{50}	NR	Mortality	48				USFWS, 1984
	Chicken	Oral LD_{50}	NR	Mortality	20				Allen et al., 1979
	Rock dove	Oral LD_{50}	NR	Mortality	27				USFWS, 1984
	Gray partridge	Oral LD_{50}	NR	Mortality	9				USFWS, 1984
	Chukar	Oral LD_{50}	NR	Mortality	25				USFWS, 1984
	Japanese quail	Oral LD_{50}	5 days	Mortality	6 [b]				Hill et al., 1975
	Japanese quail	Oral LD_{50}	NR	Mortality	70				USFWS, 1984

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Dieldrin (cont.)	California quail	Oral LD_{50}	NR	Mortality	9				USFWS, 1984
	Bobwhite	Oral LD_{50}	5 days	Mortality	3 [b]				Hill et al., 1975
	Pheasant	Oral LD_{50}	NR	Mortality	79				USFWS, 1984
	Mallard	Oral LD_{50}	5 days	Mortality	12 [b]				Hill et al., 1975
	Mallard	Oral LD_{50}	5 days	Mortality	11 [b]				Hill et al., 1975
	Mallard	Oral LD_{50}	NR	Mortality	381				USFWS, 1984
	Whistling duck	Oral LD_{50}	NR	Mortality	100				USFWS, 1984
	Canada goose	Oral LD_{50}	NR	Mortality	141				USFWS, 1984
	Goat	Oral LD_{50}	NR	Mortality	100				Allen et al., 1979
	Sheep	Oral LD_{50}	NR	Mortality	50				Allen et al., 1979
	Cattle	Oral LD_{50}	NR	Mortality	60				Allen et al., 1979
	Mule deer	Oral LD_{50}	NR	Mortality	75				Allen et al., 1979
	Cat	Oral LD_{50}	NR	Mortality	300				Allen et al., 1979
	Dog	Oral LD_{50}	NR	Mortality	65				Allen et al., 1979
Heptachlor (used as a surrogate for Heptachlor epoxide)	Dog	Oral (chronic)	60 weeks	Increased liver to body weight ratio			0.013		IRIS, 1993
	Rat	Oral (chronic)	2 years	Increased liver to body weight ratio			0.25		IRIS, 1991
	Rat	Oral (chronic)	1 generation	Increased pup death			0.35		IRIS, 1991
	Cat	Oral (chronic)	2 years	Increased liver weight			0.15		USEPA, 1987b
	Rat	Single oral dose	NR	Mortality	40				Sax, 1984
	Chicken	Single oral dose	NR	Mortality	62				Sax, 1984
INORGANIC ANALYTES									
Aluminum	Mouse	Oral (chronic)	2-3 generations	Reduced body weight gain of newborn			425		NIOSH, 1985
	Rat	Oral (subchronic)	15 days	Reduced growth			100		Bernuzzi, et al., 1989
	Rat	Oral LD_{50}	NR	Mortality	3,700				Sax, 1984
Antimony	Rat	Oral (acute)	Single oral dose	NOAEL for Death	16,714				ATSDR, 1991f
	Rat	Oral (chronic)	NS	Longevity; blood glucose; cholesterol			0.35 (water)		IRIS, 1993
	Rat	Oral (subchronic)	24 weeks	Decreased RBC, swelling of hepatic cords			41.6		ATSDR, 1991f
Arsenic	Rat	Oral	NR	Reproductive effects			0.61		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			0.58		RTECS, 1993
	Rat	Oral LD_{50}	NR	Mortality	763				RTECS, 1993
	Mouse	Oral LD_{50}	NR	Mortality	145				RTECS, 1993
	Mallard	Oral LD_{50}	NR	Mortality	323				Eisler, 1988 a
	Cowbird	Oral LD_{50}	11 days	Mortality	18.1 [b]				Eisler, 1988 a
	Young chicken	Oral	56 days	NOAEL for egg production				1 [b]	Hermeyer, 1977
Barium	Mouse	Oral (chronic)	lifetime	NOEL				0.825	IRIS, 1990
	Rat	Oral (chronic)	16 months	NOEL				5.1	IRIS, 1990
	Rat	Oral (chronic)	lifetime	NOEL				0.25	IRIS, 1990
	Rat	Oral (chronic)	13 weeks	NOEL				31.5	IRIS, 1990
	Rat	Oral (chronic)	68 weeks	Renal ultrastructure changes			142		IRIS, 1993
	Rat	Oral (subchronic)	13 weeks	LOAEL for renal effects			91		Dietz et al., 1992
	Rat	Oral (acute)	10 days	Decreased ovarian weight			198		ATSDR, 1990d
	Rat	Oral (subchronic)	13 weeks	20% population mortality		430			Dietz et al., 1992
Beryllium	Rat	Oral LD_{50}	NR	Mortality	10				USEPA, 1985g
	Rat	Oral (chronic)	NR	Increase in lung sacromas			0.22		USEPA, 1985g
	Rat	Oral (chronic)	3.2 years	NOAEL			0.85		ATSDR, 1987 c
Cadmium	Rat	Oral	NR	Reproductive effects			155		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			220		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			21.5		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			23		RTECS, 1993
	Rat	Oral LD_{50}		Mortality	250				Eisler, 1985b
	Rat	Oral LD_{50}	NR	Mortality	225				RTECS, 1993
	Mouse	Oral LD_{50}	NR	Mortality	890				RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			448		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			1,700		RTECS, 1993
	Guinea pig	Oral LD_{50}	NR	Mortality	150				Eisler, 1985b
	Mallard	Oral (subchronic)	90 days	Egg production suppressed			10		Eisler, 1985b

Table S-2.5
Ingestion Toxicity Information for Terrestrial and Semi-Aquatic Wildlife

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW-day		Sublethal RTV mg/kgBW-day		Reference
					Oral LD50	LOAEL	LOAEL	NOAEL	
Chromium	Japanese quail	Oral LD_{50}	5 days	Mortality	126				Hill and Camardese, 1986
	Rat	Oral (subchronic)	90 days	NOAEL for histopathologic and reproductive effects			1,400		Ivankovic and Preussman, 1975
	Black Duck	Oral (subchronic)	5 months	NOAEL for reproductive effects			200		Outridge and Scheuhammer, 1993
	Rat	Oral LD_{50}		Mortality	200				ATSDR, 1991g
Cobalt	Rat	Oral LD_{50}		Mortality	91				ATSDR, 1991h
	Rat	Single oral dose		Hepatic/renal hyperemia					ATSDR, 1991h
	Rat	Oral (subchronic)	8 weeks	Decreased body weight gain			4.2		ATSDR, 1991h
	Rat	Oral (chronic)	98 days	Testicular degenration			13		ATSDR, 1991h
	Rat	Oral (chronic)	69 days	Testicular atrophy			20		ATSDR, 1991h
	Dog	Oral (subchronic)	4 weeks	Increased red blood cell count			5		ATSDR, 1991h
Copper	Rat	Single oral dose		Reproductive effects			152		NIOSH, 1985 and RTECS, 1993
	Rat	Oral LD_{50}	NR	Mortality	940				Sax, 1984
	Mouse	Oral (chronic)	30 days	Decreased litter sizes with teratogenic effects			100		Lecyk, 1980
Cyanide	Rat	Oral (subchronic)	11.5 months	Increased thyroid weight, myelin degeneration			30		IRIS, 1993
	Mouse	Single oral dose	NR	Mortality	8.5				Arthur D. Little, Inc., 1981
	Young chickens	Oral	20 days	Decreased growth and food intake			11		Elzubier and Davis, 1988
	Pig	Oral	110 days	Thyroid hypofunction during pregnancy			11		Tewe and Maner, 1981
	Hamsters	Oral	12 days	Decreased fetal weight and delayed ossification		12	11.9		Frakes et al., 1986
	Mallard	Single oral dose	NR	Mortality in 6% of population		1.1			Eisler, 1991
Iron	Guinea pig	Oral LD_{50}	NR	Mortality	1,200				Sax, 1984
Lead	Rat	Oral	NR	Reproductive effects			790		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			1,140		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			520		RTECS, 1993
	Rat	Oral	NR	Reproductive effects			1,100		RTECS, 1993
	Calf	Oral LD_{50}	NR	Mortality	220				Eisler, 1988b
	Rat	Oral (subchronic)	12-14 days	Decreased fetal body weight			2.5		McClain and Becker, 1972
	Mouse	Oral	NR	Reproductive effects			1,120		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			6,300		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			300		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects			4,800		RTECS, 1993
	Domestic animal	Oral	NR	Reproductive effects			662		RTECS, 1993
	Mammal	Oral	NR	Reproductive effects			2,118		RTECS, 1993
	Kestrel	Diet	NR	Decreased egg laying fertility; decreased egg shell thickness				50	Eisler, 1988b
	Nestlings	Oral	NR	Reduced growth and brain weight; abnormal development			125		Eisler, 1988b
	Japanese quail	Oral LD_{50}	5 days	Mortality	24,752				Hill and Camardese, 1986
	Rat	Oral (chronic)	2 generations	NOAEL for developmental effects				7	Kimmel et al., 1980 and Grant et al., 1980
	Guinea pig	Oral LD_{50}		Mortality	300				Sax, 1984
	Rock dove	Oral (chronic)	NS	Kidney pathology; learning deficiences			6.25		Anders et al., 1982 and Dietz et al., 1979
	Rock dove	Oral LD_{50}		Mortality	375				Kendall and Scanlon, 1985
Manganese	Mouse	Oral (subchronic)	90 days	Delayed growth of testes			140		ATSDR, 1990e
	Mouse	Oral (chronic)	103 weeks	Mortality			4,050		ATSDR, 1990e
	Rat	Oral LD_{50}	NR	Mortality	410				ATSDR, 1990e
	Rat	Oral LD_{50}	20 days	Mortality	225				ATSDR, 1990e
	Rat	Oral (subchronic)	20 days	Decreased litter weight during gestation				620	ATSDR, 1990e
	Rat	Oral (chronic)	103 weeks	Mortality			930		ATSDR, 1990e
	Guinea pig	Oral LD_{50}	NR	Mortality	400				USEPA, 1984f
	Monkey	Oral (chronic)	18 months	Weakness, rigidity			25		ATSDR, 1990e
	Rodents/livestock	Oral (subchronic)	10 days - 2 months	Decreased growth rate			100		Cunningham et al., 1966
	Mouse	Oral (subchronic)	180 days	NOAEL for mortality		2,300			Giannuzzo and Murray, 1982

Table S–2.5
Ingestion Toxicity Information for Terrestrial and Semi–Aquatic Wildlife

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW – day Oral LD50	Lethal RTV mg/kgBW – day LOAEL	Sublethal RTV mg/kgBW – day LOAEL	Sublethal RTV mg/kgBW – day NOAEL	Reference
Mercury	Mouse	Oral LD_{50}		Mortality	22				NIOSH, 1985
	Mouse	Oral (subchronic)	Day 6–17 (gest)	Stillbirths and neonatal death			4		Suzuki, 1979
	Rat	Oral (subchronic)	Day 6–14 (gest)	Retarded fetus growth			4		Suzuki, 1979
organomercury	Rat	Oral (chronic)	NR	Reduced fertility			0.5		Eisler, 1987b
	Rat	Oral LD_{50}		Mortality	18				NIOSH, 1985
organomercury	Pig	Oral (subchronic)	Pregnancy	High incidence of stillbirths			0.5		Eisler, 1987b
organomercury	Mule deer	Oral LD_{50}		Mortality	17.9				Eisler, 1987b
organomercury	River otter	Oral LD_{50}		Mortality	2				Eisler, 1987b
organomercury	Mink	Oral LD_{50}		Mortality	1				Eisler, 1987b
organomercury	Dog	Oral (subchronic)	Pregnancy	High incidence of stillbirths			0.1		Eisler, 1987b
methylmercury	House sparrow	Oral LD_{50}		Mortality	12.6				Eisler, 1987b
ethylmercury	Rock dove	Oral LD_{50}		Mortality	22.8				Eisler, 1987b
	Chicken	Oral LD_{50}		Mortality	20				Fimreite, 1979
	Bantam chicken	Oral LD_{50}		Mortality	190				Fimreite, 1979
ethylmercury	Prairie chicken	Oral LD_{50}		Mortality	11.5				Eisler, 1987b
ethylmercury	Chukar	Oral LD_{50}		Mortality	26.9				Eisler, 1987b
methylmercury	Coturnix	Oral LD_{50}		Mortality	11				Eisler, 1987b
	Mallard	Oral	NR	Reproduction, behavior			0.064		USEPA, 1993b
methylmercury	Black duck	Oral (subchronic)	28 weeks	Reproduction inhibited			0.22 [b]		Eisler, 1987b
methylmercury	Fulvous whistling duck	Oral LD_{50}		Mortality	37.8				Eisler, 1987b
methylmercury	Northern bobwhite	Oral LD_{50}		Mortality	23.8				Eisler, 1987b
methylmercury	Bobwhite quail	Oral LD_{50}	5 days	Mortality	523				Hill et al., 1975
	Japanese quail	Oral LD_{50}		Mortality	14.4				Eisler, 1987b
ethylmercury	Gray partridge	Oral LD_{50}		Mortality	17.6				Eisler, 1987b
organomercury	Gray pheasant	Oral (subchronic)	30 days	Reduced reproductive ability			0.64		Eisler, 1987b
methylmercury	Ring–necked pheasant	Oral LD_{50}		Mortality	11.5				Eisler, 1987b
	Mouse	Oral (subchronic)	50 days	Embryotoxicity and teratogenicity			0.9		Suzuki, 1979
Nickel	Rat	Oral	NR	Reproductive effects			158		RTECS, 1994
	Rat	Oral LD_{50}	NR	Mortality	67				ATSDR, 1987d
	Rat	Oral (chronic)	2 years	Decreased body weight gain			50		ATSDR, 1987d
	Rat	Oral LD_{50}	NR	Mortality	350				Sax, 1984
	Japanese quail	Oral (acute)	5 days	Mortality	504				Hill and Camardese, 1986
	Dog	Oral (chronic)	2 years	Histological lesions in bone marrow			62.5		ATSDR, 1987d
Selenium	Rat	Oral LD_{50}	NR	Mortality	6,700				RTECS, 1993
	Rat	Oral LD_{50}	NR	Mortality	138				Sax, 1984
	Mouse	Oral	NR	Reproductive effects			134		RTECS, 1993
	Mallard	Oral (subchronic)	3 months	Reduced hatchability			1.75		Eisler, 1985 a
	Rat	Oral (chronic)	2 years	Decrease in breeding			0.2		ATSDR, 1988b
	Rat	Oral (chronic)	NS	Histological changes in heart and kidney			0.045		Eisler, 1985 a
	Japanese quail	Oral (chronic)	NS	Reduced egg hatching			0.6		Eisler, 1985 a
	Mallard	Oral (subchronic)	3 months	NOAEL for teratogenic effects			0.72	0.36	Eisler, 1985 a
	Horse	Oral LD_{50}		MLD	3.3				Eisler, 1985 a
	Mallard	Oral	6 weeks	Increased mortality		2.7 [b]			Heinz et al., 1988
	Black–capped night heron	Oral	NR	NOAEL for egg hatchability				0.61 [b]	Smith et al., 1988
Silver	Mouse	Intraperitoneal (acute)		Mortality	34				NIOSH, 1985
	Rat	Oral (chronic)	37 week	Weight gain			222.2		ATSDR, 1990f
	Mouse	Oral (chronic)	125 days	Hypoactivity			18.1		ATSDR, 1990f
Thallium	Rat	Oral LD_{50}	NR	Mortality	35				Sax, 1984
	Rat	Oral (subchronic)	30 to 60 days	adverse testicular effects			0.7		IRIS, 1993
	Ring–necked pheasant	Oral LD_{50}	NR	Mortality	23.7				USFWS, 1984
	Golden eagle	Oral LD_{50}	NR	Mortality	90				USFWS, 1984
Vanadium	Japanese quail	Oral LD_{50}	5 days	Mortality	96				Hill and Camardese, 1986
	Rat	Oral (subchronic)	2 months	Hypertension			15		Susic and Kentera, 1986
	Rat	Oral (subchronic)	35 days	NOAEL for development effects			8.4		Domingo, et al., 1986
	Chicken	Oral (subchronic)	6 weeks	Decrease in egg–laying			11 [c]		Berg et al., 1963
Zinc	Rat	Oral LD_{50}		Mortality	2,510				RTECS, 1993
	Rat	Oral	Gestation	Fetal resorptions in 4 to 20% of population			200		Shlicker and Cox, 1968
	Ferret	Oral	3–13 days	Mortality and gastrointestinal effects		390			Straube et al., 1980
	Rat	Oral (subchronic)	NR	Kidney toxicity			160		Llobet, et al., 1988

Table S–2.5
Ingestion Toxicity Information for Terrestrial and Semi–Aquatic Wildlife

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical	Test Species	Test Type	Duration	Effect	Lethal RTV mg/kgBW–day Oral LD50	Lethal RTV mg/kgBW–day LOAEL	Sublethal RTV mg/kgBW–day LOAEL	Sublethal RTV mg/kgBW–day NOAEL	Reference
DIOXINS									
TCDD	Guinea pigs	Oral LD_{50}	NR	Death	6.0E–04 [d]				USEPA, 1993a
	Rat	Oral	NR	Reproductive effects			1.0E–07 [d]		USEPA, 1993a
	Bobwhite quail	Oral LD_{50}	NR	Death	1.5E–02 [d]				USEPA, 1993a
	Pheasants	Oral	NR	Reproductive effects			1.4E–06 [d]		USEPA, 1993a

Notes:
LD_{50} = Dose resulting in 50% mortality in test population
LOAEL = Lowest Observed Adverse Effect Level
BW = Body weight
NR = Not reported
[a] Value for benzo(a)pyrene chosen as a surrogate for all PAHs. Chemical–specific toxicity studies for ecologically significant endpoints are lacking for other PAHs.
[b] Converted to dose per kilogram body weight by multiplying by ingestion and dividing by body weight. Body weights for birds obtained from Dunning, 1984.
Ingestion rates were calculated using the following regression equation (for all birds) from Nagy et al., 1987: Food Ingestion (kg/day) = 0.00582 * Body Weight$^{0.651}$ (kg). Ingestion rates for the chicken from NRC, 1984 (pg. 13).
[c] Converted from 30 ppm to 11 mg/kgBW–day using standard default parameters (USEPA, 1988b).
[d] Doses converted from pg/gBW/day to mg/kgBW/day

Table S-2.6
RTVs Selected for Ecological Risk Assessment
Units (mg/kgBW/day)

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Compound	Small Mammal [a]			Small Bird [b]			Predatory Mammal [c]			Predatory Bird [d]		
	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV
Volatile Organic Compounds												
Acetone	600	273,000	600 [e]	600	273,000	600 [e]	600	273,000	600 [e]	600	273,000	600 [e]
Benzene	760	10	10	760	10	10	760	10	10	760	10	10
2-Butanone	547	173 [f]	173	547	173 [f]	173	547	173 [f]	173	547	173 [f]	173
Carbon disulfide	NA	11	11	NA	11	11	NA	11	11	NA	11	11
Chlorobenzene	250	89	89	250	89	89	250	89	89	250	89	89
1,1-Dichloroethane	98	120	98 [e]	98	120	98 [e]	98	120	98 [e]	98	120	98 [e]
1,2-Dichloroethylene	40	9	9	40	9	9	40	9	9	40	9	9
Ethylbenzene	700	291	291	700	291	291	700	291	291	700	291	291
Methylene chloride	320	52.6	52.6	320	52.6	52.6	320	52.6	52.6	320	52.6	52.6
1,1,2,2-Tetrachloroethane	250 [g]	3.2	3.2	250 [g]	3.2	3.2	250 [g]	3.2	3.2	250 [g]	3.2	3.2
Tetrachloroethylene	1,620	100	100	1,620	100	100	1,620	100	100	1,620	100	100
Toluene	1,000	76	76	1,000	76	76	1,000	76	76	1,000	76	76
Trichloroethylene	480	750	480 [e]	480	750	480 [e]	480	750	480 [e]	480	750	480 [e]
Vinyl chloride	100	130	100 [e]	100	130	100 [e]	100	130	100 [e]	100	130	100 [e]
Xylenes (total)	860	500	500	2,014 [g]	500	500	860	500	500	2,014 [g]	500	500
Semivolatile Organic Compounds												
Acenaphthene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Acenaphthylene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Anthracene	3,400	10 [h]	10	3,400	10 [h]	10	3,400	10 [h]	10	3,400	10 [h]	10
Benzo(a)anthracene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Benzo(a)pyrene	24	10	10	24	10	10	24	10	10	24	10	10
Benzo(b)fluoranthene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Benzo(g,h,i)perylene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Benzo(k)fluoranthene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Benzoic acid	NA	40	40	NA	40	40	NA	40	40	NA	40	40
Butylbenzylphthalate	466	4,900	466 [e]	466	4,900	466 [e]	466	4,900	466 [e]	466	4,900	466 [e]
Carbazole	100	NA	100 [e]	100	NA	100 [e]	100	NA	100 [e]	100	NA	100 [e]
Chrysene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Dibenz(ah)anthracene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Dibenzofuran	125	60	60	125	60	60	125	60	60	125	60	60
Di-n-butylphthalate	1,303	125	125	1,303	125	125	1,303	125	125	1,303	125	125
Di-n-octylphthalate	1,303	125	125	1,303	125	125	1,303	125	125	1,303	125	125
bis(2-Ethylhexyl)phthalate	160	35	35	160	35	35	160	35	35	160	35	35
Fluoranthene	40	10 [h]	10	40	10 [h]	10	40	10 [h]	10	40	10 [h]	10
Fluorene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
Indeno(1,2,3-cd)pyrene	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10	24 [h]	10 [h]	10
2-Methylnaphthalene	326	10 [h]	10	326	10 [h]	10	326	10 [h]	10	326	10 [h]	10
4-Methylphenol	220	50	50	220	50	50	220	50	50	220	50	50
Naphthalene	107	10 [h]	10	107	10 [h]	10	107	10 [h]	10	107	10 [h]	10
Phenanthrene	140	10 [h]	10	140	10 [h]	10	140	10 [h]	10	140	10 [h]	10

Table S-2.6
RTVs Selected for Ecological Risk Assessment
Units (mg/kgBW/day)

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Compound	Small Mammal [a]			Small Bird [b]			Predatory Mammal [c]			Predatory Bird [d]		
	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV
Phenol	20	120	20 [e]	20	120	20 [e]	20	120	20 [e]	20	120	20 [e]
Pyrene	160	10 [h]	10	160	10 [h]	10	160	10 [h]	10	160	10 [h]	10
1,2,4-Trichlorobenzene	760	NA	760 [e]	760	NA	760 [e]	760	NA	760 [e]	760	NA	760 [e]
Pesticides and PCBs												
Aldrin	7.6 [i]	0.65 [i]	0.65	0.6 [i]	0.65 [i]	0.6 [e]	13 [i]	0.65 [i]	0.65	0.6 [i]	0.65 [i]	0.6 [e]
Aroclor-1248	100	6.4	6.4	16	0.9	0.9	100	0.0075	0.0075	16	9	9
Aroclor-1254	100	1.53	1.53	16	0.9	0.9	100	0.096	0.096	16	9	9
Aroclor-1260	100	6.4	6.4	16	0.9	0.9	100	0.0075	0.0075	16	9	9
alpha-BHC	35	5	5	16	5	5	35	5	5	16	5	5
gamma-BHC	35	5	5	16	5	5	35	5	5	16	5	5
alpha-Chlordane	20	16	16	4.8	0.031 [f]	0.031	40	16	16	4.8	0.031 [f]	0.031
gamma-Chlordane	20	16	16	4.8	0.031 [f]	0.031	40	16	16	4.8	0.031 [f]	0.031
4,4'-DDD	17.4 [j]	0.2 [j]	0.2	119 [k]	0.14 [k]	0.14	17.4 [j]	3,540 [l]	17.4 [e]	119 [k]	0.14 [k]	0.14
4,4'-DDE	140	0.2 [j]	0.2	119 [k]	0.58	0.58	140 [j]	3,540 [l]	140 [e]	119 [k]	0.58 [k]	0.58
4,4'-DDT	17.4	0.2	0.2	119	0.14	0.14	17.4	3,540	17.4 [e]	119	0.14	0.14
Dieldrin	7.6	0.65	0.65	0.6	0.65 [m]	0.6 [e]	13	0.65 [m]	0.65	0.6	0.65 [m]	0.6 [e]
Heptachlor	8	0.35	0.35	12.4	0.35	0.35	8	0.35	0.35	12.4	0.35	0.35
Heptachlor epoxide	8 [n]	0.35 [n]	0.35	12.4 [n]	0.35 [n]	0.35	8 [n]	0.35 [n]	0.35	12.4 [n]	0.35 [n]	0.35
Inorganic Compounds												
Aluminum	740	425	425	740	425	425	740	425	425	740	425	425
Antimony	3,340	41.8	41.8	3,340	41.8	41.8	3,340	41.8	41.8	3,340	41.8	41.8
Arsenic	29	0.58	0.58	3.6	1	1	2,929	0.58	0.58	3.6	1	1
Barium	430 [g]	198	198	430 [g]	198	198	430 [g]	198	198	430 [g]	198	198
Beryllium	2	0.85	0.85	2	0.85	0.85	2	0.85	0.85	2	0.85	0.85
Cadmium	30	21.5	21.5	30	10	10	30	21.5	21.5	30	10	10
Chromium	25.2	1,400	25.2 [e]	25.2	200	25.2 [e]	25.2	1,400	25.2 [e]	25.2	200	25.2 [e]
Cobalt	18.2	13	13	18.2	13	13	18.2	13	13	18.2	13	13
Copper	188	100	100	188	100	100	188	100	100	188	100	100
Cyanide	1.7	11.9	1.7 [e]	1.1	11	1.1 [e]	1.7	11.9	1.7 [e]	1.1	11	1.1 [e]
Iron	240	NA	240	240	NA	240	240	NA	240	280	NA	280
Lead	60	2.5	2.5	75	6.25	6.25	60	2.5	2.5	75	50 [f]	50
Manganese	2,300 [g]	140	140	2,300 [g]	140	140	2,300 [g]	140	140	2,300 [g]	140	140
Mercury	3.6	0.5	0.5	2.2	0.064	0.064	0.2	0.1	0.1	2.2	0.064	0.064
Nickel	13	158	13 [e]	100	158	100 [e]	13	62.5	13 [e]	100	158	100 [e]
Selenium	27.6	0.045	0.045	2.7 [g]	0.6	0.6	27.6	0.2	0.2	2.7 [g]	0.6	0.6
Silver	6.8	18.1	6.8 [e]	6.8	18.1	6.8 [e]	6.8	18.1	6.8 [e]	6.8	18.1	6.8 [e]
Thallium	7	0.7	0.7	4.74	0.7	0.7	7	0.7	0.7	18	0.7	0.7
Vanadium	19.2	8.4	8.4	19.2	11	11	19.2	8.4	8.4	19.2	11	11
Zinc	390 [g]	200	200	390 [g]	200	200	390 [g]	200	200	390 [g]	200	200

Table S-2.6
RTVs Selected for Ecological Risk Assessment
Units (mg/kgBW/day)

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Compound	Small Mammal [a]			Small Bird [b]			Predatory Mammal [c]			Predatory Bird [d]		
	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV	Lethal (1/5 LD_{50})	Sublethal (LOAEL)	Selected RTV
Dioxins												
1,2,3,4,6,7,8-HpCDD	1.2E-02 [o]	1.0E-05 [o]	1.0E-05	3.0E-01 [o]	1.4E-04 [o]	1.4E-04	1.2E-02 [o]	1.0E-05 [o]	1.0E-05	3.0E-01 [o]	1.4E-04 [o]	1.4E-04
1,2,3,4,6,7,8-HpCDF	1.2E-02 [o]	1.0E-05 [o]	1.0E-05	3.0E-01 [o]	1.4E-04 [o]	1.4E-04	1.2E-02 [o]	1.0E-05 [o]	1.0E-05	3.0E-01 [o]	1.4E-04 [o]	1.4E-04
OCDD	1.2E-01 [o]	1.0E-04 [o]	1.0E-04	3.0E+00 [o]	1.4E-03 [o]	1.4E-03	1.2E-01 [o]	1.0E-04 [o]	1.0E-04	3.0E+00 [o]	1.4E-03 [o]	1.4E-03
OCDF	1.2E-01 [o]	1.0E-04 [o]	1.0E-04	3.0E+00 [o]	1.4E-03 [o]	1.4E-03	1.2E-01 [o]	1.0E-04 [o]	1.0E-04	3.0E+00 [o]	1.4E-03 [o]	1.4E-03
2,3,7,8-TCDF	1.2E-03 [o]	1.0E-06 [o]	1.0E-06	3.0E-02 [o]	1.4E-05 [o]	1.4E-05	1.2E-03 [o]	1.0E-06 [o]	1.0E-06	3.0E-02 [o]	1.4E-05 [o]	1.4E-05

Notes:
NOAEL = No Observed Adverse Effect Level. Value corresponds to the boxed value in Table S-2.5.
LOAEL = Lowest Observed Adverst Effect Level. Value corresponds to the boxed value in Table S-2.5.
LD_{50} = Median lethal dose. Value corresponds to one-fifth of the boxed value from Table S-2.5.
NA = Not available.
[a] These RTVs represent safe chemical concentrations for the cotton mouse and the short tailed shrew.
[b] These RTVs represent safe chemical concentrations for the American woodcock, meadowlark, and the spotted sandpiper. When no data were available, the small mammal value was used as a surrogate.
[c] These RTVs represent safe chemical concentrations for the red fox and the raccoon. When no data were available, the small mammal values were used as a surrogate.
[d] These RTVs represent safe chemical concentrations for the great horned owl, the osprey, and the great blue heron. When no data were avaialable, the small bird or small mammal values were used as a surrogate.
[e] The lethal RTV was selected for modeling sublethal effects because receptors exposed to the compound are likely to exhibit lethal effects prior to any sublethal effects; this represents the most conservative scenario for evaluating total risks to receptors.
[f] Value is an NOAEL rather than a chronic LOAEL.
[g] Value is an acute LOAEL rather than an LD_{50}.
[h] The small mammal value for benzo(a)pyrene was used as a surrogate.
[i] All values for dieldrin were used as surrogates.
[j] The small mammal value for 4,4'-DDT/4,4'-DDE was used as a surrogate.
[k] The small bird value for 4,4'-DDT/4,4'-DDE was used as a surrogate.
[l] The predatory mammal value for 4,4'-DDT/4,4'-DDE was used as a surrogate.
[m] The small mammal value for dieldrin was used as a surrogate.
[n] All values for heptachlor were used as surrogates.
[o] Value for TCDD from USEPA, 1993d. Lethal RTVs are equal to one-fifth of a calculated 28-day LD_{50} for guinea pigs and 37-day LD_{50} for ring-necked pheasants. Toxic Equivalency Factors (TEFs) obtained from USEPA, (1989) were divided by the selected TCDD RTV for the following congeners: 1,2,3,4,6,7,8-HpCDD (0.01), 1,2,3,4,6,7,8-HpCDF (0.01), OCDD (0.001), OCDF (0.001), and 2,3,7,8-TCDF (0.1).

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Volatile Organic Compounds								
Acetone	Aedes aegypti;Mosquito	3rd INST-AR	48 H	LC_{50}	15,000,000		310574	83
	Ambystoma mexicanum;Salamander	3-4 WK	48 H	LC_{50}	20,000,000		219740	80
	Asellus aquaticus;Aquatic sowbug	NR	48 H	LC_{50}	7,550,000		315788	83
	Chironomus thummi;Midge	NR	48 H	LC_{50}	13,000,000		315788	83
	Chlorella pyrenoidosa;Green algae	LOG PHASE	48 H	GRO		3,400,000	310574	83
	Cipangopaludina malleata;Mud snail	NR	48 H	LC_{50}	48,000,000		219158	72
	Cloeon dipterum;Mayfly	NR	48 H	LC_{50}	7,600,000		315788	83
	Corixa punctata;Water boatman	NR	48 H	LC_{50}	5,000,000		315788	83
	Culex pipiens;Mosquito	3rd INST-AR	48 H	LC_{50}	17,000,000		310574	83
	Culex restuans;White dotted mosquito	3rd INST-AR	18 H	LC_{50}	6,190,000		212192	81
	Daphnia magna;Water flea	≤24 H	28 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	≤24 H	28 D	MOR	4,300,000		310694	83
	Daphnia magna;Water flea	≤24 H	7 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	≤24 H	14 D	MOR	4,300,000		310694	83
	Daphnia magna;Water flea	≤24 H	28 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	≤24 H	7 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	≤24 H	14 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	≤24 H	21 D	MOR	550,000		310694	83
	Daphnia magna;Water flea	8 H	0.25 H	LOC		9,280,000	212171	44
	Daphnia magna;Water flea	≤24 H	7 D	LET	8,700,000		310694	83
	Daphnia magna;Water flea	≤24 H	21 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	≤24 H	14 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	≤24 H	28 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	≤24 H	7 D	MOR	1,100,000		310694	83
	Daphnia magna;Water flea	≤24 H	14 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	≤24 H	28 D	REP		4,300,000	310694	83
	Daphnia magna;Water flea	≤24 H	21 D	MOR	4,300,000		310694	83
	Daphnia magna;Water flea	≤ 24 H	48 H	LC_{50}	31,000,000		310694	83
	Daphnia magna;Water flea	≤ 24 H	24 H	LC_{50}	35,000,000		310694	83
	Daphnia magna;Water flea	≤24 H	21 D	MOR	2,200,000		310694	83
	Daphnia magna;Water flea	<24 H	48 H	EC_{50}IM		13,500,000	212193	80
	Daphnia magna;Water flea	≤24 H	28 D	REP		1,100,000	310694	83
	Daphnia magna;Water flea	≤24 H	7 D	MOR	4,300,000		310694	83
	Daphnia pulex;Water flea	<24 H	18 H	LC_{50}	1,220,000		212192	81
	Dugesia lugubris;Turbellarian	NR	48 H	LC_{50}	7,500,000		315788	83
	Erpobdella octoculata;Leech	NR	48 H	LC_{50}	7,000,000		315788	83
	Gambusia affinis;Mosquitofish	ADULT FEMALE	96 H	LC_{50}	13,000,000		210508	57
	Gambusia affinis;Mosquitofish	ADULT FEMALE	24 H	LC_{50}	13,500,000		210508	57
	Gambusia affinis;Mosquitofish	ADULT FEMALE	48 H	LC_{50}	13,000,000		210508	57
	Gammarus pulex;Scud	NR	48 H	LC_{50}	6,000,000		315788	83
	Hydra oligactis;Hydra	NR	48 H	LC_{50}	13,500,000		315788	83
	Hydra oligactis;Hydra	BUD-LESS	48 H	LC_{50}	13,500,000		310574	83
	Indoplanorbis exustus;Snail	NR	48 H	LC_{50}	35,000,000		219158	72
	Ischnura elegans;Dragonfly	NR	48 H	LC_{50}	6,400,000		315788	83
	Lepomis macrochirus;Bluegill	5.3-7.2cm 3.5-3.9 g	96 H	LC_{50}	8,300,000		212406	68
	Lepomis macrochirus;Bluegill	NR	96 H	LC_{50}	8,300,000		210949	68
	Lymnaea stagnalis;Great pond snail	3-4 WK	48 H	LC_{50}	7,000,000		310574	83
	Lymnaea stagnalis;Great pond snail	NR	48 H	LC_{50}	7,000,000		315788	83
	Nemoura cinerea;Stonefly	NR	48 H	LC_{50}	10,300,000		315788	83

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Acetone (cont.)	Oncorhynchus mykiss;Rainbow trout	5–8 WK	48 H	LC_{50}	7,400,000		310574	83
	Oncorhynchus mykiss;Rainbow trout	10.0cm 10.2 g	6 H	LET	12,500,000		210991	78
	Oncorhynchus mykiss;Rainbow trout	1.0 g	96 H	LC_{50}	5,540,000		210666	80
	Oncorhynchus mykiss;Rainbow trout	9.4 cm 10.8 g	24 H	LC_{50}	6,100,000		210991	78
	Oryzias latipes;Medaka, high–eyes	4–5 WK	48 H	LC_{50}	14,300,000		310574	83
	Palaemonetes kadiakensis;Grass shrimp, freshwater prawn	JUV–ENILE	18 H	LC_{50}	2,610,000		212192	81
	Physa acuta;Bladder snail	NR	48 H	LC_{50}	35,000,000		219158	72
	Pimephales promelas;Fathead minnow	28 D	96 H	LC_{50}	7,280,000		312448	84
	Pimephales promelas;Fathead minnow	0.12 g	96 H	LC_{50}	7,310,000		310183	83
	Pimephales promelas;Fathead minnow	33 D	96 H	LC_{50}	8,120,000		312448	84
	Pimephales promelas;Fathead minnow	32 D	96 H	LC_{50}	6,210,000		312448	84
	Pimephales promelas;Fathead minnow	3–4 WK	48 H	LC_{50}	15,000,000		310574	83
	Pimephales promelas;Fathead minnow	0.12 g	96 H	LC_{50}	8,140,000		310183	83
	Rasbora heteromorpha;Harlequinfish, red rasbora	1.3–3 cm	48 H	LC_{50}	4,000,000		210542	69
	Rasbora heteromorpha;Harlequinfish, red rasbora	1.3–3 cm	24 H	LC_{50}	5,700,000		210542	69
	Scenedesmus pannonicus;Green algae	LOG PHASE	48 H	GRO		4,740,000	310574	83
	Selenastrum capricornutum;Green algae	LOG PHASE	96 H	GRO		7,000,000	310574	83
	Semisulcospira libertina;Marsh snail	NR	48 H	LC_{50}	35,000,000		219158	72
	Tubificidae;Oligochaete family	NR	48 H	LC_{50}	15,000,000		315788	83
	Xenopus laevis;Clawed toad	3–4 WK	48 H	LC_{50}	24,000,000		219740	80
1,1–Dichloroethylene	Daphnia magna, water flea	<24 H	48 H	LC_{50}	79,000			80
	Daphnia magna, water flea	FIRST INSTAR	24 H	LC_{50}	11,600			80
	Daphnia magna, water flea	<24 H	48 H	lethality	2,400			80
	Daphnia magna, water flea	<24 H	24 H	LC_{50}	98,000			80
	Daphnia magna, water flea	FIRST INSTAR	48 H	LC_{50}	11,600			80
	Lepomis macrochirus, bluegill	33–75 MM	96 H	LC_{50}	220,000			77
	Lepomis macrochirus, bluegill	JUVENILE, 0.32–1.2 G	24 H	LC_{50}	74,000			81
	Lepomis macrochirus, bluegill	JUVENILE, 0.32–1.2 G	96 H	LC_{50}	74,000			81
	Lepomis macrochirus, bluegill	JUVENILE, 0.32–1.2 G	96 H	LC_{50}	140,000			81
	Lepomis macrochirus, bluegill	JUVENILE, 0.32–1.2 G	24 H	LC_{50}	165,000			81
	Pimephales promelas, fathead minnow	0.8 G, 35 MM, ADULT	8 D	LC_{50}	29,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	96 H	LC_{50}	169,000			80
	Pimephales promelas, fathead minnow	0.8 G, 35 MM, ADULT	13 D	LC_{50}	29,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	5 D	LC_{50}	97,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	24 H	LC_{50}	116,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	6 D	LC_{50}	74,000			80
	Pimephales promelas, fathead minnow	0.8 G, 35 MM, ADULT	10 D	LC_{50}	29,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	7 D •	LC_{50}	29,000			80
	Pimephales promelas, fathead minnow	0.8 G, 35 MM, ADULT	12 D	LC_{50}	29,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	48 H	LC_{50}	169,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	48 H	LC_{50}	108,000			80
	Pimephales promelas, fathead minnow	0.8 G, 35 MM, ADULT	96 H	LC_{50}	108,000			80
	Pimephales promelas, fathead minnow	0.8 G, 35 MM, ADULT	9 D	LC_{50}	29,000			80
	Pimephales promelas, fathead minnow	ADULT, 0.8 G, 35 MM	24 H	LC_{50}	175,000			80
	Pimephales promelas, fathead minnow	0.8 G, 35 MM, ADULT	11 D	LC_{50}	29,000			80
	Scenedesmus atundans, green algae	10E4 CELLS/ML	96 H	GRO		410,000		85
1,1,2–Trichloroethylene	Aedes aegypti, mosquito	3RD INSTAR	48 H	LC_{50}	48,000			83
	Ambystoma mexicanum, salamander	3–4 WK	48 H	LC_{50}	48,000			80

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
1,1,2–Trichloroethylene (cont.)	Asellus aquaticus, sowbug	NR	48 H	LC_{50}	30,000			83
	Brachydanio rerio, zebrafish	NR	48 H	LC_{50}	60,000			79
	Chironomus thummi, midge	NR	48 H	LC_{50}	64,000			83
	Cloeon dipterum, mayfly	NR	48 H	LC_{50}	42,000			83
	Corixa punctata, water boatman	NR	48 H	LC_{50}	110,000			83
	Culex pipiens, mosquito	3RD INSTAR	48 H	LC_{50}	55,000			83
	Daphnia magna, water flea	<=24 H	48 H	LC_{50}	18,000			80
	Daphnia magna, water flea	NR	3 D	ABD	25,000			84
	Daphnia magna, water flea	24 H	24 H	LC_{50}	1,000,000			77
	Daphnia magna, water flea	NR	24 H	leth	110,000			84
	Daphnia magna, water flea	NR	24 H	EC_{50}	1,313,000			82
	Daphnia magna, water flea	<=24 H	24 H	LC_{50}	22,000			80
	Daphnia magna, water flea	<=24 H	48 H		2,200			80
	Dugesia lugubris, flatworm	NR	48 H	LC_{50}	42,000			83
	Erpobdella octoculata, leech	NR	48 H	LC_{50}	75,000			83
	Gammarus pulex, scud	NR	48 H	LC_{50}	24,000			83
	Hydra oligactis, hydra	BUDLESS	48 H	LC_{50}	75,000			83
	Hydra oligactis, hydra	NR	48 H	LC_{50}	75,000			83
	Ischnura elegans, dragonfly	NR	48 H	LC_{50}	49,000			83
	Lepomis macrochirus, bluegill	JUVENILE 75 D, 2.2 CM	1 H	RES	100			90
	Lepomis macrochirus, bluegill	JUVENILE, 0.32–1.2 G	96 H	LC_{50}	45,000			81
	Lepomis macrochirus, bluegill	JUVENILE, 0.32–1.2 G	24 H	LC_{50}	68,000 to 100,000			81
	Lymnaea stagnalis, great pond snail	3–4 WK	48 H	LC_{50}	56,000			83
	Lymnaea stagnalis, great pond snail	NR	48 H	LC_{50}	56,000			83
	Moina macrocopa, water flea	5 D	3 H	LC_{50}	2,300			86
	Nemoura cinerea, stonefly	NR	48 H	LC_{50}	70,000			83
	Oncorhynchus mykiss, rainbow trout	NR	24 H	RES	5,000			79
	Oncorhynchus mykiss, rainbow trout	5–8 WK	48 H	LC_{50}	42,000			83
	Oryzias latipes, medaka	3 CM, 0.3 G	48 H	LC_{50}	1,900			86
	Oryzias latipes, medaka	4–5 WK	48 H	LC_{50}	270,000			83
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	48 H	IMM	22,700			78
	Pimephales promelas, fathead minnow	31 D	96 H	LC_{50}	44,100			85
	Pimephales promelas, fathead minnow	30–35 D	24 H	LC_{50}	58,800			83
	Pimephales promelas, fathead minnow	3–4 WK	48 H	LC_{50}	47,000			83
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	96 H	IMM	21,900			78
	Pimephales promelas, fathead minnow	30–35 D	48 H	LC_{50}	57,900			83
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	72 H	IMM	22,200			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	24 H	LC_{50}	52,400			78
	Pimephales promelas, fathead minnow	30–35 D	96 H	LC_{50}	45,000			83
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	24 H	IMM	23,000			78
	Pimephales promelas, fathead minnow	0.12 G	96 H	LC_{50}	44,100			83
	Pimephales promelas, fathead minnow	30–35 D	72 H	LC_{50}	55,400			83
	Pimephales promelas, fathead minnow	1.04 G; 49.0 MM	96 H	LC_{50}	66,800			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	96 H	LC_{50}	40,700			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	72 H	LC_{50}	39,000			78
	Pimephales promelas, fathead minnow	1.04 G, 49.0 MM	48 H	LC_{50}	53,300			78
	Scenedesmus abundans, green algae	10E4 CELLS/ML	96 H	GRO	450,000			85
	Selenastrum capricornutum, green algae	LOG PHASE	96 H	PGR	175,000			83
	Tubificidae, tubificidae	NR	48 H	LC_{50}	132,000			83
	Xenopus laevis, clawed toad	3–4 WK	48 H	LC_{50}	45,000			80

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Semivolatile Organic Compounds								
bis(2-Ethylhexyl)phthalate	Anacystis aeruginosa; Blue-green algae;	LOG-PHASE 500000 CELLS/ML	96 H	EC50GR		>=320	215336	81
	Anacystis aeruginosa; Blue-green algae;	LOG-PHASE 500000 CELLS/ML	96 H	PGR *		>=320	215336	81
	Brachydanio rerio; Zebra danio, zebrafish;	4-5 WK	96 H	LC_{50}	>320		215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	4-5 WK	96 H	MOR *	>=320		215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	<4 H, EGGS	5 WK	DVP *		>=1000	215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	1-2 D	96 H	MOR *	>=320		215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	<4 H, EGGS	5 WK	GRO *		>=1000	215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	1-2 D	96 H	BEH *		>=320	215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	4-5 WK	96 H	BEH *		>=320	215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	1-2 D	96 H	LC_{50}	>320		215390	84
	Brachydanio rerio; Zebra danio, zebrafish;	<4 H, EGGS	5 WK	MOR *	>=1000		215390	84
	Bufo woodhousei fowleri; Fowler's toad;	EMBRYO TO LARVA	to 8 D *	LC_{50}	3,880		216772	78
	Bufo woodhousei fowleri; Fowler's toad;	LARVA	96 H *	LC_{50}	3,880		216772	78
	Carassius auratus; Goldfish;	EMBRYO TO LARVA	96 H *	LC_{50}	6,180		216772	78
	Carassius auratus; Goldfish;	EGGS, 4 D POSTHATCH	96 H	LC_{50} *	> 191000		210563	79
	Carassius auratus; Goldfish;	EGGS, 4 D POSTHATCH	96 H	LC_{50} *	> 186000		210563	79
	Carassius auratus; Goldfish;	EGGS, 4 D POSTHATCH	8 D	LC_{50} *	> 191000		210563	79
	Carassius auratus; Goldfish;	EGGS, 4 D POSTHATCH	8 D	LC_{50} *	> 186000		210563	79
	Chironomus plumosus; Midge;	EGG	30 D	HAT *		560	217688	77
	Chironomus plumosus; Midge;	LARVAE	30 D	DVP *		560	217688	77
	Chlorella pyrenoidosa; Green algae;	LOG-PHASE 10000 CELLS/ML	96 H	EC50GR		>320	215336	81
	Chlorella pyrenoidosa; Green algae;	LOG-PHASE 10000 CELLS/ML	96 H	PGR *		>=320	215336	81
	Daphnia magna; Water flea;	<24 H	24 H	LC_{50}	>68000		215184	80
	Daphnia magna; Water flea;	NR	21 D	REP *		10	210736	73
	Daphnia magna; Water flea;	< 24 H	21 D	MOR *	10		311061	82
	Daphnia magna; Water flea;	NR	21 D	REP *		2.5	210736	73
	Daphnia magna; Water flea;	< 24 H	21 D	MOR *	3.2		311061	82
	Daphnia magna; Water flea;	NR	21 D	REP *		3	210736	73
	Daphnia magna; Water flea;	< 24 H	48 H	LOC *		47	311061	82
	Daphnia magna; Water flea;	NR	21 D	REP *		30	210736	73
	Daphnia magna; Water flea;	<1 D	2 WK	MOR *	32		215336	81
	Daphnia magna; Water flea;	FIRST INSTAR, < 24 H	7 D	BIO *		811	312340	87
	Daphnia magna; Water flea;	FIRST INSTAR, < 24 H	7 D	MOR *	158		312340	87
	Daphnia magna; Water flea;	<1 D	3 WK	LC_{50}	>320		215336	81
	Daphnia magna; Water flea;	FIRST INSTAR, < 24 H	7 D	MOR *	811		312340	87
	Daphnia magna; Water flea;	<24 H	2 WK	REP *		320	215336	81
	Daphnia magna; Water flea;	NR	14 D	REP *		10	210736	73
	Daphnia magna; Water flea;	<24 H	48 H	LC_{50}	11,000		215184	80
	Daphnia magna; Water flea;	NR	14 D	REP *		3	210736	73
	Daphnia magna; Water flea;	FIRST INSTAR, < 24 H	21 D	MOR *	158		312340	87
	Daphnia magna; Water flea;	NR	14 D	REP *		30	210736	73
	Daphnia magna; Water flea;	FIRST INSTAR, < 24 H	7 D	BIO *		158	312340	87
	Daphnia magna; Water flea;	< 24 H	21 D	MOR *	100		311061	82
	Daphnia magna; Water flea;	<1 D	3 WK	MOR *	>=320		215336	81
	Daphnia magna; Water flea;	< 24 H	21 D	MOR *	32		311061	82
	Daphnia magna; Water flea;	<24 H	48 H	MOR *	1,100		215184	80
	Daphnia magna; Water flea;	<1 D	2 WK	LC_{50}	>320		215336	81
	Daphnia magna; Water flea;	<1 D	24 H	EC50IM		>320	215336	81

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
bis(2–Ethylhexyl)phthalate (cont.)	Daphnia magna; Water flea;	FIRST INSTAR, < 24 H	21 D	MOR *	811		312340	87
	Daphnia magna; Water flea;	1ST INSTAR, 24 H	21 D	REP		3	210732	73
	Daphnia magna; Water flea;	<1 D	2 WK	MOR *	>=320		215336	81
	Daphnia pulex; Water flea;	NEONATE, < 24 H	48 H	EC50IM		133	312730	87
	Euglena gracilis; Flagellate euglenoid;	LOG – PHASE 10000 CELLS/ML	96 H	EC50GR		>320	215336	81
	Euglena gracilis; Flagellate euglenoid;	LOG – PHASE 10000 CELLS/ML	96 H	PGR *		>=320	215336	81
	Gammarus pseudolimnaeus; Scud;	NR	96 H	LC_{50}	>32000		210732	73
	Gammarus pseudolimnaeus; Scud;	JUVENILE	96 H	LC_{50}	> 32000		210666	80
	Gammarus pulex; Scud;	>12 MM	10 D	LOC *		100	210079	91
	Gammarus pulex; Scud;	>12 MM	10 D	LOC *		500	210079	91
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	48 H	LC_{50}	> 300		210823	89
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	96 H	LC_{50}	> 300		210823	89
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	24 H	LC_{50}	> 300		210823	89
	Gasterosteus aculeatus; Three spine stickleback;	EGGS, < 6 H	35 D	EC50 *		> 320	210823	89
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	24 H	EC50 *		> 300	210823	89
	Gasterosteus aculeatus; Three spine stickleback;	EGGS, < 6 H	35 D	LC_{50}	> 320		210823	89
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	72 H	LC_{50}	> 300		210823	89
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	48 H	EC50 *		> 300	210823	89
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	72 H	EC50 *		> 300	210823	89
	Gasterosteus aculeatus; Three spine stickleback;	4–5 WK	96 H	EC50 *		> 300	210823	89
	Ictalurus punctatus; Channelcatfish;	1.5 G	96 H	LC_{50}	> 100000		210666	80
	Ictalurus punctatus; Channelcatfish;	EMBRYO TO LARVA	96 H *	LC_{50}	690		216772	78
	Jordanella floridae; Flagfish;	28–35 D	3 WK	MOR *	>=320		215336	81
	Jordanella floridae; Flagfish;	<36 H	4 WK	MOR *	>=320		215336	81
	Jordanella floridae; Flagfish;	<36 H	7 D	LC_{50}	>320		215336	81
	Jordanella floridae; Flagfish;	1–2 D	96 H	LC_{50}	>320		215336	81
	Jordanella floridae; Flagfish;	4–5 WK	96 H	BEH *		>=320	215336	81
	Jordanella floridae; Flagfish;	4–5 WK	96 H	LC_{50}	>320		215336	81
	Jordanella floridae; Flagfish;	1–2 D	48 H	LC_{50}	>320		215336	81
	Jordanella floridae; Flagfish;	<36 H	4 WK	GRO *		>=320	215336	81
	Jordanella floridae; Flagfish;	28–35 D	4 WK	MOR *	>=320		215336	81
	Jordanella floridae; Flagfish;	<36 H	4 WK	LC_{50}	>320		215336	81
	Jordanella floridae; Flagfish;	4–5 WK	48 H	LC_{50}	>320		215336	81
	Jordanella floridae; Flagfish;	1–2 D	96 H	BEH *		>=320	215336	81
	Jordanella floridae; Flagfish;	28–35 D	4 WK	GRO *		>=320	215336	81
	Jordanella floridae; Flagfish;	28–35 D	2 WK	MOR *	>=320		215336	81
	Jordanella floridae; Flagfish;	28–35 D	4 WK	REP *		>=320	215336	81
	Jordanella floridae; Flagfish;	28–35 D	1 WK	MOR *	>=320		215336	81
	Lepomis macrochirus; Bluegill;	0.32–1.2 G, JUVENILE	24 H	LC_{50}	>770000		215590	81
	Lepomis macrochirus; Bluegill;	0.32–1.2 G, JUVENILE	96 H	LC_{50}	>770000		215590	81
	Lepomis macrochirus; Bluegill;	0.6 G	96 H	LC_{50}	> 100000		210666	80
	Lepomis macrochirus; Bluegill;	JUVENILE, 35 – 60 MM	0.7 H	AVO *		112,400	215272	80
	Micropterus salmoides; Largemouth bass;	EGGS, 4 D POSTHATCH	84 H	LC_{50} *	32,100		210563	79
	Micropterus salmoides; Largemouth bass;	EMBRYO TO LARVA	96 H *	LC_{50}	32,900		216772	78
	Micropterus salmoides; Largemouth bass;	EMBRYO TO LARVA	96 H *	LC_{50}	42,100		216772	78
	Micropterus salmoides; Largemouth bass;	EGGS, 4 D POSTHATCH	7.5 D	LC_{50} *	45,500		210563	79
	Micropterus salmoides; Largemouth bass;	EGGS, 4 D POSTHATCH	7.5 D	LC_{50} *	55,700		210563	79
	Micropterus salmoides; Largemouth bass;	EGGS, 4 D POSTHATCH	84 H	LC_{50} *	65,500		210563	79
	Oncorhynchus kisutch; Coho salmon, silver salmon;	1.5 G	96 H	LC_{50}	> 100000		210666	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	12 D *	MOR *	54		217859	76

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
bis(2-Ethylhexyl)phthalate (cont.)	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	100 D	HAT *		54	217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	12 D *	MOR *	14		217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EGGS, 4 D POSTHATCH	23 D	LC_{50} *	154,000		210563	79
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	12 D *	MOR *	5		217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EGGS, 4 D POSTHATCH	27 D	LC_{50} *	149,200		210563	79
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1.5 G	96 H	LC_{50}	> 100000		210666	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EMBRYO TO LARVA	96 H *	LC_{50}	149,200		216772	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	24 D *	MOR *	14		217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGG	90 D	VTE *		14	215109	77
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	24 D *	MOR *	5		217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	100 D	GRO *		62	217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	24 D *	MOR *	54		217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EGGS, 4 D POSTHATCH	27 D	LC_{50} *	139,500		210563	79
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	5 D *	MOR *	14		217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGG	90 D	GRO *		54	215109	77
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	5 D *	MOR *	5		217859	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EGGS, 4 D POSTHATCH	23 D	LC_{50} *	139,100		210563	79
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGG	90 D	VTE *		5	215109	77
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EMBRYO TO LARVA	96 H *	LC_{50}	139,500		216772	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EYED EGGS	5 D *	MOR *	54		217859	76
	Oryzias latipes; Medaka, high-eyes;	28-35 D	4 WK	GRO *		>=320	215336	81
	Oryzias latipes; Medaka, high-eyes;	28-35 D	4 WK	REP *		>=320	215336	81
	Oryzias latipes; Medaka, high-eyes;	1-2 D	96 H	BEH *		>=320	215336	81
	Oryzias latipes; Medaka, high-eyes;	4-5 WK	48 H	LC_{50}	>320		215336	81
	Oryzias latipes; Medaka, high-eyes;	28-35 D	1 WK	MOR *	>=320		215336	81
	Oryzias latipes; Medaka, high-eyes;	4-5 WK	96 H	BEH *		>=320	215336	81
	Oryzias latipes; Medaka, high-eyes;	28-35 D	3 WK	MOR *	>=320		215336	81
	Oryzias latipes; Medaka, high-eyes;	4-5 WK	96 H	LC_{50}	>320		215336	81
	Oryzias latipes; Medaka, high-eyes;	28-35 D	4 WK	LC_{50}	>320		215336	81
	Oryzias latipes; Medaka, high-eyes;	<36 H	4 WK	LC_{50}	>320		215336	81
	Oryzias latipes; Medaka, high-eyes;	1-2 D	96 H	LC_{50}	>320		215336	81
	Oryzias latipes; Medaka, high-eyes;	<36 H	4 WK	MOR *	>=320		215336	81
	Oryzias latipes; Medaka, high-eyes;	1-2 D	48 H	LC_{50}	>320		215336	81
	Oryzias latipes; Medaka, high-eyes;	28-35 D	2 WK	MOR *	>=320		215336	81
	Oryzias latipes; Medaka, high-eyes;	28-35 D	4 WK	MOR *	>=320		215336	81
	Oryzias latipes; Medaka, high-eyes;	<36 H	7 D	LC_{50}	>320		215336	81
	Pimephales promelas; Fathead minnow;	7.5 MO, 1.24 G	56 D	MOR *	62		217859	76
	Pimephales promelas; Fathead minnow;	7.5 MO, 1.24 G	56 D	GRO *		62	217859	76
	Pimephales promelas; Fathead minnow;	FRY, 10 D	127 D	GRO *		100	215109	77
	Pimephales promelas; Fathead minnow;	FRY, 10 D	127 D	VTE *		11	215109	77
	Poecilia reticulata; Guppy;	21-28 D	2 WK	LC_{50}	>320		215336	81
	Poecilia reticulata; Guppy;	21-28 D	48 H	LC_{50}	>320		215336	81
	Poecilia reticulata; Guppy;	21-28 D	4 WK	LC_{50}	>320		215336	81
	Poecilia reticulata; Guppy;	21-28 D	1 WK	LC_{50}	>320		215336	81
	Rana arvalis; Moorfrog;	EGGS	3 WK	HAT		0.89 to 187.40	215904	87
	Rana pipiens; Leopard frog;	EMBRYO TO LARVA	to 8 D *	LC_{50}	4,440		216772	78
	Rana pipiens; Leopard frog;	LARVA	96 H *	LC_{50}	4,440		216772	78
	Salvelinus fontinalis; Brook trout;	ADULT, 1.5 YR	150 D	GRO *		52	215109	77
	Salvelinus fontinalis; Brook trout;	ADULT, 1.5 YR	150 D	VTE *		3.7	215109	77
	Selenastrum capricornutum; Green algae;	LOG-PHASE 50000 CELLS/ML	96 H	EC50GR		>320	215336	81

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
bis(2-Ethylhexyl)phthalate (cont.)	Selenastrum capricornutum; Green algae;	LOG-PHASE 50000 CELLS/ML	96 H	PGR *		>=320	215336	81
	Stephanodiscus hantzschii; Diatom;	LOG-PHASE 10000 CELLS/ML	96 H	EC50GR		>320	215336	81
	Stephanodiscus hantzschii; Diatom;	LOG-PHASE 10000 CELLS/ML	96 H	PGR *		>=320	215336	81
Inorganic Compounds								
Aluminum	Brachionus calyciflorus; Rotifer;	NEONATE	24 H	LC_{50}	> 3,000		219385	91
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		12,700	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		7,600	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		2,500	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		5,100	212262	74
	Salmo trutta; Brown trout;	ALEVIN	28 D	LC_{50}	19		213472	90
	Salmo trutta; Brown trout;	ALEVIN	42 D	LC_{50}	72		213472	90
	Salmo trutta; Brown trout;	ALEVIN	21 D	LC_{50}	84 to 105		213472	90
	Salmo trutta; Brown trout;	ALEVIN	42 D	LC_{50}	15		213472	90
	Salmo trutta; Brown trout;	ALEVIN	28 D	LC_{50}	79		213472	90
	Salmo trutta; Brown trout;	FERT EGG	<4 MO	HAT		<677	213472	90
	Salvelinus fontinalis; Brook trout;	FRY	43.2 H	LT_{50}	1,000		216632	80
	Salvelinus fontinalis; Brook trout;	FRY	7.3 D	LT_{50}	630		216632	80
	Salvelinus fontinalis; Brook trout;	FRY	79.2 H	LT_{50}	500		216632	80
	Salvelinus fontinalis; Brook trout;	ADULT, 25-30 CM	5 D	LET	320		216632	80
	Salvelinus fontinalis; Brook trout;	FRY	86.4 H	LT_{50}	1,000		216632	80
	Salvelinus fontinalis; Brook trout;	FRY	11.5 D	LT_{50}	100		216632	80
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	10.67 D	LT_{50}	480		216188	80
	Salvelinus fontinalis; Brook trout;	FRY	4.7 D	LT_{50}	650		216632	80
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	19.67 D	LT_{50}	470		216188	80
	Salvelinus fontinalis; Brook trout;	FRY	5 D	LT_{50}	1,000		216632	80
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	20.83 D	LT_{50}	20		216188	80
	Salvelinus fontinalis; Brook trout;	FRY	50.4 H	LT_{50}	500		216632	80
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	4.79 D	LT_{50}	42		216188	80
	Salvelinus fontinalis; Brook trout;	FRY	67.2 H	LT_{50}	500		216632	80
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	8.42 D	LT_{50}	500		216188	80
	Salvelinus fontinalis; Brook trout;	EYED EGGS	5 D	MOR *	320		216632	80
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	>20.83 D	LT_{50}	10		216188	80
	Salvelinus fontinalis; Brook trout;	0.2 G, 30 D	3 D	GRO *		268	213592	91
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	>20.83 D	LT_{50}	500		216188	80
	Salvelinus fontinalis; Brook trout;	FRY	55.2 H	LT_{50}	500		216632	80
	Salvelinus fontinalis; Brook trout;	FRY, 22-23 MM	>20.83 D	LT_{50}	500		216188	80
	Salvelinus fontinalis; Brook trout;	FRY	38.4 H	LT_{50}	500		216632	80
	Salvelinus fontinalis; Brook trout;	0.2 G, 30 D	56 D	MOR *	268		213592	91
	Salvelinus fontinalis; Brook trout;	FRY	5.2 D	LT_{50}	100		216632	80
	Salvelinus fontinalis; Brook trout;	RECENTLY HATCHED FRY	5 D	LET	320		216632	80
	Salvelinus fontinalis; Brook trout;	YEARLINGS, 13-17 CM	5 D	LET	320		216632	80
Aluminum chloride	Ambystoma opacum; Marbled salamander;	EGGS	8 D	LC_{50}	2,280		216199	78
	Brachydanio rerio; Zebra danio, zebrafish;	LARVAE, 7-8 D POST-SPAWN	48 H	LC_{50}	106,000		311199	85
	Brachydanio rerio; Zebra danio, zebrafish;	LARVAE, 7-8 D POST-SPAWN	48 H	LC_{50}	80,000		311199	85
	Carassius auratus; Goldfish;	EGGS	7 D	LC_{50} *	150		215305	78
	Chilomonas paramecium; Cryptomonad;	NR	0.17 H	LET	2,400		212863	73
	Cyprinus carpio; Common, mirror, colored, carp;	7.5-8.5 CM, 10.5-12.5 G	24 H	MOR *	8,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5-8.5 CM, 10.5-12.5 G	48 H	MOR *	2,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5-8.5 CM, 10.5-12.5 G	24 H	MOR *	4,000		315166	81

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Aluminum chloride (cont.)	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	48 H	MOR *	2,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	24 H	MOR *	8,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	48 H	MOR *	8,000		315166	81
	Daphnia magna; Water flea;	12 H	21 D	EC_{50}IM ?		1,400	212022	72
	Daphnia magna; Water flea;	4 H	64 H	EC_{50}IM (Calc)		1,400	212054	48
	Daphnia magna; Water flea;	12 H	48 H	EC_{50}IM ?		3,900	212022	72
	Daphnia magna; Water flea;	12 H	21 D	EC_{50}RE ?		680	212022	72
	Euglena gracilis; Flagellate euglenoid;	NR	3 H	MOR *	1,000,000		212863	73
	Gambusia affinis; Mosquitofish; Poeciliidae;	ADULT, FEMALE	48 H	LC_{50} ? (Calc)	27,500		210508	57
	Gambusia affinis; Mosquitofish; Poeciliidae;	ADULT, FEMALE	24 H	LC_{50} ? (Calc)	29,600		210508	57
	Gambusia affinis; Mosquitofish; Poeciliidae;	ADULT, FEMALE	96 H	LC_{50} ? (Calc)	27,100		210508	57
	Gambusia affinis; Mosquitofish; Poeciliidae;	ADULT, FEMALE	96 H	MOR * (Calc)	20,400		210508	57
	Microhyla carolinensis; Narrow mouthed frog;	EGGS	7 D	LC_{50} *	50		215305	78
	Micropterus salmoides; Largemouth bass;	EGGS	8 D	LC_{50}	170		216199	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EGGS	28 D	LC_{50} *	560		215305	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 WK	9.25 D	PHY *		5,140; 1,570	218830	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EGGS	28 D	LC_{50}	560		216199	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 MO	45 D	PHY *		514; 514	218830	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 11 WK	43.9 D	LT_{50}	513		219328	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 WK	4.7 D	PHY *		5,200; 5,050	218830	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 MO	31.96 D	LT_{50}	5,230		219328	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 WK	7.46 D	LT_{50}	5,140		219328	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 MO	45 D	GRO *		51.6; 51.6	218830	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 WK	71.52 H	LT_{50}	5,200		219328	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 11 WK	45 D	GRO *		513	219328	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 MO	45 D	GRO *		514	219328	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 6 MO	45 D	GRO *		51.6	219328	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 11 WK	38.9 D	LT_{50}	5,140		219328	71
	Peranema trichophorum; Flagellate;	NR	0.17 H	LET	>1,000,000		212863	73
	Pimephales promelas; Fathead minnow;	LARVAE, <24 H	14 D	GRO *		66; 35	213070	89
	Pimephales promelas; Fathead minnow;	EMBRYO	4 D	HAT *		66; 35	213070	89
	Pimephales promelas; Fathead minnow;	30 D	to 109 D	HIS		30 to 60	213182	90
	Pimephales promelas; Fathead minnow;	12 D LARVAE	to 96 H	MOR	50 to 400		210836	89
	Pimephales promelas; Fathead minnow;	JUVENILE	to 96 H	MOR	50 to 400		210836	89
	Pimephales promelas; Fathead minnow;	1 D LARVAE	to 96 H	MOR	50 to 400		210836	89
	Pimephales promelas; Fathead minnow;	LARVAE, <24 H	14 D	MOR *	66; 35		213070	89
	Pimephales promelas; Fathead minnow;	ADULT	2 MO	REP *		66; 35	213070	89
	Tetrahymena pyriformis; Ciliate;	NR	0.17 H	LET	3,200		212863	73
	Tropisternus lateralis; Beetle;	ADULT	14 D	PHY * (Calc)		27,000	212868	69
Aluminum sulfate	Asellus aquaticus; Aquatic sowbug;	ADULT, 7 MM, 1.5 MG DRY WT	48 H	EC_{50}IM ?		6,570	311972	86
	Asellus aquaticus; Aquatic sowbug;	ADULT, 7 MM, 1.5 MG DRY WT	72 H	EC_{50}IM ?		4,370	311972	86
	Biomphalaria glabrata; Snail;	ADULT, 4–4.5 SUTURE WHORL	24 H	STR *		100	212853	63
	Biomphalaria glabrata; Snail;	ADULT, 4–4.5 SUTURE WHORL	24 H	STR *		1,000	212853	63
	Cladocera; Water flea order;	NR	2 MO *	POP *		500	217183	78
	Crangonyx pseudogracilis; Amphipod;	ADULT, 4 MM, 0.2 MG DRY WT	48 H	EC_{50}IM ?		12,800	311972	86
	Crangonyx pseudogracilis; Amphipod;	ADULT, 4 MM, 0.2 MG DRY WT	96 H	EC_{50}IM ?		9,190	311972	86
	Crustacea; Crustacean class;	NR	2 MO *	ABD *		500	217183	78
	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	24 H	MOR *	8,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	24 H	MOR *	8,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	48 H	MOR *	2,000		315166	81

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Aluminum sulfate (cont.)	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	48 H	MOR *	4,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	48 H	MOR *	4,000		315166	81
	Cyprinus carpio; Common, mirror, colored, carp;	7.5–8.5 CM, 10.5–12.5 G	48 H	MOR *	8,000		315166	81
	Daphnia magna; Water flea;	8 H, YOUNG	0.25 H *	LOC *		136,000	212171	44
	Fundulus heteroclitus; Mummichog;	NR	36 H	LC_{100} (Calc)	2,200		212865	15
	Fundulus heteroclitus; Mummichog;	NR	5 D	LC_{100} (Calc)	1,100		212865	15
	Gambusia affinis; Mosquitofish;	ADULT, FEMALE	24 H	LC_{50} ? (Calc)	69,000		210508	57
	Gambusia affinis; Mosquitofish;	ADULT, FEMALE	48 H	LC_{50} ? (Calc)	38,000		210508	57
	Gambusia affinis; Mosquitofish;	ADULT, FEMALE	48 H	MOR * (Calc)	< 28,000		210508	57
	Gambusia affinis; Mosquitofish;	ADULT, FEMALE	96 H	LC_{50} ? (Calc)	37,000		210508	57
	Micropterus dolomieui; Smallmouth bass;	13.8(12–17) MM, 32.5(9–59) MG	30 D	GRO *		251.6	312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE	30 D	MOR *	251.6		312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE, 48 H POST-HATCH	96 H	MOR *	100		312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE, 48 H POST-HATCH	96 H	MOR *	196		312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE, 48 H POST-HATCH	96 H	MOR *	217		312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE, 48 H POST-HATCH	96 H	MOR *	32		312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE, 48 H POST-HATCH	96 H	MOR *	320		312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE, 48 H POST-HATCH	96 H	MOR *	56		312723	87
	Micropterus dolomieui; Smallmouth bass;	LARVAE, 48 H POST-HATCH	96 H	MOR *	560		312723	87
	Notemigonus crysoleucas; Golden shiner;	NR	45 D	MOR *	100,000		312756	86
	Notemigonus crysoleucas; Golden shiner;	NR	45 D	MOR *	100,000		312756	86
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	24 H	MOR *	910		212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	24 H	MOR *	9,100		212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	48 H	LET	9,100		212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	48 H	MOR *	910		212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	72 H	MOR *	910		212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	96 H	HEM *		90	212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	96 H	HEM *		910	212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	96 H	HEM *		910	212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	96 H	MOR *	90		212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	118–355 G, 22–31 CM FORK LENGTH	96 H	MOR *	910		212508	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	50–80 MM	10 D	LC0	200,000		216520	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	50–80 MM	10 D	LC0	50,000		216520	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	50–80 MM	42 H	LC_{100}	50,000		216520	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	50–80 MM	42 H	LC_{100}	50,000		216520	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	50–80 MM	96 H	MOR *	50,000		216520	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING, 11 WK	45 D	PHY *		513	218830	73
	Salvelinus fontinalis; Brook trout;	14 MO, 210 MM, 130 G	24 H	LC_{50} ?	4,000		216115	75
	Salvelinus fontinalis; Brook trout;	14 MO, 210 MM, 130 G	24 H	LC_{50} ?	4,450		216115	75
	Salvelinus fontinalis; Brook trout;	14 MO, 210 MM, 130 G	24 H	MOR *	5,000		216115	75
	Salvelinus fontinalis; Brook trout;	14 MO, 210 MM, 130 G	24 H	MOR *	5,000		216115	75
	Salvelinus fontinalis; Brook trout;	14 MONTHS, 210 MM, 130 G	96 H	LC_{50} ?	3,600		216115	75
	Salvelinus fontinalis; Brook trout;	EYED EMBRYO - LARVAE	45 D	GRO *		283	312720	87
	Salvelinus fontinalis; Brook trout;	EYED EMBRYO - LARVAE	60 D	BEH *		283	312720	87
	Salvelinus fontinalis; Brook trout;	EYED EMBRYO - LARVAE	60 D	MOR *	283		312720	87
	Stizostedion lucioperca; Pikeperch;	11.5–16 MM	24 H	MOR *	400		212700	75
Arsenic	Ceriodaphnia reticulata; Water flea;	< 4 H	48 H	LC_{50}	1,800		311181	84
	Daphnia magna; Water flea;	< 24 H	48 H	LC_{50}	3,800		311181	84
	Daphnia pulex; Water flea;	< 24 H	48 H	LC_{50}	1,900		311181	84

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Arsenic (cont.)	Ictalurus punctatus; Channel catfish;	400 G	0.1 to 7 WK	RSD		1,910 to 2,500	315333	77
	Lepomis cyanellus; Green sunfish;	<4 YR, 5.5-90.7 G	4 MO	HIS		1,000 to 20,000	311560	85
	Lepomis macrochirus; Bluegill;	NR	6 MO	MOR *	5,000		212143	73
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		2,600	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		2,900	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		3,600	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		4,100	212262	74
	Simocephalus vetulus; Water flea;	< 24 H	48 H	LC_{50}	1,700		311181	84
Barium	Daphnia magna; Water flea;	<= 24 H	24 H	LC_{50}	> 530,000		215184	80
	Daphnia magna; Water flea;	<= 24 H	48 H	LC_{50}	410,000		215184	80
	Daphnia magna; Water flea;	<= 24 H	48 H	MOR *	68,000		215184	80
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		26,000	311789	86
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		103,000	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		41,200	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		113,000	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		83,800	212262	74
Barium chloride	Lemna minor; Duckweed	FRONDS	96 H	GRO		25000	283261	88
	Daphnia magna; Water flea	12 H	48 H	IMM		14500	228732	72
	Echinogammarus berilloni; Scud	NR	24 H	LC_{50}	336,000		307710	86
	Gammarus pulex; Scud	NR	24 H	LC_{50}	3,980,000		307706	86
	Salmo trutta; Brown trout	YEARLING	48 H	LC_{50}	150,000		240072	74
	Austropotamobius pallipes pall; Crayfish	19-32 MM	96 H	LC_{50}	46,000		228813	73
	Gambusia affinis; Mosquitofish	ADULT, FEMALE	24 H	LC_{50}	2,910,000		215454	57
	Orconectes limosus; Crayfish	19-32 MM	96 H	LC_{50}	78,000		228816	73
	Gambusia affinis; Mosquitofish	ADULT, FEMALE	96 H	MOR	66,200		215457	57
	Daphnia magna; Water flea	12 H	21 D	REP		8,900	228734	72
Beryllium chloride	Daphnia magna; Water flea	<=24H OLD	24 H	LC_{50}	1,900		211148	80
	Gammarus fasciatus; Scud	JUVENILE, 0.007 G	96 H	LC_{50}	700		298192	86
	Pimephales promelas; Fathead minnow	NR	96 H	LC_{50}	150		287114	60
	Daphnia magna; Water flea	<= 24 H	48 H	MOR	250		211150	80
Beryllium nitrate	Cyprinus carpio; Common carp	FERTILIZED EGGS	72 H	HAT		80	215613	78
Beryllium sulfate	Daphnia magna; Water flea	NR	24 H	IMM		4,640	305745	89
	Tubifex tubifex; Tubificid worm	NR	24 H	IMM		25,970	234436	91
	Ambystoma maculatum; Spotted salamander	41.2 MG, 20.1 MM	24 H	LC_{50}	6,830		247921	75
	Ambystoma opacum; Marbled salamander	333 MG, 35.9 MM	24 H	LC_{50}	31,500		247915	75
	Lepomis macrochirus; Bluegill	NR	96 H	LC_{50}	1,300		287110	60
	Pimephales promelas; Fathead minnow	NR	96 H	LC_{50}	200		287102	60
	Poecilia reticulata; Guppy	0.1-0.25 G ADULT, 2.4-3.6 CM,	24 H	LC_{50}	22,200		242842	73
	Poecilia reticulata; Guppy	0.1-0.25 G ADULT, 2.4-3.6 CM,	24 H	MOR	1,000		242848	73
	Poecilia reticulata; Guppy	0.1-0.25 G ADULT, 2.4-3.6 CM,	96 H	MOR	10		242849	73
Cadmium	Algae; Algae, phytoplankton, algal mat	NATURAL COMMUNITY	2 to 244 H	PGR		3.4 to 84.0	311823	85
	Algae; Algae, phytoplankton, algal mat	EXPO GRO PHASE	24 H	PSE		<=56200	213095	89
	Algae; Algae, phytoplankton, algal mat	PHYTOPLANKTON	14 D	BMS *		100	313109	88
	Algae; Algae, phytoplankton, algal mat	NATURAL COMMUNITY	382 H	PGR		2.9 to 4.2	311823	85
	Anabolia nervosa; Quiver fly	LARVAE	7 D	LET	9,000,000		210725	57
	Anacystis nidulans; Blue-green algae	NR	48 H	BCF		500	312317	86
	Anacystis nidulans; Blue-green algae	NR	36 H	BCF		1,000	312317	86

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Anacystis nidulans; Blue-green algae	NR	48 H	BCF		1,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	36 H	BCF		10,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	24 H	BCF		10,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	48 H	BCF		10,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	48 H	BCF		100	312317	86
	Anacystis nidulans; Blue-green algae	NR	12 H	BCF		5,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	24 H	BCF		500	312317	86
	Anacystis nidulans; Blue-green algae	NR	24 H	BCF		5,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	36 H	BCF		100	312317	86
	Anacystis nidulans; Blue-green algae	NR	36 H	BCF		5,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	24 H	BCF		1,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	24 H	BCF		100	312317	86
	Anacystis nidulans; Blue-green algae	NR	12 H	BCF		500	312317	86
	Anacystis nidulans; Blue-green algae	NR	48 H	BCF		5,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	12 H	BCF		1,000	312317	86
	Anacystis nidulans; Blue-green algae	NR	36 H	BCF		500	312317	86
	Anacystis nidulans; Blue-green algae	NR	12 H	BCF		100	312317	86
	Anacystis nidulans; Blue-green algae	NR	12 H	BCF		10,000	312317	86
	Anodonta anatina; Fresh-water mussel	80-100 MM	15 WK	RSD		0.5 to 1.0	213792	91
	Anodonta cygnea; Swan mussel	NR	to 12 WK	PHY *		50	213466	90
	Anodonta cygnea; Swan mussel	10 (8.5-11.5) CM	to 12 WK	BIO *		50	213467	90
	Asellus aquaticus; Aquatic sowbug	8-10 MM	96 H	LC_{50}*	60		312041	85
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 30 D, 1.35 MM	96 H	LC_{50}	80		311953	86
	Asellus aquaticus; Aquatic sowbug	EMBRYO, STAGE D	96 H	LC_{50}	240		311953	86
	Asellus aquaticus; Aquatic sowbug	8-10 MM	48 H	LC_{50}*	3,600		312041	85

Table S–2.7
AQUIRE Freshwater Toxicity Information
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Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Asellus aquaticus; Aquatic sowbug	JUVENILE, 1.60 MM	96 H	LC_{50}	170		311953	86
	Asellus aquaticus; Aquatic sowbug	8–10 MM	48 H	LC_{50}*	4,000		312041	85
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 1.60 MM	96 H	LC_{50}	150		311953	86
	Asellus aquaticus; Aquatic sowbug	ADULT, 9.87 MM	96 H	LC_{50}	600		311953	86
	Asellus aquaticus; Aquatic sowbug	ADULT, 9.87 MM	96 H	LC_{50}	1,000		311953	86
	Asellus aquaticus; Aquatic sowbug	8–10 MM	24 H	LC_{50}*	13,000		312041	85
	Asellus aquaticus; Aquatic sowbug	EMBRYO, STAGE C	96 H	LC_{50}	2,000		311953	86
	Asellus aquaticus; Aquatic sowbug	8–10 MM	24 H	LC_{50}*	11,000		312041	85
	Asellus aquaticus; Aquatic sowbug	EMBRYO, STAGE D	96 H	LC_{50}	300		311953	86
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 5.92 MM	96 H	LC_{50}	540		311953	86
	Asellus aquaticus; Aquatic sowbug	8–10 MM	96 H	LC_{50}*	60		312041	85
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 3.52 MM	96 H	LC_{50}	230		311953	86
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 5.92 MM	96 H	LC_{50}	450		311953	86
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 3.52 MM	96 H	LC_{50}	320		311953	86
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 30 D, 1.35 MM	96 H	LC_{50}	53		311953	86
	Asellus aquaticus; Aquatic sowbug	EMBRYO, STAGE C	96 H	LC_{50}	1,750		311953	86
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 2.30 MM	96 H	LC_{50}	175		311953	86
	Asellus aquaticus; Aquatic sowbug	JUVENILE, 2.30 MM	96 H	LC_{50}	170		311953	86
	Astacus astacus; European crayfish	8–10 CM	to 10 WK	HIS		2	210376	91
	Astacus astacus; European crayfish	8–10 CM	2 WK	ENZ *		2	210376	91
	Baetis rhodani; Mayfly	8–10 MM	48 H	LC_{50}*	4,000		312041	85
	Baetis rhodani; Mayfly	8–10 MM	24 H	LC_{50}*	95,000		312041	85
	Baetis rhodani; Mayfly	8–10 MM	48 H	LC_{50}*	2,200		312041	85
	Baetis rhodani; Mayfly	8–10 MM	96 H	LC_{50}*	50		312041	85
	Baetis rhodani; Mayfly	8–10 MM	96 H	LC_{50}*	70		312041	85
	Baetis rhodani; Mayfly	8–10 MM	24 H	LC_{50}*	90,000		312041	85
	Brachionus calyciflorus; Rotifer	NEONATE	24 H	LC_{50}	1,300		219385	91
	Carassius auratus; Goldfish	5.0–20.9 G	14 D	HEM *		445	310472	84
	Catostomus commersoni; White sucker	JUVENILE, 142 MM, 28.7 G	1 WK	RSD		660	312412	87
	Ceriodaphnia reticulata; Water flea	< 4 H	48 H	LC_{50}	66		311181	84
	Channa punctatus; Snake–head catfish	FINGERLING	48 H	LC_{50}	34,640		313173	88
	Channa punctatus; Snake–head catfish	FINGERLING	96 H	LC_{50}	18,500		313173	88
	Channa punctatus; Snake–head catfish	FINGERLING	13 D	GRO *		3,500	313173	88
	Chironomidae; Midge family	LARVAE	12 MO	POP		7.6	213176	88
	Chironomus plumosus; Midge	LARVA–STATE L3	96 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L2	96 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L2	72 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L4	72 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L2	48 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L3	72 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L2	24 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L3	24 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L1	24 H	LC_{50}	21,530		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L4	96 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L4	24 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L3	48 H	LC_{50}	32,000		215356	89
	Chironomus plumosus; Midge	LARVA–STATE L4	48 H	LC_{50}	32,000		215356	89
	Chironomus riparius; Midge	LARVA–STATE L1	24 H	LC_{50}	53,610		215356	89
	Chironomus riparius; Midge	LARVA–STATE L4	24 H	LC_{50}	10,000		215356	89
	Chironomus riparius; Midge	LARVA–STATE L2	48 H	LC_{50}	10,000		215356	89

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Chironomus riparius; Midge	4TH INSTAR LARVAE	>10 D	RSD		50 to 100	212729	89
	Chironomus riparius; Midge	LARVA-STATE L2	72 H	LC_{50}	7,690		215356	89
	Chironomus riparius; Midge	EGGS	7 to 96 H	MOR *	1,000		215356	89
	Chironomus riparius; Midge	LARVA-STATE L3	24 H	LC_{50}	32,000		215356	89
	Chironomus riparius; Midge	LARVA-STATE L3	96 H	LC_{50}	7,360		215356	89
	Chironomus riparius; Midge	EGGS	7 to 96 H	MOR *	1,000		215356	89
	Chironomus riparius; Midge	LARVA-STATE L3	72 H	LC_{50}	15,210		215356	89
	Chironomus riparius; Midge	10-12 MM	48 H	LC_{50}*	200,000		312041	85
	Chironomus riparius; Midge	10-12 MM	96 H	LC_{50}*	300,000		312041	85
	Chironomus riparius; Midge	LARVA-STATE L4	96 H	LC_{50}	6,680		215356	89
	Chironomus riparius; Midge	LARVA-STATE L2	24 H	LC_{50}	10,000		215356	89
	Chironomus riparius; Midge	LARVA-STATE L4	48 H	LC_{50}	10,000		215356	89
	Chironomus riparius; Midge	EGGS	<=24 H	MOR *	3,200		215356	89
	Chironomus riparius; Midge	10-12 MM	24 H	LC_{50}*	200,000		312041	85
	Chironomus riparius; Midge	LARVA-STATE L3	48 H	LC_{50}	32,000		215356	89
	Chironomus riparius; Midge	LARVA-STATE L4	72 H	LC_{50}	10,000		215356	89
	Chironomus riparius; Midge	10-12 MM	96 H	LC_{50}*	200,000		312041	85
	Chironomus riparius; Midge	EGGS	<=24 H	MOR *	10,000		215356	89
	Chironomus riparius; Midge	LARVA-STATE L2	96 H	LC_{50}	4,320		215356	89
	Chironomus tentans; Midge	LARVA-STATE L1	24 H	LC_{50}	9,990		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	72 H	LC_{50}	730		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	48 H	LC_{50}	2,370		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	96 H	LC_{50}	1,410		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	24 H	LC_{50}	10,000		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	48 H	LC_{50}	2,700		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	96 H	LC_{50}	80		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	96 H	LC_{50}	480		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	72 H	LC_{50}	130		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	72 H	LC_{50}	1,930		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	24 H	LC_{50}	440		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	24 H	LC_{50}	10,000		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	48 H	LC_{50}	210		215356	89
	Chironomus thummi; Midge	LARVAE	7 D	LET	150,000		210725	57
	Chironomus yoshimatsui; Midge	3RD AND 4TH INSTAR	2 D	RSD *		10,000	311481	84
	Corbicula fluminea; Asiatic clam	ADULT 5 CM	1 D	RSD		0.3	312002	86
	Coregonus clupeaformis; Lake whitefish	26.63 G	72 D	BCF *		0.00125	210688	89
	Cyprinidae; Minnow, carp family	2 SUMMERS	84 H	LET *	25,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	5.63 D	LET *	20,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	7 D	MOR *	13,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	33 H	LET *	30,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	5.63 D	LET *	15,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	14 H	LET *	50,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	96 H	LET *	25,000		210725	57
	Cypris subglobosa; Ostracod	NR	96 H	LC_{50}	687.4		312365	88
	Cypris subglobosa; Ostracod	NR	24 H	LC_{50}	6,981		312365	88
	Cypris subglobosa; Ostracod	NR	48 H	LC_{50}	3,020		312365	88
	Cypris subglobosa; Ostracod	NR	12 H	LC_{50}	12,660		312365	88
	Daphnia lumholzi; Water flea	NR	96 H	LC_{50}	83		312365	88
	Daphnia lumholzi; Water flea	NR	48 H	LC_{50}	618.6		312365	88
	Daphnia lumholzi; Water flea	NR	12 H	LC_{50}	2,325		312365	88

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Daphnia hambolzi; Water flea	NR	24 H	LC_{50}	1,585		312365	88
	Daphnia magna; Water flea	<= 24 H	48 H	LC_{50}	33		310929	84
	Daphnia magna; Water flea	< 24 H	21 D	REP *		3.2	310589	85
	Daphnia magna; Water flea	< 24 H	14 D	LC_{50}	24		310589	85
	Daphnia magna; Water flea	NR	3 WK	MOR *	7.78		210772	89
	Daphnia magna; Water flea	NR	3 WK	MOR *	22.9		210772	89
	Daphnia magna; Water flea	<= 24 H	48 H	LC_{50}	62		310929	84
	Daphnia magna; Water flea	< 24 H	21 D	LC_{50}	14		310589	85
	Daphnia magna; Water flea	< 24 H	48 H	LC_{50}	118		311181	84
	Daphnia magna; Water flea	< 24 H	21 D	LET	5.6		310589	85
	Daphnia magna; Water flea	< 24 H	21 D	MOR *	3.2		310589	85
	Daphnia magna; Water flea	NR	3 WK	REP *		1.86	210772	89
	Daphnia magna; Water flea	NR	28 D	MOR *	0.5		312770	87
	Daphnia magna; Water flea	<= 24 H	48 H	LC_{50}	40		310929	84
	Daphnia magna; Water flea	<= 24 H	48 H	LC_{50}	36		310929	84
	Daphnia magna; Water flea	<= 24 H	48 H	LC_{50}	24		310929	84
	Daphnia magna; Water flea	<= 24 H	48 H	LC_{50}	36		310929	84
	Daphnia magna; Water flea	< 24 H	21 D	MOR *	1.8		310589	85
	Daphnia magna; Water flea	NR	28 D	MOR *	1		312770	87
	Daphnia magna; Water flea	< 24 H	14 D	REP *		32	310589	85
	Daphnia magna; Water flea	< 24 H	21 D	MOR *	1		310589	85
	Daphnia magna; Water flea	< 24 H	21 D	GRO *		0.32	310589	85
	Daphnia magna; Water flea	NR	28 D	LET	5		312770	87
	Daphnia pulex; Water flea	< 24 H	48 H	LC_{50}	68		311181	84
	Dugesia tigrina; Turbellarian, flatworm	NR	96 H	LC_{50}	2,250		218709	74
	Elodea canadensis; Waterweed	SHOOTS	to 9 WK	RSD *		0.5 to 6.0	210652	77
	Ephemerella ignita; Mayfly	8-10 MM	24 H	LC_{50}*	54,000		312041	85
	Ephemerella ignita; Mayfly	8-10 MM	96 H	LC_{50}*	13,000		312041	85
	Ephemerella ignita; Mayfly	8-10 MM	24 H	LC_{50}*	61,000		312041	85
	Ephemerella ignita; Mayfly	8-10 MM	48 H	LC_{50}*	19,000		312041	85
	Ephemerella ignita; Mayfly	8-10 MM	96 H	LC_{50}*	12,000		312041	85
	Ephemerella ignita; Mayfly	8-10 MM	48 H	LC_{50}*	18,000		312041	85
	Esox lucius; Northern pike	50-160 G	to 11 WK	RSD		60 to 225	213460	90
	Gambusia affinis; Mosquitofish	NR	48 H	MOR *	6,700		313098	88
	Gammarus fasciatus; Scud	0-1 WK	6 WK	GRO *		3.42	210772	89
	Gammarus fasciatus; Scud	0-1 WK	6 WK	MOR *	2.23		210772	89
	Gammarus fasciatus; Scud	0-1 WK	6 WK	GRO *		2.23	210772	89
	Gammarus fasciatus; Scud	0-1 WK	6 WK	MOR *	1.49		210772	89
	Gammarus lacustris; Scud	NR	96 H	LC_{50}	40.1		313058	88
	Gammarus pulex; Scud	8-12 MM	24 H	LC_{50}*	1,300		312041	85
	Gammarus pulex; Scud	8-12 MM	96 H	LC_{50}*	20		312041	85
	Gammarus pulex; Scud	8-12 MM	96 H	LC_{50}*	30		312041	85
	Gammarus pulex; Scud	8-12 MM	24 H	LC_{50}*	1,600		312041	85
	Gammarus pulex; Scud	8-12 MM	48 H	LC_{50}*	400		312041	85
	Gammarus pulex; Scud	8-12 MM	48 H	LC_{50}*	400		312041	85
	Gammarus roeseli; Scud	NR	7 D	LET	400		210725	57
	Gasterosteus aculeatus; Three spine stickleback	0.3-0.6 G	to 10 D	RSD		2,500	312680	87
	Gastropoda; Snails, limpets class	NR	210 D	RSD *		2	219245	73
	Heteropneustes fossilis; Indian catfish	70 G	1 to 60 D	ENZ *		260	310049	82
	Hexagenia rigida; Mayfly	YEARLING, NYMPHS, 24 MM	96 H	LC_{50}	6,200		212091	80

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Hyalella azteca; Scud	0-1 WK	6 WK	MOR *	0.57		210772	89
	Hyalella azteca; Scud	0-1 WK	6 WK	MOR *	0.92		210772	89
	Hyalella azteca; Scud	0-1 WK	6 WK	GRO *		2.23	210772	89
	Hydrodictyon reticulatum; Green algae	NR	1 to 168 H	BMS		100 to 10000	213348	89
	Hydropsyche angustipennis; Caddisfly	10-15 MM	96 H	LC_{50}*	520,000		312041	85
	Hydropsyche angustipennis; Caddisfly	10-15 MM	24 H	LC_{50}*	200,000		312041	85
	Hydropsyche angustipennis; Caddisfly	10-15 MM	48 H	LC_{50}*	200,000		312041	85
	Hydropsyche angustipennis; Caddisfly	10-15 MM	96 H	LC_{50}*	200,000		312041	85
	Ictalurus nebulosus; Brown bullhead	NR	24 H	THL *		50	313113	87
	Invertebrates; Invertebrates	ZOOPLANKTON	14 D	BMS *		3	312800	87
	Invertebrates; Invertebrates	CLADOCERA, COPEPODA, ROTIFERA	2 WK	POP *		3	311256	83
	Invertebrates; Invertebrates	ZOOPLANKTON	14 D	BMS *		1	312800	87
	Lamellidens marginalis; Mussel	7 CM	4.2 to 11.3 H	PHY *		500 to 2,000	213311	89
	Lamellidens marginalis; Mussel	5.0-6.0 CM	1 to 30 D	GRO		500 to 2,000	213776	91
	Lamellidens marginalis; Mussel	5.0-6.0 CM	1 to 30 D	OC		500 to 2,000	213776	91
	Lamellidens marginalis; Mussel	5.0-6.0 CM	96 H	LC_{50}	10,000		213776	91
	Lamellidens marginalis; Mussel	NR	96 H	LC_{50}	10,000		213311	89
	Lampsilis ventricosa; Lamp-mussel	NR	2 WK	RSD		< 2 to 4.5	312614	87
	Lemna minor; Duckweed	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		200	311789	86
	Lepomis macrochirus; Bluegill	NR	48 H	ENZ *		1	213021	88
	Lepomis macrochirus; Bluegill	NR	14 D	PHY		1 to 100	212707	88
	Lepomis macrochirus; Bluegill	NR	6 MO	LET	5,000		212143	73
	Limnodrilus hoffmeisteri; Oligochaete	30-40 MM	24 H	LC_{50}*	24,000		312041	85
	Limnodrilus hoffmeisteri; Oligochaete	30-40 MM	96 H	LC_{50}*	2,900		312041	85
	Limnodrilus hoffmeisteri; Oligochaete	30-40 MM	24 H	LC_{50}*	20,000		312041	85
	Limnodrilus hoffmeisteri; Oligochaete	30-40 MM	48 H	LC_{50}*	6,400		312041	85
	Limnodrilus hoffmeisteri; Oligochaete	30-40 MM	48 H	LC_{50}*	6,800		312041	85
	Limnodrilus hoffmeisteri; Oligochaete	30-40 MM	96 H	LC_{50}*	2,400		312041	85
	Limnodrilus sp; Sludge worm	NR	14 D	RSD		50	311865	83
	Lophopodella carteri; Bryozoa	ANCENSTRULAE 2-3 DAYS	96 H	LC_{50}	150		216703	80
	Macrobrachium hendersodayanus; Prawn	NR	96 H	OC *		34	311545	84
	Morone saxatilis; Striped bass	LARVAE, 6 WK	290 H	LC_{50}	6		310625	85
	Morone saxatilis; Striped bass	LARVAE, 1 D	1 to 52 H	MOR	1 to 20		310625	85
	Morone saxatilis; Striped bass	LARVAE, 7 D	2 to 120 H	MOR	5 to 250		310625	85
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}GR *		809,000	212262	74
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}BM *		7,400	212262	74
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}BM *		14,600	212262	74
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}GR *		20,800	212262	74
	Noemacheilus barbatulus; Stone loach	5-12 G	to 15 WK	RSD		1,250	311872	86
	Noemacheilus barbatulus; Stone loach	5-15 G	2 to 77 D	RSD *		1,250	312707	87
	Noemacheilus barbatulus; Stone loach	2-21 G	to 119 D	RSD		3 to 1,250	213451	90
	Noemacheilus barbatulus; Stone loach	7-21 G	25 WK	BIO		3	219243	90
	Notemigonus crysoleucas; Golden shiner	NR	48 H	ENZ *		100	213021	88
	Notemigonus crysoleucas; Golden shiner	ADULT, 70-90 MM	12 H	ENZ *		1,350	312205	87
	Notemigonus crysoleucas; Golden shiner	ADULT, 70-90 MM	6 H	HEM *		1,350	312205	87
	Notemigonus crysoleucas; Golden shiner	NR	96 H	PHY		1,350 to 2,400	212707	88
	Notemigonus crysoleucas; Golden shiner	ADULT, 70-90 MM	96 H	LC_{50}	3,150		312205	87
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	30 H	LET *	7,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	150-220 G	to 1.5 H	RSD *		0.6 to 1.12	315315	81
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	JUVENILE, 10 G	1 WK	RSD *		3,000 to 60,000	312729	87

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.7 CM, 3.1 G	48 H	LC_{50}?	7		219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	FRY, 3 CM	48 H	LC_{50}	91		210459	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	2 MO	MOR	18 to 54		312383	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.0 CM, 2.1 G	24 H	LC_{50}?	4,200		219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	7 D	MOR *	3,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	3 MO	BIO		9	312383	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.0 CM, 2.1 G	96 H	LC_{50}?	6		219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	9–200 G	3 to 133 D	RSD		3 to 15	213451	90
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	375 G	3 D	PHY *		6.4	310404	84
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	77 H	LET *	5,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	FRY, 3 CM	48 H	LC_{50}	3,698		210459	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	FRY, 3 CM	48 H	LC_{50}	358		210459	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	7 D	MOR *	8 to 10		310185	68
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	36–102 G	25 WK	BIO		3	219243	90
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	280 D	RSD		0.01 to 4.8	219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	21 H	LET *	8,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	FRY, 3 CM	48 H	LC_{50}	677		210459	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	2 SUMMERS	5.92 D	LET *	8,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	NR	12 MO	BIO *		9	313110	88
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.7 CM, 1.1 G	96 H	LC_{50}?	7		219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.0 CM, 2.1 G	10 D	LC_{50}?	5		219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.7 CM, 1.1 G	10 D	LC_{50}?	7		219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	46.21 G	72 D	BCF *		0.00127	210688	89
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	6 D	LET *	4,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	375 G	178 D	PHY *		3.6	310404	84
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.0 CM, 2.1 G	48 H	LC_{50}?	9		219245	73
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	EYED EGGS	4 to 756 D	RSD		0.5 to 7.1	217341	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	18 H	LET *	10,000		210725	57
	Oryzias latipes; Medaka, high–eyes	FERTILIZED EGGS	1 WK	ABN *		10	310880	84
	Oryzias latipes; Medaka, high–eyes	EGG	NR	HAT		30 to 10,000	213213	89
	Oryzias latipes; Medaka, high–eyes	EGG	48 H	RSD		300 to 4,500	213212	89
	Pectinatella magnifica; Bryozoa	ANCENSTRULAE 2–3 DAYS	96 H	LC_{50}	700		216703	80
	Physa fontinalis; Bladder snail	10–12 MM	96 H	LC_{50}*	80		312041	85
	Physa fontinalis; Bladder snail	10–12 MM	48 H	LC_{50}*	2,100		312041	85
	Physa fontinalis; Bladder snail	10–12 MM	24 H	LC_{50}*	4,200		312041	85
	Physa fontinalis; Bladder snail	10–12 MM	48 H	LC_{50}*	1,800		312041	85
	Physa fontinalis; Bladder snail	10–12 MM	24 H	LC_{50}*	4,400		312041	85
	Physa fontinalis; Bladder snail	10–12 MM	96 H	LC_{50}*	80		312041	85
	Physa gyrina; Pouch snail	ADULT	48 H	LC_{50}?	4,250		212021	76
	Physa gyrina; Pouch snail	JUVENILE	48 H	LC_{50}?	690		212021	76
	Physa gyrina; Pouch snail	ADULT	228 H	LC_{50}?	830		212021	76
	Physa gyrina; Pouch snail	ADULT	4 to 60 H	REP		1,800 to 10,000	212021	76
	Physa gyrina; Pouch snail	ADULT	96 H	LC_{50}?	1,370		212021	76
	Physa gyrina; Pouch snail	JUVENILE	96 H	LC_{50}?	410		212021	76
	Physa gyrina; Pouch snail	ADULT	24 H	LC_{50}?	7,600		212021	76
	Pimephales promelas; Fathead minnow	NR	48 H	BNZ *		1	213021	88
	Pimephales promelas; Fathead minnow	NR	48 H	BNZ *		10	213021	88
	Plumatella emarginata; Bryozoan	ANCENSTRULAE 2–3 DAYS	96 H	LC_{50}	1,090		216703	80
	Polycelis tenuis; Turbellarian	10–12 MM	48 H	LC_{50}*	125,000		312041	85
	Polycelis tenuis; Turbellarian	10–12 MM	96 H	LC_{50}*	74,000		312041	85

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Polycelis tenuis; Turbellarian	10-12 MM	96 H	LC_{50}*	80,000		312041	85
	Polycelis tenuis; Turbellarian	10-12 MM	24 H	LC_{50}*	130,000		312041	85
	Polycelis tenuis; Turbellarian	10-12 MM	24 H	LC_{50}*	270,000		312041	85
	Polycelis tenuis; Turbellarian	10-12 MM	48 H	LC_{50}*	100,000		312041	85
	Potamogeton crispus; Curled pondweed	NR	NR	PSF *		1,000	217552	77
	Procambarus clarkii; Red swamp crayfish	ADULT INTERMOLT	to 30 D	BIO		100	212572	89
	Procambarus clarkii; Red swamp crayfish	ADULT, INTERMOLT	96 H	ENZ *		100	312701	87
	Procambarus clarkii; Red swamp crayfish	ADULT INTERMOLT, 19.5-30.2 G	1 to 96 H	BIO *		10,000	215112	91
	Rutilus rutilus; Roach	100 G	to 25 WK	RSD		500	311872	86
	Rutilus rutilus; Roach	15-100 G	1 to 70 D	RSD *		30 to 500	312707	87
	Rutilus rutilus; Roach	NR	65 D	RSD		450	213451	90
	Salvelinus fontinalis; Brook trout	EMBRYO	NR	GRO *		0.02 to 2,000	218196	88
	Salvelinus fontinalis; Brook trout	1 SUMMER	47 H	LET *	10,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	26 H	LET *	25,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	7 D	MOR *	4,000		210725	57
	Salvelinus fontinalis; Brook trout	2 SUMMERS	5.83 D	LET *	25,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	76 H	LET *	6,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	4.42 D	LET *	5,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	55 H	LET *	8,000		210725	57
	Salvelinus fontinalis; Brook trout	EMBRYO	NR	HAT *		0.02 to 2,000	218196	88
	Salvelinus fontinalis; Brook trout	ADULT	30 D	STR *		3.6 to 60	312833	86
	Scyliorhinus canicula; Dogfish	NR	to 10 D	BIO		25,000 to 50,000	212560	89
	Selenastrum capricornutum; Green algae	25 E3 CELLS/ML, LAG PHASE	48 H	PGR *		30	213335	90
	Selenastrum capricornutum; Green algae	25 E3 CELLS/ML, LAG PHASE	48 H	PHY *		30	213335	90
	Simocephalus vetulus; Water flea	< 24 H	48 H	LC_{50}	24		311181	84
	Spirodela polyrhiza; Large duckweed	THREE FROND COLONY	14 D	PHY		100 to 10,000	213264	89
	Spirodela polyrhiza; Large duckweed	THREE FROND COLONY	14 D	PGR		100 to 10,000	213264	89
	Spirulina platensis; Blue-green algae	NR	12 H	BCF		5,000	312317	86
	Spirulina platensis; Blue-green algae	NR	36 H	BCF		10,000	312317	86
	Spirulina platensis; Blue-green algae	NR	24 H	BCF		10,000	312317	86
	Spirulina platensis; Blue-green algae	NR	48 H	BCF		1,000	312317	86
	Spirulina platensis; Blue-green algae	NR	12 H	BCF		1,000	312317	86
	Spirulina platensis; Blue-green algae	NR	36 H	BCF		1,000	312317	86
	Spirulina platensis; Blue-green algae	NR	48 H	BCF		5,000	312317	86
	Spirulina platensis; Blue-green algae	NR	36 H	BCF		100	312317	86
	Spirulina platensis; Blue-green algae	NR	48 H	BCF		500	312317	86
	Spirulina platensis; Blue-green algae	NR	48 H	BCF		10,000	312317	86
	Spirulina platensis; Blue-green algae	NR	12 H	BCF		10,000	312317	86
	Spirulina platensis; Blue-green algae	NR	48 H	BCF		100	312317	86
	Spirulina platensis; Blue-green algae	NR	36 H	BCF		5,000	312317	86
	Spirulina platensis; Blue-green algae	NR	12 H	BCF		500	312317	86
	Spirulina platensis; Blue-green algae	NR	24 H	BCF		500	312317	86
	Spirulina platensis; Blue-green algae	NR	24 H	BCF		1,000	312317	86
	Spirulina platensis; Blue-green algae	NR	24 H	BCF		5,000	312317	86
	Spirulina platensis; Blue-green algae	NR	24 H	BCF		100	312317	86
	Spirulina platensis; Blue-green algae	NR	12 H	BCF		100	312317	86
	Spirulina platensis; Blue-green algae	NR	36 H	BCF		500	312317	86
	Tilapia mossambica; Mozambique tilapia	103.59 G, 19.9 CM	to 45 D	HEM *		0.0783 to 6.4635	213331	90
	Tilapia mossambica; Mozambique tilapia	NR	to 6 WK	HEM *		100,000	312792	87
	Tinca tinca; Tench	1 SUMMER	21 H	LET *	50,000		210725	57

Table S−2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cadmium (cont.)	Tinca tinca; Tench	1 SUMMER	73 H	LET *	25,000		210725	57
	Tinca tinca; Tench	1 SUMMER	5.08 D	LET *	20,000		210725	57
	Tinca tinca; Tench	2 SUMMERS	53 H	LET *	40,000		210725	57
	Tinca tinca; Tench	1 SUMMER	28 H	LET *	40,000		210725	57
	Tinca tinca; Tench	1 SUMMER	7 D	MOR *	19,000		210725	57
	Tribolodon hakonensis; Japanese barbel	4.3 CM, 1.1 G	48 H	LC_{50}?	56 to 100		219245	73
	Tribolodon hakonensis; Japanese barbel	4.3 CM, 1.1 G	96 H	LC_{50}?	56 to 100		219245	73
	Tubifex sp; Tubificid worm	NR	14 D	RSD		50	311865	83
	Tubifex tubifex; Tubificid worm	NR	7 D	LET	5,000		210725	57
Chromium	Aedes aegypti; Mosquito;	LARVAE	48 H	LC_{50}	12,500		313255	88
	Ceriodaphnia reticulata; Water flea;	< 4 H	48 H	LC_{50}	45		311181	84
	Colisa fasciata; Giant gourami;	5.23 G, 5.41 CM, ADULT	24 H	HEM *		48,000	312803	87
	Colisa fasciata; Giant gourami;	NR	2 to 96 H	BIO *		48,000	312719	87
	Cyclops sp; Cyclopoid copepod;	ADULT	48 H	LC_{50}	10,470		313255	88
	Daphnia ambigua; Water flea;	12 H	72 H	EC_{50}IM		1,700	218476	76
	Daphnia ambigua; Water flea;	12 H	72 H	EC_{50}IM		7,700	218476	76
	Daphnia galeata; Water flea;	12 H	72 H	EC_{50}IM		65,600	218476	76
	Daphnia magna; Water flea;	12 H	72 H	EC_{50}IM		42,100	218476	76
	Daphnia magna; Water flea;	12 H	72 H	EC_{50}IM		5,200	218476	76
	Daphnia magna; Water flea;	24−48 HR, NEONATE	21 D	GRO *		5	213950	91
	Daphnia magna; Water flea;	< 24 H	48 H	LC_{50}	22		311181	84
	Daphnia magna; Water flea;	24−48 HR, NEONATE	21 D	MOR	5 to 15		213950	91
	Daphnia magna; Water flea;	24−48 HR, NEONATE	21 D	REP *		5	213950	91
	Daphnia pulex; Water flea;	< 24 H	48 H	LC_{50}	48		311181	84
	Daphnia pulex; Water flea;	NR	96 H	LC_{50}	90,400		210394	89
	Daphnia pulicaria; Water flea;	12 H	72 H	EC_{50}IM		110,800	218476	76
	Dugesia dorotocephala; Turbellarian, flatworm;	18−20 MM	1 H	BEH *		50 to 500	310581	91
	Dugesia tigrina; Turbellarian, flatworm;	NR	96 H	LC_{50}	2,220		218709	74
	Hydrodictyon reticulatum; Green algae;	NR	1 to 168 H	BMS		100 to 10000	213348	89
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		35,000	311789	86
	Lophopodella carteri; Bryozoa;	ANCENSTRULAE, 2−3 D	96 H	LC_{50}	1,560		216703	80
	Myriophyllum spicatum; Water−milfoil;	4 CM APEX	32 D	EC_{50}BM *		14,600	212262	74
	Myriophyllum spicatum; Water−milfoil;	4 CM APEX	32 D	EC_{50}BM *		9,900	212262	74
	Myriophyllum spicatum; Water−milfoil;	4 CM APEX	32 D	EC_{50}GR *		24,400	212262	74
	Myriophyllum spicatum; Water−milfoil;	4 CM APEX	32 D	EC_{50}GR *		26,000	212262	74
	Mystus vittatus; Catfish;	80−100 MM, 6−10 G	96 H	LC_{50} ?	200,000		315793	82
	Pectinatella magnifica; Bryozoa;	ANCENSTRULAE, 2−3 D	96 H	LC_{50}	1,440		216703	80
	Pimephales promelas; Fathead minnow;	40−68 MM	48 H	LC_{50}	58,000		210837	75
	Pimephales promelas; Fathead minnow;	40−68 MM	48 H	LC_{50}	61,000		210837	75
	Pimephales promelas; Fathead minnow;	40−68 MM	96 H	LC_{50}	37,000		210837	75
	Pimephales promelas; Fathead minnow;	40−68 MM	96 H	LC_{50}	52,000		210837	75
	Plumatella emarginata; Bryozoan;	ANCENSTRULAE, 2−3 D	96 H	LC_{50}	650		216703	80
	Simocephalus vetulus; Water flea;	< 24 H	48 H	LC_{50}	50		311181	84
Cobalt	Anabolia nervosa; Quiver fly	LARVAE	7 D	LET	400,000		210725	57
	Chironomus thummi; Midge	LARVAE	7 D	LET	600,000		210725	57
	Corbicula fluminea; Asiatic clam	NR	NR	RSD		130 to 150	215024	80
	Cyprinidae; Minnow, carp family	1 SUMMER	7 D	MOR *	90,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	29 H	LET *	500,000		210725	57

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cobalt (cont.)	Cyprinidae; Minnow, carp family	1 SUMMER	10 H	LET *	1,000,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	4.5 D	LET *	150,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	7 D	MOR *	100,000		210725	57
	Cyprinidae; Minnow, carp family	2 SUMMERS	66 H	LET *	300,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	65 H	LET *	200,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	43 H	LET *	300,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	7.08 D	LET *	125,000		210725	57
	Gammarus roeseli; Scud	NR	7 D	LET	8,000		210725	57
	Lemna minor; Duckweed	NR	NR	BCF *		15	218581	75
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	7 D	MOR *	30,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	2 SUMMERS	58 H	LET *	50,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	36 H	LET *	50,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	63 H	LET *	40,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	14 H	LET *	100,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	26 H	LET *	55,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	4.08 D	LET *	35,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	3.58 D	LET *	45,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	7 D	MOR *	40,000		210725	57
	Salvelinus fontinalis; Brook trout	2 SUMMERS	75 H	LET *	50,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	67 H	LET *	50,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	20 H	LET *	100,000		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	60 H	LET *	55,000		210725	57
	Tinca tinca; Tench	1 SUMMER	6.42 D	LET *	150,000		210725	57
	Tinca tinca; Tench	2 SUMMERS	72 H	LET *	300,000		210725	57
	Tinca tinca; Tench	1 SUMMER	32 H	LET *	500,000		210725	57
	Tinca tinca; Tench	1 SUMMER	72 H	LET *	200,000		210725	57
	Tinca tinca; Tench	1 SUMMER	7 D	MOR *	125,000		210725	57
	Tinca tinca; Tench	1 SUMMER	46 H	LET *	300,000		210725	57
	Tinca tinca; Tench	1 SUMMER	14 H	LET *	1,000,000		210725	57
	Tubifex tubifex; Tubificid worm	NR	7 D	LET	400,000		210725	57
Cobalt chloride	Spirulina platensis; Blue-green algae	NR	168 H	GRO		8,130	299978	87
	Daphnia magna; Water flea	NR	24 H	IMM		2,610	305743	89
	Tubifex tubifex; Tubificid worm	NR	24 H	IMM		447,710	234412	91
	Crangonyx pseudogracilis; Amphipod	ADULT, 4 MM, 0.2 MG DRY WT	48 H	IMM		167,000	299125	86
	Cyclops abyssorum prealpinus; Cyclopoid copepod	ADULT, 0.62 MM	48 H	IMM		15,500	232882	74
	Daphnia magna; Water flea	12 H	48 H	IMM		1,620	232878	72
	Eudiaptomus padanus padanus; Calanoid copepod	ADULT, 0.43 MM	48 H	IMM		4,000	232883	74
	Philodina acuticornis; Rotifer	0.2-0.5 MM	24 H	IMM		32,000	225424	74
	Colisa fasciata; Giant gourami	4.56 G, ADULT, FEMALE	96 H	LC_{50}	102,000		221932	79
	Daphnia hyalina; Water flea	ADULT, 1.27 MM	48 H	LC_{50}	1,320		232884	74
	Daphnia magna; Water flea	1ST AND 2ND INSTAR LARVAE	96 H	LC_{50}	1,500		298195	86
	Dugesia tigrina; Turbellarian, flatworm	JUVENILE, 0.006 G	96 H	LC_{50}	12,000		298196	86
	Pimephales promelas; Fathead minnow	JUVENILE, 0.2-0.5 G	96 H	LC_{50}	22,000		298198	86
	Rana hexadactyla; Frog	20(15-25) MM, 500(350-800) MG,	96 H	LC_{50}	17,590		276775	85
	Austropotamobius pallipes pallipes; Crayfish	19-32 MM	96 H	LC_{50}	8,800		232888	73
	Orconectes limosus; Crayfish	19-32 MM	30 D	LC_{50}	790		232887	73
	Ceriodaphnia dubia; Water flea	<24 H	24 H	LC_{50}	2,347		317084	92
	Pimephales promelas; Fathead minnow	5-15 D	48 H	MOR	13,733		317082	92
	Carassius auratus; Goldfish	60-90 MM, 3-5 G	to 7 D	MOR	100,000		221110	37
	Heteropneustes fossilis; Indian catfish	4.0 MM, 3 D, HATCHLINGS	18 D	MOR	454		238822	73

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cobalt chloride (cont.)	Stizostedion lucioperca; Pikeperch	11.5-16 MM	24 H	MOR	11		255008	75
	Daphnia magna; Water flea	12 H	21 D	REP		12	232881	72
Copper	Algae; Algae, phytoplankton, algal mat;	EXPO GRO PHASE	24 H	PSE		<=1270	213095	89
	Algae; Algae, phytoplankton, algal mat;	PHYTOPLANKTON	124 H	PGR		10 to 400	311876	83
	Algae; Algae, phytoplankton, algal mat;	PHYTOPLANKTON	14 D	BMS *		100	313109	88
	Aquatic community; Aquatic community;	OLIGOTROPHIC STREAM	NR	POP *		2.5 to 15	218766	88
	Brachionus calyciflorus; Rotifer;	NEONATE	24 H	LC_{50}	26		219385	91
	Brachionus calyciflorus; Rotifer;	NEONATE	24 H	LC_{50}	31		219385	91
	Callitriche platycarpa; Macrophyte;	NR	28 D	LT50 (Calc)	6,000		218344	78
	Carassius auratus; Goldfish;	NR	to 4 WK	PHY		100 to 4000	213419	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	26		213110	89
	Ceriodaphnia dubia; Water flea;	ADULT	48 H	LC_{50}	110		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	27		213110	89
	Ceriodaphnia dubia; Water flea;	ADULT	48 H	LC_{50}	63		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	28		213110	89
	Ceriodaphnia dubia; Water flea;	ADULT	48 H	LC_{50}	71		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	30		213110	89
	Ceriodaphnia dubia; Water flea;	ADULT	48 H	LC_{50}	79		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	95		213110	89
	Ceriodaphnia dubia; Water flea;	< 4 H	48 H	LC_{50}	17		311181	84
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	31		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	17		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	32		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	20		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	34		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	23		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	37		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	25		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	38		213110	89
	Ceriodaphnia dubia; Water flea;	ADULT	48 H	LC_{50}	66		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	42		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	104		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	49		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	21		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	58		213110	89
	Ceriodaphnia dubia; Water flea;	ADULT	48 H	LC_{50}	127		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	67		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	19		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	81		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	24		213110	89
	Ceriodaphnia dubia; Water flea;	NEONATE, <12 H, FIRST INSTAR	48 H	LC_{50}	78		213110	89
	Ceriodaphnia dubia; Water flea;	FIRST INSTAR NEONATES, 2-8 H	7 D	MOR	1.5 to 122.5		213110	89
	Ceriodaphnia dubia; Water flea;	FIRST INSTAR NEONATES, 2-8 H	7 D	REP *		1.5	213110	89
	Ceriodaphnia dubia; Water flea;	FIRST INSTAR NEONATES, 2-8 H	7 D	REP *		6.3	213110	89
	Chironomidae; Midge family;	LARVAE	12 MO	POP		67	213176	88
	Chironomus plumosus; Midge;	LARVA-STATE L1	24 H	LC_{50}	3,160		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L2	24 H	LC_{50}	8,590		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L2	48 H	LC_{50}	3,760		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L2	72 H	LC_{50}	1,990		215356	89

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Copper (cont.)	Chironomus plumosus; Midge;	LARVA-STATE L2	96 H	LC_{50}	1,580		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L3	24 H	LC_{50}	>10000		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L3	48 H	LC_{50}	2,050		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L3	72 H	LC_{50}	980		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L3	96 H	LC_{50}	530		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L4	24 H	LC_{50}	23,600		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L4	48 H	LC_{50}	12,510		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L4	72 H	LC_{50}	6,260		215356	89
	Chironomus plumosus; Midge;	LARVA-STATE L4	96 H	LC_{50}	2,200		215356	89
	Chironomus riparius; Midge;	2ND INSTAR LARVAE	240 H	LC_{50}	200		215023	91
	Chironomus riparius; Midge;	2ND INSTAR LARVAE	48 H	LC_{50}	1,200		215023	91
	Chironomus riparius; Midge;	2ND INSTAR LARVAE	96 H	LC_{50}	700		215023	91
	Chironomus riparius; Midge;	LARVA-STATE L1	24 H	LC_{50}	3,400		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L2	24 H	LC_{50}	9,070		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L2	48 H	LC_{50}	3,910		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L2	72 H	LC_{50}	1,860		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L2	96 H	LC_{50}	1,270		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L3	24 H	LC_{50}	13,430		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L3	48 H	LC_{50}	4,220		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L3	72 H	LC_{50}	1,630		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L3	96 H	LC_{50}	1,260		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L4	24 H	LC_{50}	8,990		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L4	48 H	LC_{50}	2,940		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L4	72 H	LC_{50}	1,120		215356	89
	Chironomus riparius; Midge;	LARVA-STATE L4	96 H	LC_{50}	640		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L1	24 H	LC_{50}	2,700		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L2	24 H	LC_{50}	7,100		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L2	48 H	LC_{50}	2,400		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L2	72 H	LC_{50}	1,350		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L2	96 H	LC_{50}	540		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L3	24 H	LC_{50}	10,100		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L3	48 H	LC_{50}	3,100		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L3	72 H	LC_{50}	850		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L3	96 H	LC_{50}	550		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L4	24 H	LC_{50}	>10000		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L4	48 H	LC_{50}	2,200		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L4	72 H	LC_{50}	870		215356	89
	Chironomus tentans; Midge;	LARVA-STATE L4	96 H	LC_{50}	310		215356	89
	Chlorella vulgaris; Green algae;	NR	8 D	PGR		10 to 400	311876	83
	Cypris subglobosa; Ostracod;	NR	12 H	LC_{50}	13,581		312365	88
	Cypris subglobosa; Ostracod;	NR	24 H	LC_{50}	12,200		312365	88
	Cypris subglobosa; Ostracod;	NR	48 H	LC_{50}	5,363		312365	88
	Cypris subglobosa; Ostracod;	NR	96 H	LC_{50}	277.3		312365	88
	Daphnia lumholzi; Water flea;	NR	12 H	LC_{50}	83		312365	88
	Daphnia lumholzi; Water flea;	NR	24 H	LC_{50}	67.2		312365	88
	Daphnia lumholzi; Water flea;	NR	48 H	LC_{50}	54.6		312365	88
	Daphnia lumholzi; Water flea;	NR	96 H	LC_{50}	9.4		312365	88
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		266	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		341	310633	84
	Daphnia magna; Water flea;	<= 24 H	48 H	EC50IM (Calc)		31.8	310529	83

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Copper (cont.)	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		36	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		146	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		55	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		257	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		92.8	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		102	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		96.6	310633	84
	Daphnia magna; Water flea;	> 24 H	48 H	EC50IM (Calc)		207	310633	84
	Daphnia magna; Water flea;	< 24 H	48 H	LC_{50}	54		311181	84
	Daphnia magna; Water flea;	NR	24 H	MOR	772		312372	85
	Daphnia pulex; Water flea;	< 24 H	36 D	LET	10.1		310453	84
	Daphnia pulex; Water flea;	< 24 H	42 D	RPP *		10.1	310453	84
	Daphnia pulex; Water flea;	< 24 H	48 H	LC_{50}	53		311181	84
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	10.8		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	11.4		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	113		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	165		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	184		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	199		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	213		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	240		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	35.5		215081	78

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Copper (cont.)	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	53.3		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	55.3		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	55.4		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	627		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	7.24		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	76.4		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	78.8		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	84.7		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	9.06		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	9.3		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	97.2		215081	78
	Dugesia dorotocephala; Turbellarian, flatworm;	18–20 MM	1 H	BHH *		20 to 200	310581	91
	Dugesia tigrina; Turbellarian, flatworm;	NR	96 H	LC_{50}	2,450		218709	74
	Elodea nuttallii; Waterweed, ditchmoss;	NR	14 D	LT50 (Calc)	6,000		218344	78
	Gambusia affinis; Mosquitofish;	NR	12 H	LC_{50} ?	49		315578	78
	Gambusia affinis; Mosquitofish;	NR	133 D	MOR *	3.2		315578	78
	Gambusia affinis; Mosquitofish;	NR	48 H	MOR *	160		313098	88
	Gambusia affinis; Mosquitofish;	NR	96 H	LC_{50} ?	56		315578	78
	Gammarus lacustris; Scud;	ADULT	0.12 H	BHH		0.05 to 5000	311804	83
	Gammarus lacustris; Scud;	NR	96 H	LC_{50}	212		313058	88
	Gammarus pulex; Scud;	JUVENILE, 2–3 MOLT, 3–5 MM	240 H	LC_{50}	33		215023	91
	Gammarus pulex; Scud;	JUVENILE, 2–3 MOLT, 3–5 MM	48 H	LC_{50}	47		215023	91
	Gammarus pulex; Scud;	JUVENILE, 2–3 MOLT, 3–5 MM	96 H	LC_{50}	37		215023	91
	Gnathonemus petersii; Electric fish;	JUVENILE, 5–20 G	4 H	PHY *		500	310685	84
	Invertebrates; Invertebrates;	MACRO–INVERTEBRATES	14 D	BHH *		5.5	213398	89
	Invertebrates; Invertebrates;	MACROINVERTEBRATES	10 D	LC_{50}	15		210388	89
	Invertebrates; Invertebrates;	MACROINVERTEBRATES	10 D	LC_{50}	6		210388	89
	Invertebrates; Invertebrates;	MACROINVERTEBRATES	4 D	LC_{50}	14		210388	89
	Invertebrates; Invertebrates;	MACROINVERTEBRATES	4 D	LC_{50}	26		210388	89
	Lamellidens marginalis; Mussel;	5.0–6.0 CM	1 to 30 D	GRO		250 to 1000	213776	91
	Lamellidens marginalis; Mussel;	5.0–6.0 CM	1 to 30 D	OC		250 to 1000	213776	91
	Lamellidens marginalis; Mussel;	5.0–6.0 CM	96 H	LC_{50}	5,000		213776	91
	Lamellidens marginalis; Mussel;	7 CM	to 9.75 H	PHY *		250 to 1000	213311	89
	Lamellidens marginalis; Mussel;	NR	96 H	LC_{50}	5,000		213311	89
	Lamellidens marginalis; Mussel;	NR	96 H	LC_{50}	5,000		213875	91
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC50GR		1,100	311789	86
	Lemna minor; Duckweed;	NR	21 D	LT50 (Calc)	6,000		218344	78
	Lepomis macrochirus; Bluegill;	5.3–7.2 CM, 3.5–3.9 G	96 H	LC_{50}	1,250		212406	68
	Lepomis macrochirus; Bluegill;	NR	4 D	BHH		36 to 130	212858	89
	Lepomis macrochirus; Bluegill;	NR	NR	BHH		25 to 1800	212858	89
	Lophopodella carteri; Bryozoa;	ANCENSTRULAE, 2–3 DAYS	96 H	LC_{50}	510		216703	80
	Macrobrachium hendersodayanus; Prawn;	NR	96 H	OC *		1,750	311545	84
	Myriophyllum spicatum; Water–milfoil;	4 CM APEX	32 D	EC50BM *		250	212262	74
	Myriophyllum spicatum; Water–milfoil;	4 CM APEX	32 D	EC50BM *		380	212262	74
	Myriophyllum spicatum; Water–milfoil;	4 CM APEX	32 D	EC50GR *		1,500	212262	74
	Myriophyllum spicatum; Water–milfoil;	4 CM APEX	32 D	EC50GR *		700	212262	74
	Oncorhynchus kisutch; Coho salmon, silver salmon;	JUVENILE, 6 G	96 H	LC_{50}	164 ; 17		310541	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	11 CM, 13 G	96 H	LC_{50} ?	250		212122	72
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	32 MM, 0.36 G	15 H *	MOR *	200		218499	74
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	32 MM, 0.36 G	16.67 H *	MOR *	200		218499	74

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Copper (cont.)	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	32 MM, 0.36 G	24 H	LC_{50}	130		218499	74
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	32 MM, 0.36 G	24 H	LC_{50}	140		218499	74
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	32 MM, 0.36 G	4.33 H *	MOR *	2,000		218499	74
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	32 MM, 0.36 G	5.5 H *	MOR *	2,000		218499	74
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	55.5 G	40 D	GRO *		225	218386	76
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	6–8 G	48 H	HEM *		30	219917	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	75–100 G	48 H	MOR *	85		315401	82
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	75–100 G	8 H	PHY *		170	315401	82
	Oncorhynchus mykiss; Rainbow trout, donaldson trout; Oncorhy	FINGERLING, 0.2 G	1 WK	MOR *	4.0		315625	79

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Copper (cont.)	Pimephales promelas; Fathead minnow;	20–69 MM	96 H	LC_{50} ?	20,000		218320	76
	Pimephales promelas; Fathead minnow;	20–69 MM	96 H	LC_{50} ?	21,000		218320	76
	Pimephales promelas; Fathead minnow;	EMBRYO, 1 D	30 D	MOR *	221.8		215081	78
	Plumatella emarginata; Bryozoan;	ANCENSTRULAE, 2–3 DAYS	96 H	LC_{50}	140		216703	80
	Poecilia reticulata; Guppy;	JUVENILE	96 H	LC_{50}	112		212010	76
	Poecilia reticulata; Guppy;	JUVENILE	96 H	LC_{50}	138		212010	76
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	1045 H	LC_{50}	890		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	1227 H	LC_{50}	776		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	1358 H	LC_{50}	657		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	146 H	LC_{50}	3,024		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	246 H	LC_{50}	2,330		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	342 H	LC_{50}	1,780		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	453 H	LC_{50}	1,520		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	49 H	LC_{50}	11,000		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	549 H	LC_{50}	1,380		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	622 H	LC_{50}	1,190		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	72 H	LC_{50}	8,100		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	734 H	LC_{50}	1,150		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	843 H	LC_{50}	1,090		311758	83
	Procambarus clarkii; Red swamp crayfish;	ADULT, 24.8 G, 9.3 CM	945 H	LC_{50}	1,000		311758	83
	Procambarus clarkii; Red swamp crayfish;	EMBRYO	1147 H	LC_{50}	206		311758	83
	Procambarus clarkii; Red swamp crayfish;	EMBRYO	1267 H	LC_{50}	184		311758	83
	Procambarus clarkii; Red swamp crayfish;	EMBRYO	436 H	LC_{50}	3,350		311758	83
	Procambarus clarkii; Red swamp crayfish;	EMBRYO	598 H	LC_{50}	1,700		311758	83
	Procambarus clarkii; Red swamp crayfish;	EMBRYO	855 H	LC_{50}	1,140		311758	83
	Procambarus clarkii; Red swamp crayfish;	EMBRYO	903 H	LC_{50}	716		311758	83
	Procambarus clarkii; Red swamp crayfish;	EMBRYO	927 H	LC_{50}	556		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	12 H	LC_{50}	4,170		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	140 H	LC_{50}	527		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	24 H	LC_{50}	1,990		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	247 H	LC_{50}	242		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	344 H	LC_{50}	199		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	456 H	LC_{50}	146		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	48 H	LC_{50}	1,350		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	504 H	LC_{50}	67		311758	83
	Procambarus clarkii; Red swamp crayfish;	LARVAE	98 H	LC_{50}	720		311758	83
	Salmo salar; Atlantic salmon;	2–3 YR	96 H	LC_{50}	125		212068	72
	Salmo trutta; Brown trout;	78 G, 3RD YR CLASS	53 D	HIS *		15	310527	83
	Salvelinus fontinalis; Brook trout;	YEARLING, 14–16 CM, 30–42 G *	720 D	GRO *		9.4	218397	74
	Salvelinus fontinalis; Brook trout;	YEARLING, 14–16 CM, 30–42 G *	720 D	HAT *		9.4	218397	74
	Salvelinus fontinalis; Brook trout;	YEARLING, 14–16 CM, 30–42 G *	720 D	MOR *	9.4		218397	74
	Salvelinus fontinalis; Brook trout;	YEARLING, 14–16 CM, 30–42 G *	720 D	REP *		9.4	218397	74
	Simocephalus vetulus; Water flea;	< 24 H	48 H	LC_{50}	57		311181	84
Cyanide	Carassius auratus; Goldfish	39–60 MM	0.17 H	AVO		20,000	215692	76
	Dugesia tigrina; Turbellarian, flatworm	NR	96 H	LC_{50}	19,400		218709	74
	Gnathonemus petersii; Electric fish	JUVENILE, 5–20 G	4 H	PHY *		100	310685	84
	Lepomis macrochirus; Bluegill	NR	96 H	LC_{50} ?	180		210949	68
	Myriophyllum spicatum; Water–milfoil	4 CM, APEX	32 D	EC_{50}BM *		22,400	212262	74
	Myriophyllum spicatum; Water–milfoil	4 CM, APEX	32 D	EC_{50}BM *		20,000	212262	74

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Cyanide (cont.)	Myriophyllum spicatum; Water-milfoil	4 CM, APEX	32 D	EC_{50}GR *		28,600	212262	74
	Myriophyllum spicatum; Water-milfoil	4 CM, APEX	32 D	EC_{50}GR *		27,300	212262	74
	Physella heterostropha; Snail	NR	96 H	LC_{50} ?	432		210949	68
Iron	Dugesia dorotocephala; Turbellarian, flatworm;	18-20 MM	1 H	BEH *		1,000 to 50,000	310581	91
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		3,700	311789	86
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	EGGS AND LARVA	NR	DVP *		5,700	315523	82
	Salmo trutta; Brown trout;	ALEVIN	NR	MOR *	5,170		311637	83
	Salmo trutta; Brown trout;	EGG	NR	HAT *		460	311637	83
	Salmo trutta; Brown trout;	EYED EGGS	NR	MOR *	5,170		311637	83
	Salmo trutta; Brown trout;	NEWLY HAT ALEVIN	NR	MOR *	3,020		311637	83
	Tilapia sparrmanii; Banded bream;	10.24-99.43 G	2 to 72 H	OC *		88,000	213066	89
Lead	Astacus astacus; European crayfish;	8-10 CM	2 WK	BNZ *		20	210376	91
	Astacus astacus; European crayfish;	8-10 CM	to 10 WK	HIS		20	210376	91
	Barbus arulius; Barb;	1.24 G	4 D	HIS		200,000 to 400,00	219972	87
	Brachionus calyciflorus; Rotifer;	NEONATE	24 H	LC_{50}	> 4,000		219385	91
	Brachydanio rerio; Zebra danio, zebrafish;	DECHLORIONATED EGG	24 H			72	219870	80
	Brachydanio rerio; Zebra danio, zebrafish;	EGG	48 H			72	219870	80
	Bufo arenarum; Toad;	EMBRYO	24 H	DVP *		1,000	213162	90
	Bufo arenarum; Toad;	EMBRYO	24 H	MOR *	1,000		213162	90
	Carassius auratus; Goldfish;	UNDERYEARLING	1 WK *	BNZ *		470	315460	77
	Ceriodaphnia reticulata; Water flea;	< 4 H	48 H	LC_{50}	530		311181	84
	Daphnia magna; Water flea;	< 24 H	48 H	LC_{50}	4,400		311181	84
	Daphnia pulex; Water flea;	< 24 H	48 H	LC_{50}	5,100		311181	84
	Dugesia dorotocephala; Turbellarian, flatworm;	18-20 MM	1 H	BEH *		100 to 1,000	310581	91
	Dugesia tigrina; Turbellarian, flatworm;	NR	96 H	LC_{50}	160,000		218709	74
	Hyalella azteca; Scud;	NR	5 D	LC_{100}	5,000		219804	80
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		8,000	311789	86
	Lepomis gibbosus; Pumpkinseed;	> 1.75 YR	<=2 WK *	BNZ *		90	315460	77
	Micropterus dolomieui; Smallmouth bass;	EGG	96 H	MOR *	<=15,900		312153	86
	Micropterus dolomieui; Smallmouth bass;	FINGERLING	10 WK	LOC *		405	312153	86
	Micropterus dolomieui; Smallmouth bass;	FINGERLING	90 D	GRO *		405	312153	86
	Micropterus dolomieui; Smallmouth bass;	FINGERLING	90 D	HEM *		405	312153	86
	Micropterus dolomieui; Smallmouth bass;	FINGERLING	96 H	LC_{50}	29,000		312153	86
	Micropterus dolomieui; Smallmouth bass;	SAC FRY, 7 D POST-SPAWN	96 H	MOR *	<=15,900		312153	86
	Micropterus dolomieui; Smallmouth bass;	SWIM-UP FRY, 17 D POST-SPAWN	96 H	LC_{50}	2,800		312153	86
	Micropterus dolomieui; Smallmouth bass;	SWIM-UP, FRY 17 D POST-SPAWN	96 H	LC_{50}	2,200		312153	86
	Micropterus salmoides; Largemouth bass;	NR	24 H	BEH *		1,500	311127	78
	Micropterus salmoides; Largemouth bass;	NR	24 H	RES *		1,050	311127	78
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		363,000	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		808,000	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		725,000	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		767,000	212262	74
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	10.5 G	32 WK	HIS *			310573	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	15 G	24 H	HEM *		130	315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	110		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	120		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	120		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	210		315719	78

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Lead (cont.)	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	300		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	470		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	490		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	500		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	52		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	53		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	740		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	80		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	85		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	900		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	4 MO, 15 G	4 to 72 H	MOR *	910		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	53 G	1 WK	MOR *	1,000		315719	78
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	6-18 MO	<=2 WK *	ENZ *		10	315460	77
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	6.5 G	30 WK	HIS *		120	310573	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	NEWLY HAT, SAC FRY	189 D	ABN *		32	219830	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	NEWLY HAT, SAC FRY	189 D	ENZ *		100	219830	80
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	NEWLY HAT, SAC FRY	189 D	HBM *		100	219830	80
	Pimephales promelas; Fathead minnow;	JUVENILE	4 WK	PHY		500 to 1,000	210204	89
	Potamogeton crispus; Curled pondweed;	NR	NR	PSI *		25,000	217552	77
	Salvelinus fontinalis; Brook trout;	6-18 MO	<=2 WK *	ENZ *		90	315460	77
	Simocephalus vetulus; Water flea;	< 24 H	48 H	LC_{50}	4,500		311181	84
Manganese	Algae; Algae, phytoplankton, algal mat;	NATURAL COLONY	38 D	POP *		280	212862	69
	Anabolia nervosa; Quiver fly;	LARVAE	7 D	LET	2,000,000		210725	57
	Chironomus thummi; Midge;	LARVAE	7 D	LET	1,000,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	2.25 H	LET *	1,000,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	24 H	LET *	2,000,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	25 H	LET *	1,800,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	4.17 D	LET *	800,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	5.13 D	LET *	700,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	6.63 D	LET *	650,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	7 D	MOR *	600,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	78 H	LET *	900,000		210725	57
	Cyprinidae; Minnow, carp family;	2 SUMMERS	48 H	LET *	2,000,000		210725	57
	Gammarus roeseli; Scud;	NR	7 D	LET	70,000		210725	57
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	$EC_{50}GR$		31,000	311789	86
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	10 H	LET *	700,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	13 H	LET *	600,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	34 H	LET *	300,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	5 D	LET *	100,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	7 D	MOR *	75,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	77 H	LET *	150,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	2 SUMMERS	34 H	LET *	600,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	15 H	LET *	700,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	23 H	LET *	600,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	4.79 D	LET *	150,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	66 H	LET *	300,000		210725	57
	Salvelinus fontinalis; Brook trout;	1 SUMMER	7 D	MOR *	100,000		210725	57
	Salvelinus fontinalis; Brook trout;	2 SUMMERS	41 H	LET *	600,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	48 H	LET *	2,000,000		210725	57

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Manganese (cont.)	Tinca tinca; Tench;	1 SUMMER	6.75 D	LET *	1,500,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	7 D	MOR *	1,200,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	7 D	MOR *	1,300,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	96 H	LET *	1,800,000		210725	57
	Tinca tinca; Tench;	2 SUMMERS	7 D	LET *	2,000,000		210725	57
	Tubifex tubifex; Tubificid worm;	NR	7 D	LET	700,000		210725	57
Mercury	Caridina rajadhari; Freshwater prawn	NR	48 H	LC_{50}	6.918		311025	85
	Caridina rajadhari; Freshwater prawn	NR	72 H	LC_{50}	5.784		311025	85
	Caridina rajadhari; Freshwater prawn	NR	96 H	LC_{50}	4.786		311025	85
	Caridina rajadhari; Freshwater prawn	STAGE C, 2.5 CM	30 D	HIS * (Calc)		0.51	311025	85
	Lamellidens marginalis; Mussel	NR	96 H	LC_{50}	10,000		213311	89
	Lamellidens marginalis; Mussel	7 CM	3. to 6.5 H	PHY *		500 to 2,000	213311	89
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}BM *		3,400	212262	74
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}BM *		4,400	212262	74
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}GR *		12,000	212262	74
	Myriophyllum spicatum; Water-milfoil	4 CM APEX	32 D	EC_{50}GR *		1,200	212262	74
	Planaria sp; Planarian, flatworm	NR	6.6 H	LT_{50}	500		218981	73
	Amoeba sp; Amoeba	NR	> 1.66 H	LT_{50}	500		218981	73
	Dugesia tigrina; Turbellarian, flatworm	NR	96 H	LC_{50}	270		218709	74
	Potamogeton crispus; Curled pondweed	NR	NR	PSE *		5,000	217552	77
	Carassius auratus; Goldfish	NR	8 D	RSD *		230	219568	71
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	5.8-15.6 CM, 1.7-52.5 G	2 to 209 D	RSD		48,200	210503	71
	Cyprinidae; Minnow, carp family	1 SUMMER	60 H	LET *	1,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	7 D	MOR *	700		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	7 D	MOR *	500		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	7 D	MOR *	300		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	7 D	MOR *	290		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	1.25 H	LET *	100,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	2.5 H	LET *	75,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	4.5 H	LET *	50,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	8.5 H	LET *	5,000		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	24.25 H	LET *	1,500		210725	57
	Tinca tinca; Tench	1 SUMMER	4.5 H	LET *	50,000		210725	57
	Tinca tinca; Tench	1 SUMMER	12.58 H	LET *	5,000		210725	57
	Tinca tinca; Tench	1 SUMMER	72 H	LET *	1,500		210725	57
	Tinca tinca; Tench	1 SUMMER	4.25 D	LET *	1,300		210725	57
	Tinca tinca; Tench	1 SUMMER	7 D	MOR *	1,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	8.17 H	LET *	800		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	11 H	LET *	500		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	13.67 H	LET *	350		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	7 D	MOR *	150		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	7 D	MOR *	250		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	16.33 H	LET *	800		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	18 H	LET *	500		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	21 H	LET *	350		210725	57
	Cyprinidae; Minnow, carp family	1 SUMMER	84 H	LET *	800		210725	57
	Tinca tinca; Tench	1 SUMMER	7.17 D	LET *	1,100		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	1 SUMMER	5.33 D	LET *	250		210725	57
	Salvelinus fontinalis; Brook trout	1 SUMMER	4.25 D	LET *	300		210725	57

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Mercury (cont.)	Cyprinidae; Minnow, carp family	2 SUMMERS	58 H	LET *	4,500		210725	57
	Tinca tinca; Tench	2 SUMMERS	4.3 D	LET *	1,500		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout	2 SUMMERS	24 H	LET *	500		210725	57
	Salvelinus fontinalis; Brook trout	2 SUMMERS	88 H	LET *	500		210725	57
	Gammarus roeseli; Scud	NR	7 D	LET	100		210725	57
	Tubifex tubifex; Tubificid worm	NR	7 D	LET	300		210725	57
	Chironomus thummi; Midge	LARVAE	7 D	LET	3,500		210725	57
	Anabolia nervosa; Quiver fly	LARVAE	7 D	LET	2,000		210725	57
	Carassius auratus; Goldfish	20-25 G	to 15 D	BIO *		50	219207	72
	Carassius auratus; Goldfish	15-25 G	to 15 D	BIO *		50	219207	72
	Cyclops sp; Cyclopoid copepod	ADULT	48 H	LC_{50}	600		313255	88
	Aedes aegypti; Mosquito	LARVAE	48 H	LC_{50}	290		313255	88
	Chironomus tentans; Midge	LARVA-STATE L1	24 H	LC_{50}	2,280		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	24 H	LC_{50}	23,400		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	48 H	LC_{50}	8,040		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	72 H	LC_{50}	570		215356	89
	Chironomus tentans; Midge	LARVA-STATE L2	96 H	LC_{50}	240		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	24 H	LC_{50}	29,600		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	48 H	LC_{50}	6,700		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	72 H	LC_{50}	580		215356	89
	Chironomus tentans; Midge	LARVA-STATE L3	96 H	LC_{50}	280		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	24 H	LC_{50}	32,300		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	48 H	LC_{50}	6,860		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	72 H	LC_{50}	3,040		215356	89
	Chironomus tentans; Midge	LARVA-STATE L4	96 H	LC_{50}	570		215356	89
	Chironomus riparius; Midge	LARVA-STATE L1	24 H	LC_{50}	1,690		215356	89
	Chironomus riparius; Midge	LARVA-STATE L2	24 H	LC_{50}	1,960		215356	89
	Chironomus riparius; Midge	LARVA-STATE L2	48 H	LC_{50}	820		215356	89
	Chironomus riparius; Midge	LARVA-STATE L2	72 H	LC_{50}	260		215356	89
	Chironomus riparius; Midge	LARVA-STATE L2	96 H	LC_{50}	220		215356	89
	Chironomus riparius; Midge	LARVA-STATE L3	24 H	LC_{50}	750		215356	89
	Chironomus riparius; Midge	LARVA-STATE L3	48 H	LC_{50}	240		215356	89
	Chironomus riparius; Midge	LARVA-STATE L3	72 H	LC_{50}	230		215356	89
	Chironomus riparius; Midge	LARVA-STATE L3	96 H	LC_{50}	230		215356	89
	Chironomus riparius; Midge	LARVA-STATE L4	24 H	LC_{50}	4,800		215356	89
	Chironomus riparius; Midge	LARVA-STATE L4	48 H	LC_{50}	790		215356	89
	Chironomus riparius; Midge	LARVA-STATE L4	72 H	LC_{50}	710		215356	89
	Chironomus riparius; Midge	LARVA-STATE L4	96 H	LC_{50}	480		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L1	24 H	LC_{50}	3,180		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L3	24 H	LC_{50}	2,430		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L3	48 H	LC_{50}	1,760		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L3	72 H	LC_{50}	1,360		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L3	96 H	LC_{50}	600		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L4	24 H	LC_{50}	3,230		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L4	48 H	LC_{50}	1,280		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L4	72 H	LC_{50}	880		215356	89
	Chironomus plumosus; Midge	LARVA-STATE L4	96 H	LC_{50}	880		215356	89
	Chironomus riparius; Midge	EGGS	<=24 H	MOR *	10,000		215356	89
	Chironomus riparius; Midge	EGGS	7 to 96 H	MOR *	320		215356	89
	Chironomus riparius; Midge	EGGS	<=24 H	MOR *	3,200		215356	89

Table S--2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Mercury (cont.)	Chironomus riparius; Midge	EGGS	7 to 96 H	MOR *	320		215356	89
	Gambusia affinis; Mosquitofish	NR	<24 H	LT_{50}	50 to 500		315524	79
	Gambusia affinis; Mosquitofish	NR	30 D	BCF *		1	315524	79
	Gambusia affinis; Mosquitofish	NR	30 D	BCF *		1	315524	79
	Gambusia affinis; Mosquitofish	NR	30 D	BCF *		1	315524	79
	Gnathonemus petersii; Electric fish	JUVENILE, 5–20 G	20 H	PHY *		100	310685	84
	Caridina rajadhari; Freshwater prawn	NR	24 H	LC_{50}	9.12		311025	85
	Lamellidens marginalis; Mussel	32 G	48 H	OC *		5,910	311622	84
	Tilapia mossambica; Mozambique tilapia	7.0–11.8 CM	11 WK	BIO *		10	310166	84
	Catostomus commersoni; White sucker	JUVENILE, 142 MM, 28.7 G	1 WK	RSD		190	312412	87
	Algae; Algae, phytoplankton, algal mat	PHYTOPLANKTON	14 D	BMS *		100	313109	88
	Tilapia mossambica; Mozambique tilapia	7–10 CM, 6–10 G	1 WK	HBM *		4,000	212931	87
	Lamellidens marginalis; Mussel	5.0–6.0 CM	96 H	LC_{50}	5,000		213776	91
	Lamellidens marginalis; Mussel	5.0–6.0 CM	1 to 30 D	GRO		500 to 2,000	213776	91
	Lamellidens marginalis; Mussel	5.0–6.0 CM	1 to 30 D	OC		500 to 2,000	213776	91
	Brachionus calyciflorus; Rotifer	NEONATE	24 H	LC_{50}	60		219385	91
Nickel	Ambloplites rupestris; Rock bass;	YOUNG–OF–THE–YEAR	96 H	LC_{50}	2,480		215081	78
	Anabolia nervosa; Quiver fly;	LARVAE	7 D	LET	2,000,000		210725	57
	Brachionus calyciflorus; Rotifer;	NEONATE	24 H	LC_{50}	4,000		219385	91
	Chironomus thummi; Midge;	LARVAE	7 D	LET	850,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	15 H	LET *	200,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	20 H	LET *	125,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	23 H	LET *	100,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	35 H	LET *	75,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	5.13 D	LET *	50,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	59 H	LET *	65,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	6 H	LET *	1,000,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	7 D	MOR *	45,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	74 H	LET *	60,000		210725	57
	Cyprinidae; Minnow, carp family;	1 SUMMER	8 H	LET *	500,000		210725	57
	Cyprinidae; Minnow, carp family;	2 SUMMERS	79 H	LET *	100,000		210725	57
	Daphnia magna; Water flea;	24–48 HR, NEONATE	21 D	GRO *		100	213950	91
	Daphnia magna; Water flea;	24–48 HR, NEONATE	21 D	MOR	50 to 150		213950	91
	Daphnia magna; Water flea;	24–48 HR, NEONATE	21 D	REP *		100	213950	91
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	1,034		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	1,140		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	1,813		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	1,836		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	1,901		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	2,042		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	2,171		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	2,182		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	2,325		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	2,717		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	3,014		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	3,156		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	3,316		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	3,414		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	3,607		215081	78

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Nickel (cont.)	Daphnia pulicaria; Waterflea;	NR	48 H	LC_{50}	3,757		215081	78
	Daphnia pulicaria; Water flea;	NR	48 H	LC_{50}	697		215081	78
	Dugesia dorotocephala; Turbellarian, flatworm;	18-20 MM	1 H	BEH *		1,000 to 50,000	310581	91
	Dugesia tigrina; Turbellarian, flatworm;	NR	96 H	LC_{50}	16,800		218709	74
	Gammarus roeseli; Scud;	NR	7 D	LET	15,000		210725	57
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		450	311789	86
	Mystus vittatus; Catfish;	80-100 MM, 6-10 G	96 H	LC_{50} ?	255,000		315793	82
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	11.17 H	LET *	100,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	34 H	LET *	50,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	4.58 D	LET *	35,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	7 D	MOR *	25,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	7.04 D	LET *	30,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	1 SUMMER	73 H	LET *	40,000		210725	57
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	2 SUMMERS	50 H	LET *	50,000		210725	57
	Pimephales promelas; Fathead minnow;	EMBRYO, 1 D	30 D	GRO *		434	215081	78
	Pimephales promelas; Fathead minnow;	EMBRYO, 1 D	30 D	MOR *	109		215081	78
	Pimephales promelas; Fathead minnow;	EMBRYO, 1 D	30 D	MOR *	434		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	12,356		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	17,678		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	2,916		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	2,923		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	5,163		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	5,209		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	5,383		215081	78
	Pimephales promelas; Fathead minnow;	NR	96 H	LC_{50}	8,617		215081	78
	Salvelinus fontinalis; Brook trout; Salmonidae;	1 SUMMER	27 H	LET *	100,000		210725	57
	Salvelinus fontinalis; Brook trout; Salmonidae;	1 SUMMER	39 H	LET *	50,000		210725	57
	Salvelinus fontinalis; Brook trout; Salmonidae;	1 SUMMER	5.75 D	LET *	35,000		210725	57
	Salvelinus fontinalis; Brook trout; Salmonidae;	1 SUMMER	7 D	MOR *	30,000		210725	57
	Salvelinus fontinalis; Brook trout; Salmonidae;	1 SUMMER	92 H	LET *	40,000		210725	57
	Salvelinus fontinalis; Brook trout; Salmonidae;	2 SUMMERS	62 H	LET *	50,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	25 H	LET *	100,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	46 H	LET *	75,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	7 D	MOR *	55,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	7.33 H	LET *	1,000,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	76 H	LET *	65,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	8.08 D	LET *	60,000		210725	57
	Tinca tinca; Tench;	1 SUMMER	8.5 H	LET *	500,000		210725	57
	Tinca tinca; Tench;	2 SUMMERS	97 H	LET *	100,000		210725	57
	Tubifex tubifex; Tubificid worm;	NR	7 D	LET	30,000		210725	57
Selenium	Daphnia magna; Water flea	<=24 H OLD	24 H	LC_{50}	660		215184	80
	Daphnia magna; Water flea	<=24 H OLD	48 H	LC_{50}	430		215184	80
	Daphnia magna; Water flea	<= 24 H	48 H	MOR *	220		215184	80
	Daphnia magna; Water flea	<24 H	48 H	EC_{50}IM ?		2,620	210956	90
	Daphnia magna; Water flea	<24 H	48 H	EC_{50}IM ?		9,340	210956	90
	Chironomus riparius; Midge	<24 H	48 H	EC_{50}IM ?		1,790	210956	90
	Chironomus riparius; Midge	<24 H	48 H	EC_{50}IM ?		14,300	210956	90
	Daphnia magna; Water flea	<24 H	21 D	MOR *	711		210956	90
	Daphnia magna; Water flea	<24 H	21 D	MOR *	1,410		210956	90

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Selenium (cont.)	Daphnia magna; Water flea	<24 H	21 D	REP *		156	210956	90
	Daphnia magna; Water flea	<24 H	21 D	REP *		348	210956	90
	Chironomus riparius; Midge	<24 H	30 D	DVP *		6 to 6,050	210956	90
	Daphnia magna; Water flea	<24 H	21 D	BCF *		5	210956	90
	Daphnia magna; Water flea	<24 H	21 D	BCF *		85	210956	90
	Daphnia magna; Water flea	<24 H	21 D	BCF *		156	210956	90
	Daphnia magna; Water flea	<24 H	21 D	BCF *		348	210956	90
	Daphnia magna; Water flea	MIDDLE INSTAR	48 H	LC_{50}	710		210486	80
	Daphnia magna; Water flea	MIDDLE INSTAR	96 H	LC_{50}	430		210486	80
	Daphnia magna; Water flea	MIDDLE INSTAR	14 D	LC_{50}	430		210486	80
	Pimephales promelas; Fathead minnow	FRY, 0.03 G, 17 MM, 25–35 D	96 H	LC_{50}	1,000		210486	80
	Pimephales promelas; Fathead minnow	FRY, 0.03 G, 17 MM, 25–35 D	14 D	LC_{50}	600		210486	80
	Hyalella azteca; Scud	ADULT	48 H	LC_{50}	940		210486	80
	Hyalella azteca; Scud	ADULT	96 H	LC_{50}	340		210486	80
	Hyalella azteca; Scud	ADULT	14 D	LC_{50}	70		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	120 H *	LT_{50}	1		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	85 H *	LT_{50}	5		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	62 H *	LT_{50}	1,000		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	33 H *	LT_{50}	1,500		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	25 H *	LT_{50}	20,000		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	11 H *	LT_{50}	25,000		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	14 H *	LT_{50}	30,000		210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	12 H *	LT_{50}	40		210486	80
	Daphnia magna; Water flea	2 D	to 3 WK	MOR *	280		210486	80
	Daphnia magna; Water flea	2 D	to 3 WK	REP *		280	210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	17 D	HAT *		40,000	210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	17 D	DVP *		15,000	210486	80
	Pimephales promelas; Fathead minnow	2 D, EGG	17 D	DVP *		10,000	210486	80
	Lepomis macrochirus; Bluegill	JUVENILE, 40–70 MM TOTAL LENGTH	48 H	RBS *		5	310565	83
	Micropterus salmoides; Largemouth bass	JUVENILE, 40–70 MM TOTAL LENGTH	48 H	RBS *		5	310565	83
	Lemna minor; Duckweed	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		2,400	311789	86
	Oncorhynchus tshawytscha; Chinook salmon	FRY, 0.5 G	96 H	LC_{50}	46,600		213174	90
	Oncorhynchus tshawytscha; Chinook salmon	FRY, 0.5 G	96 H	LC_{50}	50,900		213174	90
	Oncorhynchus tshawytscha; Chinook salmon	FRY, 0.5 G	96 H	LC_{50}	85,500		213174	90
	Oncorhynchus tshawytscha; Chinook salmon	FRY, 0.6 G	96 H	LC_{50}	67,100		213174	90
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY, 0.5 G	96 H	LC_{50}	21,800		213174	90
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY, 0.5 G	96 H	LC_{50}	24,500		213174	90
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY, 0.5 G	96 H	LC_{50}	25,800		213174	90
	Oncorhynchus kisutch; Coho salmon, silver salmon	FRY, 0.7 G	96 H	LC_{50}	16,900		213174	90
	Pimephales promelas; Fathead minnow	59–61 D	1 to 98 D	GRO		5,000 to 30,000	213930	89
	Pimephales promelas; Fathead minnow	59–61 D	98 D			5,000 to 30,000	213930	89
	Brachionus calyciflorus; Rotifer	NEONATE	24 H	LC_{50}	16,000		219385	91
	Dugesia dorotocephala; Turbellarian, flatworm	18–20 MM	1 H	BHI *		1,000 to 10,000	310581	91
	Daphnia magna; Water flea	<24 H	21 D	BCF *		711	210956	90
Silver	Brachionus calyciflorus; Rotifer	NEONATE	24 H	LC_{50}	7.5		219385	91
	Ceriodaphnia reticulata; Water flea	< 4 H	48 H	LC_{50}	11		311181	84
	Daphnia pulex; Water flea	< 24 H	48 H	LC_{50}	14		311181	84
	Simocephalus vetulus; Water flea	< 24 H	48 H	LC_{50}	15		311181	84

Table S-2.7
AQUIRE Freshwater Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Vanadium oxide sulfate	Carassius auratus; Goldfish	3-5 CM, 0.3-2.9 G	6 D	LC_{50}	1,020		228999	79
	Lepomis macrochirus; Bluegill	NR	96 H	LC_{50}	6,000		287133	60
	Pimephales promelas; Fathead minnow	NR	96 H	LC_{50}	4,800		287131	60
	Poecilia reticulata; Guppy	1.5-2.5 CM, 0.1-0.5 G	6 D	LC_{50}	128		229000	79
Zinc	Algae; Algae, phytoplankton, algal mat;	CLADOCERA, COPEPODA, ROTIFERA	2 WK	CLR *		15 to 30	311256	83
	Algae; Algae, phytoplankton, algal mat;	EXPO G RO PHASE	24 H	PSE		<=98100	213095	89
	Asellus communis; Aquatic sowbug;	NR	20 D	RSD *		0.11 to 0.12	312027	86
	Brachionus calyciflorus; Rotifer;	NEONATE	24 H	LC_{50}	1,300		219385	91
	Canthocamptus sp; Copepod;	LARVAE	24 H	LET	1,250		311797	85
	Carassius auratus; Goldfish;	20-25 G	to 15 D	BIO *		500	219207	72
	Catostomus commersoni; White sucker;	JUVENILE, 142 MM, 28.7 G	1 WK	RSD		890	312412	87
	Ceriodaphnia reticulata; Water flea;	< 4 H	48 H	LC_{50}	76		311181	84
	Channa punctatus; Snake-head catfish;	2.4 G, 58 MM	24 H	ENZ *		56,000	315190	81
	Chironomidae; Midge family;	LARVAE	12 MO	POP		1,140	213176	88
	Chironomus riparius; Midge;	4TH INSTAR LARVAE	>10 D	RSD		50 to 100	212729	89
	Clarias lazera; Catfish;	IMMATURE, 12-15 G	2 to 96 H	BIO *		32,000	312716	87
	Clarias lazera; Catfish;	JUVENILE, 230 MM, 130 G	24 H	RSD *		15,000	312717	87
	Cyclops sp; Cyclopoid copepod;	ADULT	48 H	LC_{50}	3,310		313255	88
	Cypris subglobosa; Ostracod;	NR	12 H	LC_{50}	47,780		312365	88
	Cypris subglobosa; Ostracod;	NR	24 H	LC_{50}	50,620		312365	88
	Cypris subglobosa; Ostracod;	NR	48 H	LC_{50}	34,990		312365	88
	Cypris subglobosa; Ostracod;	NR	96 H	LC_{50}	8,352		312365	88
	Daphnia lumholzi; Water flea;	NR	12 H	LC_{50}	10,740		312365	88
	Daphnia lumholzi; Water flea;	NR	24 H	LC_{50}	6,704		312365	88
	Daphnia lumholzi; Water flea;	NR	48 H	LC_{50}	2,290		312365	88
	Daphnia lumholzi; Water flea;	NR	96 H	LC_{50}	437.5		312365	88
	Daphnia magna; Water flea;	24-48 HR, NEONATE	21 D	GRO *		150	213950	91
	Daphnia magna; Water flea;	24-48 HR, NEONATE	21 D	MOR	50 to 150		213950	91
	Daphnia magna; Water flea;	24-48 HR, NEONATE	21 D	REP *		150	213950	91
	Daphnia magna; Water flea;	< 24 H	48 H	LC_{50}	68		311181	84
	Daphnia pulex; Water flea;	< 24 H	48 H	LC_{50}	107		311181	84
	Dugesia dorotocephala; Turbellarian, flatworm;	18-20 MM	1 H	BEH *		1,000 to 10,000	310581	91
	Dugesia tigrina; Turbellarian, flatworm;	NR	96 H	LC_{50}	7,400		218709	74
	Gambusia affinis; Mosquitofish;	MIXED SIZES	to 30 D	RSD		50	312897	88
	Gambusia affinis; Mosquitofish;	NR	48 H	LC_{50} ?	116		315578	78
	Gammarus lacustris; Scud;	NR	96 H	LC_{50}	2,240		313058	88
	Gomphonema parvulum; Diatom;	MIXED SPECIES	to 28 D	ABD *		1,000	212397	84
	Hyphessobrycon serpae; Serpa tetra;	JUVENILE & OLDER FISH	14 D	RSD		66,000	212709	78
	Invertebrates; Invertebrates;	CLADOCERA, COPEPODA, ROTIFERA	2 WK	POP *		17.1 to 89.6	311256	83
	Invertebrates; Invertebrates;	CLADOCERA, COPEPODA, ROTIFERA	2 WK	POP *		30 to 90	311256	83
	Lemna minor; Duckweed;	20 COLONIES OR 40 FRONDS	4 D	EC_{50}GR		10,000	311789	86
	Lepomis gibbosus; Pumpkinseed;	15-25 G	to 15 D	BIO *		500	219207	72
	Lepomis macrochirus; Bluegill;	NR	6 MO	MOR *	5,000		212143	73
	Limnodrilus sp; Sludge worm;	NR	14 D	RSD		1,000	311865	83
	Lophopodella carteri; Bryozoa;	ANCENSTRULAE, 2-3 D	96 H	LC_{50}	5,630		216703	80
	Macrobrachium hendersodayanus; Prawn;	NR	96 H	OC *		7,870	311545	84
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}BM *		21,600	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		20,900	212262	74
	Myriophyllum spicatum; Water-milfoil;	4 CM APEX	32 D	EC_{50}GR *		21,600	212262	74

Table S–2.7
AQUIRE Freshwater Toxicity Information
Units = μg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication
					Lethal	Sublethal		
Zinc (cont.)	Mystus vittatus; Catfish;	80–100 MM, 6–10 G	96 H	LC_{50} ?	209,000		315793	82
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	20--50 G	6 H	PHY *		2,000	311200	82
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	FINGERLING	12 D	RSD *		910 to 2,320	311689	86
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	JUVENILE	to 4 WK	BIO		44 to 140	310107	84
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	NR	48 H	LC_{50}	2,600		310185	68
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	NR	48 H	LC_{50}	2,800		218317	68
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	NR	48 H	LC_{50}	3,500		218317	68
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	SAC–FRY	42 D	GRO *		430	310527	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	SAC–FRY	42 D	MOR *	120		310527	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	SAC–FRY	42 D	MOR *	430		310527	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	SAC–FRY	42 D	MOR * (Calc)	220		310527	83
	Oncorhynchus mykiss; Rainbow trout, donaldson trout;	SAC–FRY	42 D	MOR * (Calc)	80		310527	83
	Osteichthyes; Bony fish class;	ADULT GUPPY, 20–30 MM	48 H	LC_{50}	2,630		212882	88
	Osteichthyes; Bony fish class;	ADULT GUPPY, 20–30 MM	96 H	LC_{50}	1,860		212882	88
	Osteichthyes; Bony fish class;	JUVENILE GUPPY, 8–15 MM	48 H	LC_{50}	1,970		212882	88
	Osteichthyes; Bony fish class;	JUVENILE GUPPY, 8–15 MM	96 H	LC_{50}	1,360		212882	88
	Pectinatella magnifica; Bryozoa;	ANCENSTRULAE, 2–3 D	96 H	LC_{50}	4,310		216703	80
	Phaenopsectra sp; Chironomid;	MIXED SPECIES	to 28 D	ABD *		10,000	212397	84
	Pimephales promelas; Fathead minnow;	NEWLY HAT, < 24 H	7 D	GRO *		184	311182	85
	Pimephales promelas; Fathead minnow;	NEWLY HAT, < 24 H	7 D	GRO *		85	311182	85
	Pimephales promelas; Fathead minnow;	NEWLY HAT, < 24 H	7 D	LC_{50}	238		311182	85
	Pimephales promelas; Fathead minnow;	NEWLY HAT, < 24 H	96 H	LC_{50}	238		311182	85
	Pimephales promelas; Fathead minnow;	SUBADULT, 8–12 WK, <=250 MG	2 to 35 D	GRO *		600	210678	89
	Pimephales promelas; Fathead minnow;	SUBADULT, 8–12 WK, <=250 MG	96 H	LC_{50}	2,540		210678	89
	Plumatella emarginata; Bryozoan;	ANCENSTRULAE, 2–3 D	96 H	LC_{50}	5,300		216703	80
	Salmo trutta; Brown trout;	NR	2 to 40 D	RSD		366 to 832	311216	85
	Tilapia sparrmanii; Banded bream;	12.13--81.77 G	2 to 72 H	OC *		98,000	213066	89
	Tilapia zillii; Tilapia;	IMMATURE, 7–9 G	2 to 96 H	BIO *		22,000	312716	87
	Tubifex sp; Tubificid worm;	NR	14 D	RSD		1,000	311865	83

NOTES:

ABD = Abundance
ABN = Abnormalities
BCF = Bioconcentration factor
BEH = Behavioral change
BIO = Biochemical effect
BM = Biomass
BMS = Biomass
C = Celcius
CLR = Chlorophyll content
CM = Centimeter
D = Days
EC_{50} = Effect of concentration to 50% of the population
EMS = Emergance?
ENZ = Enzyme effect
F = Farenheit
G = Grams
GR = Growth
GRO = Growth
H = Hours
HAT = Hatchability
HEM = Hematological effect
HIS = Histological effect
IM = Immobilization
LC_{50} = Lethal concentration to 50% of test organisms
LET = Lethality
LOC = Locomotor Behaviour
LT_{50} = Lethal threshold to 50% of test organisms
MM = Millimeter
MOR = Mortality
NR = Not reported
OC = Oxygen consumption
PGR = Population growth
PHY = Physiological effects
POP = Population, species diversity
PSE = Photosynthesis effect
RE = Reproduction
REP = Adverse effect to reproduction
RES = Respiratory effects
RN = Renewel
RSD = Residue
ST = Static
STR = Stress
THL = Thermal effect
VTE = Vertebral effect
μg/L = Microgram per liter

[ ] = Lowest effect concentration (if a range is provided, the low end of the range is the lowest effect concentration).

Table S-2.8
AQUIRE Salt Water Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure Duration	Effect	Effect Concentration Lethal	Effect Concentration Sublethal	AQUIRE Reference Number	Year of Publication	BCF
Aluminum sulfate	Artemia salina; Brine shrimp	LARVAE	3 D	LC_{50}	3,100		307334	73	
	Balanus eburneus; Barnade	LARVAE	3 D	LC_{50}	210		307332	73	
	Mytilus galloprovincialis; Mediteranean	LARVAE	3 D	LC_{50}	2,550		307333	73	
Barium chloride	Cancer anthonyi; Yellow rock crab	EMBRYO	7D	HAT		10,000	307783	88	
	Cancer anthonyi; Yellow rock crab	EMBRYO	7D	MOR	10,000		307781	88	
Cobalt	Argyrosomus regius; Line fish	NR	NR	BCF *		0.03	222764	73	100
	Argyrozona argyrozona; Silverfish	NR	NR	BCF *		0.03	222763	73	90
	Choromytilus meridionalis; Black mussel	NR	NR	BCF *		0.03	222753	73	1,150
	Donax serra; White sand mussel	NR	NR	BCF *		0.03	222754	73	1,250
	Ecklonia maxima; Kelp	NR	NR	BCF		0.03	222758	73	215
	Genypterus capensis; Kingklip	NR	NR	BCF *		0.03	222767	73	70
	Gigartina radula; Red algae	NR	NR	BCF		0.03	222761	73	600
	Haliotis midae; Abalone	NR	NR	BCF *		0.03	222755	73	800
	Jasus lalandei; Cape spiney lobster	NR	NR	BCF *		0.03	222756	73	140
	Lophius piscatorius; Angler fish	NR	NR	BCF *		0.03	222770	73	190
	Merluccius capensis; Stock fish	NR	NR	BCF *		0.03	222766	73	150
	Pachymetopon grande; Bronze bream, blue hottentot	NR	NR	BCF *		0.03	222765	73	60
	Parechinus sp; Sea urchin	NR	NR	BCF		0.03	222772	73	190
	Porphyra capensis; Red algae, purple laver	NR	NR	BCF		0.03	222759	73	1,600
	Pyura sp; Sea squirt	NR	NR	BCF		0.03	222773	73	2,350
	Seriola pappei; Line fish, yellowtail	NR	NR	BCF *		0.03	222762	73	400
	Suhria vittata; Red algae	NR	NR	BCF		0.03	222760	73	1,500
	Synaptura marginata; Tong, sole	NR	NR	BCF *		0.03	D-222768	73	100
	Trachurus trachurus; Horse mackerel, scad	NR	NR	BCF *		0.03	222769	73	250
	Trigla capensis; Sea robin, gurnard	NR	NR	BCF *		0.03	222771	73	350
	Ulva sp; Green algae	NR	NR	BCF		0.03	222757	73	600
Copper	Acartia tonsa; Calanoid copepod	ADULTS	96 H	LC_{50}	17		223785	78	
	Acartia tonsa; Calanoid copepod	F6 GENERATION	96 H	LC_{50}	55		223784	78	
	Acartia tonsa; Calanoid copepod	F2 GENERATION	96 H	LC_{50}	64		223786	78	
	Acartia tonsa; Calanoid copepod	F1 GENERATION	96 H	LC_{50}	31		223783	78	
	Atherinops affinis; Topsmelt	LARVAE, 8 D	96 H	LC_{50}	235		313542	91	
	Atherinops affinis; Topsmelt	LARVAE, 8 D	96 H	LC_{50}	212		313541	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO-LARVAE	12 D	EC_{50}AB		75	313537	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO-LARVAE	12 D	EC_{50}AB		190	313539	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO	12 D	EC_{50}HA		115	313536	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO	12 D	EC_{50}AB		149	313532	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO	12 D	EC_{50}HA		182	313534	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO	12 D	EC_{50}HA		165	313535	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO-LARVAE	12 D	EC_{50}AB		156	313538	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO	12 D	EC_{50}AB		180	313531	91	
	Atherinops affinis; Topsmelt	BASTULA EMBRYO	12 D	EC_{50}AB		115	313533	91	
	Atherinops affinis; Topsmelt	LARVAE, 8 D	96 H	LC_{50}	288		313540	91	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	MOR *	37.1		270467	81	

Table S-2.8
AQUIRE Salt Water Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure Duration	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication	BCF
					Lethal	Sublethal			
Copper (cont.)	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	BEH *		19.1	270477	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	MOR *	72.0		270464	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	DVP *		18.5	270460	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	MOR *	39.0		270472	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	MOR *	9.6		270470	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	BEH *		20.8	270475	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	BEH *		18.5	270474	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	MOR *	138.5		270465	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	BEH *		9.0	270478	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	MOR *	68.0		270469	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	BEH *		9.0	270476	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	MOR *	69.5		270473	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	48 H	MOR *	20.0		270471	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	DVP *		20.8	270461	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	MOR *	20.8		270466	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	MOR *	18.5		270462	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	MOR *	37.0		270463	81	
	Balanus improvisus; Barnacle	LARVAE, STAGE 2 NAUPLII	96 H	MOR *	74.2		270468	81	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	24 H	FCR *		10	212497	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	5 D	FCR *		10	212513	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	24 H	FCR *		12	210223	77	
	Calanoida; Copepod suborder	3.0 UG DRY WT, JUVENILE	96 H	LC_{50}	52		212515	77	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	7 D	FCR *		5	212503	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	24 H	FCR *		32	210224	77	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	24 H	FCR *		5	212496	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	5 D	FCR *		11	212493	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	24 H	FCR *		10	212506	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	24 H	FCR *		100	212509	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	48 H	LC_{50}	105		212518	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	72 H	FCR *		10	212510	77	
	Calanoida; Copepod suborder	JUVENILE, DRY WT 3.0 UG	72 H	FCR *		10	210226	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	5 D	FCR *		30	212494	77	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	24 H	FCR *		50	212499	77	
	Calanoida; Copepod suborder	6.0 UG DRY WT, MOSTLY ADULT	96 H	LC_{50}	60		212517	77	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	96 H	FCR *		10	212501	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	72 H	FCR *		20	212511	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	5 D	FCR *		48	212495	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	24 H	FCR *		50	212508	77	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	7 D	FCR *		20	212505	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	5 D	FCR *		20	212514	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	72 H	FCR *		50	212512	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	72 H	FCR *		50	212490	77	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	24 H	FCR *		20	212498	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	5 D	FCR *		6.0	212492	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	72 H	FCR *		20	212489	77	
	Calanoida; Copepod suborder	3.0 UG DRY WT, JUVENILE	24 H	FCR *		6.1	210222	77	

Table S-2.8
AQUIRE Salt Water Toxicity Information
Units = µg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure Duration	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication	BCF
					Lethal	Sublethal			
Copper (cont.)	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	96 H	FCR *		5	212500	77	
	Calanoida; Copepod suborder	MOSTLY ADULT, 6.0 UG DRY WT	96 H	FCR *		20	212502	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	48 H	FCR *		3.1	212519	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	24 H	FCR *		20	212507	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	24 H	FCR *		78	210225	77	
	Calanoida; Copepod suborder	JUVENILE, 3.0 UG DRY WT	72 H	FCR *		100	212491	77	
	Calanoida; Copepod suborder	4.7 UG DRY WT	96 H	LC_{50}	45		212516	77	
	Clupeidae; Herring family	ADULT	24 H	LC_{50}	440		310793	85	
	Copepoda; Copepod order	MOSTLY ADULT, 6.0 UG DRY WT	7 D	FCR *		10	212504	77	
	Cyprinodon variegatus; Sheepshead minnow	LARVAE, <=24 H	96 H	LC_{50}	368		307285	89	
	Engraulididae; Anchovy family	ADULT	48 H	LC_{50}	460		310794	85	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	32 H	LC_{50}	185		250909	79	
	Engraulis mordax; Northern anchovy	LARVA	26 H	LC_{50}	391		250916	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	12 H	LC_{50}	199		250906	79	
	Engraulis mordax; Northern anchovy	LARVA	32 H	LC_{50}	375		250917	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	25 H	LC_{50}	186		250908	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	24 H	LC_{50} *	186		250910	79	
	Engraulis mordax; Northern anchovy	LARVA	32 H	LC_{50} *	370		250920	79	
	Engraulis mordax; Northern anchovy	LARVA	24 H	LC_{50}	398		250915	79	
	Engraulis mordax; Northern anchovy	LARVA	8 H	LC_{50}	485		250912	79	
	Engraulis mordax; Northern anchovy	LARVA	4 H	LC_{50}	523		250911	79	
	Engraulis mordax; Northern anchovy	LARVA	12 H	LC_{50}	457		250913	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	6 H	LC_{50}	235		250904	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	2 H	LC_{50}	409		250902	79	
	Engraulis mordax; Northern anchovy	LARVA	46 H	LC_{50}	372		250919	79	
	Engraulis mordax; Northern anchovy	LARVA	40 H	LC_{50}	374		250918	79	
	Engraulis mordax; Northern anchovy	LARVA	20 H	LC_{50}	412		250914	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	4 H	LC_{50}	292		250903	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	18 H	LC_{50}	193		250907	79	
	Engraulis mordax; Northern anchovy	8-10 H, EMBRYO	8 H	LC_{50}	213		250905	79	
	Eurytemora affinis; Calanoid copepod	NEWLY HATCHED NAUPLII	96 H	LC_{50}	33.7		307411	83	
	Eurytemora affinis; Calanoid copepod	NEWLY HATCHED NAUPLII	96 H	LC_{50}	31.1		307408	83	
	Eurytemora affinis; Calanoid copepod	NEWLY HATCHED NAUPLII	96 H	LC_{50}	7.5		307410	83	
	Eurytemora affinis; Calanoid copepod	NAUPLII	2 to 72 H	BUH *		10 to 25	307412	83	
	Eurytemora affinis; Calanoid copepod	NEWLY HATCHED NAUPLII	96 H	LC_{50}	28.7		307409	83	
	Eurytemora affinis; Calanoid copepod	NEWLY HATCHED NAUPLII	96 H	LC_{50}	30.6		307407	83	
	Eurytemora affinis; Calanoid copepod	NAUPLII	96 H	ABN *		25	307415	83	
	Eurytemora affinis; Calanoid copepod	NAUPLII	48 H	DVP *		43	307414	83	
	Eurytemora affinis; Calanoid copepod	NAUPLII	24 H	PRV *		25 to 35	307413	83	
	Morone saxatilis; Striped bass	LARVAE, 16 D	96 H	LC_{50}	24		310422	88	
	Mytilus californianus; Mussel	NR	24 H	BIO *		0.1 to 10.0	287064	85	
	Mytilus californianus; Mussel	NR	24 H	FLT *		0.1 to 10.0	287063	85	
	Mytilus galloprovincialis; Mediterranean mussel	4-5 CM	3 D	CYT *		80	311526	90	
	Mytilus galloprovincialis; Mediterranean mussel	4-5 CM	72 H	PHY *		40	267965	81	
	Mytilus sp; Mussel	ADULT	96 H	LC_{50}	200		310792	85	
	Nereis arenaceodentata; Polychaete	ADULT	28 D	LC_{50}	44		312801	78	

Table S-2.8
AQUIRE Salt Water Toxicity Information
Units = μg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure Duration	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication	BCF
					Lethal	Sublethal			
Copper (cont.)	Nereis arenaceodentata; Polychaete	ADULT	7 D	LC_{50}	60		312799	78	
	Nereis arenaceodentata; Polychaete	ADULT	4 D	LC_{50}	77		312798	78	
	Nereis arenaceodentata; Polychaete	ADULT	14 D	LC_{50}	48		312800	78	
	Osteichthyes; Bony fish class	ADULT GUPPY, 20-30 MM	96 H	LC_{50}	410		306542	88	
	Osteichthyes; Bony fish class	ADULT GUPPY, 20-30 MM	96 H	LC_{50}	1130		306546	88	
	Osteichthyes; Bony fish class	JUVENILE GUPPY, 8-15 MM	96 H	LC_{50}	310		306548	88	
	Osteichthyes; Bony fish class	JUVENILE GUPPY, 8-15 MM	96 H	LC_{50}	240		306544	88	
	Osteichthyes; Bony fish class	ADULT GUPPY, 20-30 MM	48 H	LC_{50}	840		306541	88	
	Osteichthyes; Bony fish class	ADULT GUPPY, 20-30 MM	48 H	LC_{50}	3120		306545	88	
	Osteichthyes; Bony fish class	JUVENILE GUPPY, 8-15 MM	48 H	LC_{50}	570		306547	88	
	Osteichthyes; Bony fish class	JUVENILE GUPPY, 8-15 MM	48 H	LC_{50}	280		306543	88	
	Synechocystis aquatilis; Blue-green algae	EXPO GRO PHASE	6 H	EC_{50}CH *		700	307576	90	
	Synechocystis aquatilis; Blue-green algae	EXPO GRO PHASE	6 H	EC_{50}CH *		650	307575	90	
	Uca annulipes; Fiddler crab	24-29 MM	96 H	OC *	500		307644	89	
	Uca annulipes; Fiddler crab	24-29 MM	48 H	OC *	870		307645	89	
	Uca triangularis; Fiddler crab	24-29 MM	96 H	OC *	1500		307646	89	
	Uca triangularis; Fiddler crab	24-29 MM	96 H	OC *	4670		307647	89	
	Uca triangularis; Fiddler crab	24-29 MM	48 H	OC *	3410		307648	89	
Iron	Glenodinium halli; Dinoflagellate	ACTIVELY GROWING CULT	6D	PGR		100,000	281951	80	
	Glenodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	PGR		30,000	281949	80	
	Glenodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	PGR		35,000	261950	80	
	Isochrysis galbana; Haptophyte	ACTIVELY GROWING CULT	48H	PGR		35,000	281947	80	
	Thalassiosira guillardii; Diatom	ACTIVELY GROWING CULT	48H	PGR		20,000	281948	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	EC_{50} GR		17,500	281952	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	EC_{50} GR		26,000	281954	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	EC_{50} GR		1,000	291959	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	EC_{50} GR		1,100	281960	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	EC_{50} GR		900	281961	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	EC_{50} GR		3,700	281962	80	
	Isochrysis galbana; Haptophyte	ACTIVELY GROWING CULT	48H	EC_{50} GR		9,000	281956	80	
	Isochrysis galbana; Haptophyte	ACTIVELY GROWING CULT	48H	EC_{50} GR		8,500	281957	80	
	Isochrysis galbana; Haptophyte	ACTIVELY GROWING CULT	48H	EC_{50} GR		9,800	281958	80	
	Thalassiosira guillardii; diatom	ACTIVELY GROWING CULT	48H	EC_{50} GR		15,000	281964	80	
	Thalassiosira guillardii; diatom	ACTIVELY GROWING CULT	48H	EC_{50} GR		15,000	281965	80	
	Thalassiosira guillardii; diatom	ACTIVELY GROWING CULT	48H	EC_{50} GR		15,000	281966	80	
	Thalassiosira guillardii; diatom	ACTIVELY GROWING CULT	48H	EC_{50} GR		15,000	281967	80	
	Thalassiosira guillardii; diatom	ACTIVELY GROWING CULT	48H	EC_{50} GR		19,000	281968	80	
	Glenodinium halli; Dinoflagellate	ACTIVELY GROWING CULT	48H	PGR		200 to 2,000	281945	80	
	Glenodinium halli; Dinoflagellate	ACTIVELY GROWING CULT	48H	PGR		500 to 5,000	281946	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	PGR		200 to 5,000	281939	80	
	Gymnodinium splendens; Dinoflagellate	ACTIVELY GROWING CULT	48H	PGR		100 to 4,000	281940	80	
	Isochrysis galbana; Haptophyte	ACTIVELY GROWING CULT	48H	PGR		500 to 20,000	281941	80	
	Isochrysis galbana; Haptophyte	ACTIVELY GROWING CULT	48H	PGR		1,000 to 2,500	281942	80	
	Thalassiosira guillardi; Diatom	ACTIVELY GROWING CULT	48H	PGR		8,000 to > 200	281943	80	
	Thalassiosira guillardi; Diatom	ACTIVELY GROWING CULT	48H	PGR		7,000 to > 200	281944	80	

Table S-2.8
AQUIRE Salt Water Toxicity Information
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Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure Duration	Effect	Effect Concentration Lethal	Effect Concentration Sublethal	AQUIRE Reference Number	Year of Publication	BCF
Iron chloride	Cancer anthonyi; Yellow rock crab	EMBRYO	7D	HAT		1,000	307801	88	
	Siganus fuscescens; Rabbitfish	NR	24H	LC_{50}	68,800		209505	89	
	Tridentiger trigonocephalus; Striped goby	NR	24H	LC_{50}	99,400		209529	89	
	Cancer anthonyi; Yellow rock crab	EMBRYO	7D	MOR	100,000		307799	88	
Manganese	Argyrosomus regius; Line fish	NR	NR	BCF *		0.7 ; 1.0	283991	73	320
	Argyrozona argyrozona; Silverfish	NR	NR	BCF *		0.7 ; 1.0	283990	73	120
	Choromytilus meridionalis; Black mussel	NR	NR	BCF *		0.7 ; 1.0	283980	73	2,800
	Donax serra; White sand mussel	NR	NR	BCF *		0.7 ; 1.0	283981	73	1,400
	Ecklonia maxima; Kelp	NR	NR	BCF		0.7 ; 1.0	283985	73	450
	Genypterus capensis; Kingklip	NR	NR	BCF *		0.7 ; 1.0	283994	73	830
	Gigartina radula; Red algae	NR	NR	BCF		0.7 ; 1.0	283988	73	3,200
	Haliotis midae; Abalone	NR	NR	BCF *		0.7 ; 1.0	283982	73	450
	Jasus lalandei; Cape spiney lobster	NR	NR	BCF *		0.7 ; 1.0	283983	73	370
	Laminaria digitata; Brown algae	GROWING REGION	NR	BCF		1.4	240488	69	236
	Laminaria digitata; Brown algae	GROWING REGION	NR	BCF (Calc)		8.4	240489	69	65
	Merluccius capensis; Stock fish	NR	NR	BCF *		0.7 ; 1.0	283993	73	280
	Pachymetopon grande; Bronze bream, blue hottentot	NR	NR	BCF *		0.7 ; 1.0	283992	73	150
	Plankton; Plankton	NR	NR	BCF		0.098 ; 0.061	225220	71	1,130 to 11,000
	Porphyra capensis; Red algae, purple laver	NR	NR	BCF		0.7 ; 1.0	283986	73	11,000
	Sardinops ocellata; Sardine, pilchard	NR	NR	BCF *		0.7 ; 1.0	283997	73	1,800
	Scomber japonicus; Chub mackerel	NR	NR	BCF *		0.7 ; 1.0	283998	73	620
	Seriola pappei; Line fish, yellowtail	NR	NR	BCF *		0.7 ; 1.0	283989	73	320
	Suhria vittata; Red algae	NR	NR	BCF		0.7 ; 1.0	283987	73	6,000
	Synaptura marginata; Tong, sole	NR	NR	BCF *		0.7 ; 1.0	283995	73	970
	Trachurus trachurus; Horse mackerel, scad	NR	NR	BCF *		0.7 ; 1.0	283996	73	450
	Trigla capensis; Sea robin, gurnard	NR	NR	BCF *		0.7 ; 1.0	283999	73	280
	Ulva sp; Green algae	NR	NR	BCF		0.7 ; 1.0	283984	73	8,000
	Zostera marina; Eelgrass	NR	32 H	BCF *		0.0000043	226961	80	1,700,000
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226957	80	9
	Zostera marina; Eelgrass	NR	37 H	BCF *		2200	226940	80	370
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226945	80	6,600
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226956	80	160
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226937	80	6,100
	Zostera marina; Eelgrass	NR	32 H	BCF *		0.0000043	226947	80	700
	Zostera marina; Eelgrass	NR	32 H	BCF *		0.0000043	226960	80	2,300,000
	Zostera marina; Eelgrass	NR	37 H	BCF *		2200	226935	80	1,900,000
	Zostera marina; Eelgrass	NR	37 H	BCF *		2200	226963	80	2,400,000
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226954	80	150
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226943	80	3,700
	Zostera marina; Eelgrass	NR	32 H	BCF *		0.0000043	226939	80	950
	Zostera marina; Eelgrass	NR	37 H	BCF *		2200	226941	80	95
	Zostera marina; Eelgrass	NR	37 H	BCF *		2200	226942	80	21
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226936	80	4,000
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226958	80	49
	Zostera marina; Eelgrass	NR	32 H	BCF *		0.0000043	226962	80	1,500,000

Table S–2.8
AQUIRE Salt Water Toxicity Information
Units = μg/L

Baseline Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Chemical Name	Species	Age	Exposure Duration	Effect	Effect Concentration		AQUIRE Reference Number	Year of Publication	BCF
					Lethal	Sublethal			
Manganese (cont.)	Zostera marina; Eelgrass	NR	32 H	BCF *		0.0000043	226946	80	210
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226938	80	6,000
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226959	80	26
	Zostera marina; Eelgrass	NR	37 H	BCF *		2200	226934	80	1,700,000
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226955	80	61
	Zostera marina; Eelgrass	NR	21 H	BCF *		0.0000014	226944	80	6,600

NOTES:
ABD = Abundance
ABN = Abnormalities
BCF = Bioconcentration factor
BEH = Behavioral change
BIO = Biochemical effect
BM = Biomass
BMS = Biomass
C = Celcius
CH = Chlorophyll content
CLR = Chlorophyll content
CM = Centimeter
D = Days
EC_{50} = Effect of concentration to 50% of the population
EMS = Emergance?
ENZ = Enzyme effect
F = Farenheit
FCR = Food consumption rate
G = Grams
GR = Growth
GRO = Growth
H = Hours
HAT = Hatchability
HEM = Hematological effect
HIS = Histological effect
IM = Immobilization
LC_{50} = Lethal concentration to 50% of test organisms
LET = Lethality
LOC = Locomotor Behaviour
LT_{50} = Lethal threshold to 50% of test organisms
MM = Millimeter
MOR = Mortality
NR = Not reported
OC = Oxygen consumption
PGR = Population growth
PHY = Physiological effects
POP = Population, species diversity
PRV = Predation vulnerability
PSE = Photosynthesis effect
RE = Reproduction
REP = Adverse effect to reproduction
RES = Respiratory effects
RN = Renewel
RSD = Residue
ST = Static
STR = Stress
THL = Thermal effect
VTE = Vertebral effect
μg/L = Microgram per liter

[ ] = Lowest effect concentration (if a range is provided, the low end of the range is the lowest effect concentration).

Table S-2.9
Summary of Average Energy of Decay for Radiological Analytes

Baseline Ecological Risk Assessment
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

RADIONUCLIDE	Average Energy of Decay (MeV) [a]		
	alpha	beta	gamma
Actinium-228	NA	4.6E-01	9.3E-01
Bismuth-212	1.1E+01	4.7E-01	1.8E-01
Bismuth-212	7.8E+00	6.5E-01	1.5E+00
Cesium-137	NA	2.5E-01	6.0E-01
Lead-212	NA	1.7E-01	1.5E-01
Lead-214	1.5E+01	9.8E-01	1.7E+00
Potassium-40	NA	5.2E-01	1.6E-01
Radium-226	1.7E+01	3.6E-03	6.9E-03
Radium-228	NA	4.8E-01	9.3E-01
Thallium-208	NA	5.6E-01 [b]	3.4E+00 [b]
Uranium-235	4.5E+00	2.1E-01	1.8E-01

NOTES:

[a] All average energy values were obtained from Blaylock et al., 1993 unless otherwise noted. Radiations that contribute less than 0.1 % of the energy per transformation are omitted. Decay energies include those for short-lived daughter radionuclides. (In estimating ecological exposures, energies of daughter radionuclides that were also selected as CPCs were subtracted from the above values).

[b] Calculated from data presented in Kocher, 1981.

NA - not applicable.

Appendix S-2 Reference List
Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

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APPENDIX S-3

MODEL OF POTENTIAL EXPOSURES AND RISKS FOR REPRESENTATIVE WILDLIFE SPECIES TO NONRADIOLOGICAL CPCs

Table S-3.1
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	MAXIMUM EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
Methylene chloride	2.5E-03						
Toluene	5.3E-03						
Xylene (total)	3.5E-03						
Acenaphthene	2.6E-01	7.6E-03	2.0E-03	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Anthracene	3.6E-01	7.6E-03	2.7E-03	7.6E-03	2.7E-03	2.4E-01	2.4E-01
Benzo(a)anthracene	5.1E-01	7.6E-03	3.9E-03	7.6E-03	3.9E-03	2.4E-01	2.4E-01
Benzo(a)pyrene	4.9E-01	7.6E-03	3.7E-03	7.6E-03	3.7E-03	2.4E-01	2.4E-01
Benzo(b)fluoranthene	1.0E+00	7.6E-03	7.6E-03	7.6E-03	7.6E-03	2.4E-01	2.4E-01
Benzo(g,h,i)perylene	3.0E-01	7.6E-03	2.3E-03	7.6E-03	2.3E-03	2.4E-01	2.4E-01
Benzo(k)fluoranthene	7.4E-01	7.6E-03	5.6E-03	7.6E-03	5.6E-03	2.4E-01	2.4E-01
Butylbenzylphthalate	3.6E-02	2.3E-03	8.3E-05	2.3E-03	8.3E-05	1.9E+00	1.9E+00
Carbazole	1.6E-01	5.2E-02	8.3E-03	5.2E-02	8.3E-03	1.5E-01	1.5E-01
Chrysene	5.2E-01	7.6E-03	4.0E-03	7.6E-03	4.0E-03	2.4E-01	2.4E-01
Dibenz(a,h)anthracene	2.4E-01	7.6E-03	1.8E-03	7.6E-03	1.8E-03	2.4E-01	2.4E-01
Dibenzofuran	6.4E-02	3.3E-02	2.1E-03	3.3E-02	2.1E-03	1.5E-01	1.5E-01
Di-n-butylphthalate	2.5E-01	2.3E-03	5.7E-04	2.3E-03	5.7E-04	1.9E+00	1.9E+00
bis(2-Ethylhexyl)phthalate	8.2E-01	2.3E-03	1.9E-03	2.3E-03	1.9E-03	1.9E+00	1.9E+00
Fluoranthene	1.1E+00	7.6E-03	8.1E-03	7.6E-03	8.1E-03	2.4E-01	2.4E-01
Fluorene	2.6E-01	7.6E-03	2.0E-03	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Indeno(1,2,3-cd)pyrene	2.9E-01	7.6E-03	2.2E-03	7.6E-03	2.2E-03	2.4E-01	2.4E-01
Naphthalene	3.7E-02	7.6E-03	2.8E-04	7.6E-03	2.8E-04	2.4E-01	2.4E-01
Phenanthrene	8.0E-01	7.6E-03	6.1E-03	7.6E-03	6.1E-03	2.4E-01	2.4E-01
Pyrene	8.6E-01	7.6E-03	6.6E-03	7.6E-03	6.6E-03	2.4E-01	2.4E-01
Aroclor-1260	4.0E-01	1.2E-01	4.8E-02	1.2E-01	4.8E-02	3.8E+00	3.2E-01
alpha-Chlordane	4.7E-02	5.1E-03	2.4E-04	5.1E-03	2.4E-04	5.5E-01	1.8E+00
gamma-Chlordane	1.1E-01	5.1E-03	5.8E-04	5.1E-03	5.8E-04	5.5E-01	1.8E+00
4,4'-DDD	1.2E-01	1.0E-02	1.2E-03	1.0E-02	1.2E-03	1.2E+00	2.9E+00
4,4'-DDE	3.4E-02	1.0E-02	3.4E-04	1.0E-02	3.4E-04	1.2E+00	2.9E+00
4,4'-DDT	1.3E-01	1.0E-02	1.3E-03	1.0E-02	1.3E-03	1.2E+00	2.9E+00
Dieldrin	1.8E-03	1.7E-02	3.1E-05	1.7E-02	3.1E-05	1.5E+00	4.4E-01
Heptachlor	4.2E-02	2.5E-02	1.1E-03	2.5E-02	1.1E-03	4.7E-02	6.0E-01
Heptachlor epoxide	4.7E-02	5.9E-03	2.7E-04	5.9E-03	2.7E-04	3.5E-01	1.4E+00

Table S-3.1
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil
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EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	MAXIMUM EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
Aluminum	1.8E+03	8.0E-04	1.4E+00	8.0E-04	1.4E+00	7.5E-02	7.5E-02
Arsenic	1.4E+00	3.0E-01	4.2E-01	3.0E-01	4.2E-01	1.0E-01	1.0E-01
Barium	3.7E+01	3.0E-02	1.1E+00	3.0E-02	1.1E+00	7.5E-03	7.5E-03
Cadmium	2.4E+01	3.3E+01	7.9E+02	3.3E+01	7.9E+02	2.1E+00	3.8E-01
Chromium	1.2E+01	1.5E-03	1.8E-02	1.5E-03	1.8E-02	2.8E-01	2.8E-01
Cobalt	1.3E+01	4.0E-03	5.3E-02	4.0E-03	5.3E-02	1.0E+00	1.0E+00
Copper	7.2E+01	7.8E-01	5.6E+01	7.8E-01	5.6E+01	6.0E-01	6.0E-01
Lead	2.1E+02	NA	0.0E+00	NA	0.0E+00	1.5E-02	1.5E-02
Manganese	5.3E+01	5.0E-02	2.6E+00	5.0E-02	2.6E+00	2.0E-02	2.0E-02
Mercury	2.6E-01	1.8E-01	4.7E-02	1.8E-01	4.7E-02	1.0E-02	2.3E+00
Selenium	1.1E-01	9.0E-03	9.9E-04	9.0E-03	9.9E-04	7.5E-01	5.1E-01
Silver	4.8E-01	8.0E-02	3.8E-02	8.0E-02	3.8E-02	1.5E-01	1.5E-01
Vanadium	4.4E+00	1.1E-03	4.8E-03	1.1E-03	4.8E-03	1.3E-01	1.3E-01
Zinc	3.8E+02	6.1E-01	2.3E+02	6.1E-01	2.3E+02	2.1E+00	2.1E+00

CPC = Contaminant of Potential Concern

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2

[b] CPC concentrations in invertebrate tissue equals the invertebrate BAF multiplied by the maximum soil concentration of the contaminant.

[c] CPC concentrations in plant tissue equals the plant BAF multiplied by the maximum soil concentration of the contaminant.

Table S-3.1
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
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POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Red fox*	*Great-horned owl*
Methylene chloride	6.9E-06	3.5E-05	1.7E-05	1.8E-08	6.9E-07
Toluene	1.5E-05	7.5E-05	3.6E-05	3.9E-08	1.5E-06
Xylene (total)	9.7E-06	4.9E-05	2.4E-05	2.6E-08	9.6E-07
Acenaphthene	9.9E-04	3.9E-03	2.0E-03	2.6E-06	1.8E-04
Anthracene	1.3E-03	5.4E-03	2.8E-03	3.6E-06	2.5E-04
Benzo(a)anthracene	1.9E-03	7.7E-03	4.0E-03	5.2E-06	3.6E-04
Benzo(a)pyrene	1.8E-03	7.3E-03	3.8E-03	4.9E-06	3.4E-04
Benzo(b)fluoranthene	3.8E-03	1.5E-02	7.8E-03	1.0E-05	7.0E-04
Benzo(g,h,i)perylene	1.1E-03	4.5E-03	2.3E-03	3.0E-06	2.1E-04
Benzo(k)fluoranthene	2.8E-03	1.1E-02	5.8E-03	7.5E-06	5.1E-04
Butylbenzylphthalate	1.1E-04	5.2E-04	2.6E-04	8.7E-07	1.2E-04
Carbazole	1.6E-03	3.3E-03	2.2E-03	2.2E-06	1.1E-04
Chrysene	2.0E-03	7.8E-03	4.1E-03	5.3E-06	3.6E-04
Dibenz(a,h)anthracene	9.0E-04	3.6E-03	1.9E-03	2.4E-06	1.7E-04
Dibenzofuran	4.6E-04	1.2E-03	7.1E-04	7.5E-07	4.1E-05
Di-n-butylphthalate	7.6E-04	3.6E-03	1.8E-03	6.0E-06	8.4E-04
bis(2-Ethylhexyl)phthalate	2.5E-03	1.2E-02	5.9E-03	2.0E-05	2.8E-03
Fluoranthene	4.0E-03	1.6E-02	8.3E-03	1.1E-05	7.4E-04
Fluorene	9.9E-04	3.9E-03	2.0E-03	2.6E-06	1.8E-04
Indeno(1,2,3-cd)pyrene	1.1E-03	4.4E-03	2.3E-03	3.0E-06	2.0E-04
Naphthalene	1.4E-04	5.6E-04	2.9E-04	3.8E-07	2.6E-05
Phenanthrene	3.1E-03	1.2E-02	6.3E-03	8.2E-06	5.6E-04
Pyrene	3.3E-03	1.3E-02	6.8E-03	8.8E-06	6.0E-04
Aroclor-1260	7.6E-03	1.2E-02	9.0E-03	4.3E-05	6.0E-03
alpha-Chlordane	1.6E-04	6.9E-04	3.5E-04	6.0E-07	7.4E-05
gamma-Chlordane	3.9E-04	1.7E-03	8.5E-04	1.4E-06	1.8E-04
4,4'-DDD	4.9E-04	1.8E-03	9.7E-04	2.4E-06	3.6E-04
4,4'-DDE	1.4E-04	5.2E-04	2.8E-04	6.7E-07	1.0E-04
4,4'-DDT	5.3E-04	2.0E-03	1.1E-03	2.6E-06	3.9E-04
Dieldrin	9.1E-06	2.9E-05	1.6E-05	4.4E-08	5.3E-06
Heptachlor	2.6E-04	7.3E-04	4.3E-04	4.1E-07	2.5E-05
Heptachlor epoxide	1.7E-04	6.9E-04	3.5E-04	5.1E-07	5.5E-05

Table S-3.1
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil North of Child's Street
Baseline Risk Assessment for Operable Unit 1
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POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Red fox*	*Great-horned owl*
Aluminum	5.2E+00	2.6E+01	1.3E+01	1.5E-02	7.1E-01
Arsenic	6.1E-02	7.3E-02	6.4E-02	4.8E-05	1.7E-03
Barium	2.5E-01	6.6E-01	3.9E-01	3.5E-04	1.1E-02
Cadmium	1.1E+02	1.0E+02	1.0E+02	2.8E-01	3.6E+01
Chromium	3.5E-02	1.7E-01	8.4E-02	1.2E-04	8.7E-03
Cobalt	4.4E-02	1.9E-01	9.7E-02	2.2E-04	2.6E-02
Copper	7.8E+00	8.1E+00	7.8E+00	9.5E-03	9.5E-01
Lead	5.7E-01	2.9E+00	1.4E+00	1.5E-03	6.1E-02
Manganese	5.0E-01	1.1E+00	7.0E-01	6.0E-04	1.8E-02
Mercury	7.1E-03	9.6E-03	7.9E-03	5.5E-06	7.7E-04
Selenium	4.4E-04	1.7E-03	8.8E-04	1.7E-06	1.7E-04
Silver	6.5E-03	1.2E-02	8.3E-03	7.7E-06	3.9E-04
Vanadium	1.3E-02	6.3E-02	3.1E-02	3.8E-05	2.1E-03
Zinc	3.2E+01	3.5E+01	3.2E+01	9.0E-02	1.4E+01

[d] Calculated by summing the products of individual prey type concentrations and percent in diet, multiplying by the ingestion rate, and dividing by body weight (Table 7-11).

Table S-3.2
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	AVERAGE EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
Methylene chloride	2.5E-03						
Toluene	3.7E-03						
Xylene (total)	3.2E-03						
Acenaphthene	2.6E-01	7.6E-03	2.0E-03	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Anthracene	3.4E-01	7.6E-03	2.6E-03	7.6E-03	2.6E-03	2.4E-01	2.4E-01
Benzo(a)anthracene	3.6E-01	7.6E-03	2.8E-03	7.6E-03	2.8E-03	2.4E-01	2.4E-01
Benzo(a)pyrene	3.6E-01	7.6E-03	2.8E-03	7.6E-03	2.8E-03	2.4E-01	2.4E-01
Benzo(b)fluoranthene	3.5E-01	7.6E-03	2.7E-03	7.6E-03	2.7E-03	2.4E-01	2.4E-01
Benzo(g,h,i)perylene	3.0E-01	7.6E-03	2.3E-03	7.6E-03	2.3E-03	2.4E-01	2.4E-01
Benzo(k)fluoranthene	4.7E-01	7.6E-03	3.6E-03	7.6E-03	3.6E-03	2.4E-01	2.4E-01
Butylbenzylphthalate	3.6E-02	2.3E-03	8.3E-05	2.3E-03	8.3E-05	1.9E+00	1.9E+00
Carbazole	1.6E-01	5.2E-02	8.3E-03	5.2E-02	8.3E-03	1.5E-01	1.5E-01
Chrysene	3.7E-01	7.6E-03	2.8E-03	7.6E-03	2.8E-03	2.4E-01	2.4E-01
Dibenz(a,h)anthracene	2.4E-01	7.6E-03	1.8E-03	7.6E-03	1.8E-03	2.4E-01	2.4E-01
Dibenzofuran	6.4E-02	3.3E-02	2.1E-03	3.3E-02	2.1E-03	1.5E-01	1.5E-01
Di-n-butylphthalate	2.5E-01	2.3E-03	5.7E-04	2.3E-03	5.7E-04	1.9E+00	1.9E+00
bis(2-Ethylhexyl)phthalate	4.4E-01	2.3E-03	1.0E-03	2.3E-03	1.0E-03	1.9E+00	1.9E+00
Fluoranthene	4.5E-01	7.6E-03	3.5E-03	7.6E-03	3.5E-03	2.4E-01	2.4E-01
Fluorene	2.6E-01	7.6E-03	2.0E-03	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Indeno(1,2,3-cd)pyrene	2.9E-01	7.6E-03	2.2E-03	7.6E-03	2.2E-03	2.4E-01	2.4E-01
Naphthalene	3.7E-02	7.6E-03	2.8E-04	7.6E-03	2.8E-04	2.4E-01	2.4E-01
Phenanthrene	4.7E-01	7.6E-03	3.6E-03	7.6E-03	3.6E-03	2.4E-01	2.4E-01
Pyrene	4.2E-01	7.6E-03	3.2E-03	7.6E-03	3.2E-03	2.4E-01	2.4E-01
Aroclor-1260	1.8E-01	1.2E-01	2.1E-02	1.2E-01	2.1E-02	3.8E+00	3.2E-01
alpha-Chlordane	3.9E-02	5.1E-03	2.0E-04	5.1E-03	2.0E-04	5.5E-01	1.8E+00
gamma-Chlordane	7.9E-02	5.1E-03	4.1E-04	5.1E-03	4.1E-04	5.5E-01	1.8E+00
4,4'-DDD	5.5E-02	1.0E-02	5.5E-04	1.0E-02	5.5E-04	1.2E+00	2.9E+00
4,4'-DDE	2.0E-02	1.0E-02	2.0E-04	1.0E-02	2.0E-04	1.2E+00	2.9E+00
4,4'-DDT	6.4E-02	1.0E-02	6.4E-04	1.0E-02	6.4E-04	1.2E+00	2.9E+00
Dieldrin	1.8E-03	1.7E-02	3.1E-05	1.7E-02	3.1E-05	1.5E+00	4.4E-01
Heptachlor	3.0E-02	2.5E-02	7.5E-04	2.5E-02	7.5E-04	4.7E-02	6.0E-01
Heptachlor epoxide	3.2E-02	5.9E-03	1.9E-04	5.9E-03	1.9E-04	3.5E-01	1.4E+00

Table S-3.2
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	AVERAGE EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
Aluminum	1.2E+03	8.0E-04	9.8E-01	8.0E-04	9.8E-01	7.5E-02	7.5E-02
Arsenic	4.3E-01	3.0E-01	1.3E-01	3.0E-01	1.3E-01	1.0E-01	1.0E-01
Barium	1.3E+01	3.0E-02	4.0E-01	3.0E-02	4.0E-01	7.5E-03	7.5E-03
Cadmium	4.5E+00	3.3E+01	1.5E+02	3.3E+01	1.5E+02	2.1E+00	3.8E-01
Chromium	8.1E+00	1.5E-03	1.2E-02	1.5E-03	1.2E-02	2.8E-01	2.8E-01
Cobalt	1.3E+01	4.0E-03	5.3E-02	4.0E-03	5.3E-02	1.0E+00	1.0E+00
Copper	1.5E+01	7.8E-01	1.2E+01	7.8E-01	1.2E+01	6.0E-01	6.0E-01
Lead	5.8E+01	N/	0.0E+00	NA	0.0E+00	1.5E-02	1.5E-02
Manganese	1.8E+01	5.0E-02	9.1E-01	5.0E-02	9.1E-01	2.0E-02	2.0E-02
Mercury	1.2E-01	1.8E-01	2.2E-02	1.8E-01	2.2E-02	1.0E-02	2.3E+00
Selenium	1.1E-01	9.0E-03	9.9E-04	9.0E-03	9.9E-04	7.5E-01	5.1E-01
Silver	4.8E-01	8.0E-02	3.8E-02	8.0E-02	3.8E-02	1.5E-01	1.5E-01
Vanadium	3.6E+00	1.1E-03	4.0E-03	1.1E-03	4.0E-03	1.3E-01	1.3E-01
Zinc	1.0E+02	6.1E-01	6.2E+01	6.1E-01	6.2E+01	2.1E+00	2.1E+00

CPC = Contaminant of Potential Concern

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2

[b] CPC concentrations in invertebrate tissue equals the invertebrate BAF multiplied by the maximum soil concentration of the contaminant.

[c] CPC concentrations in plant tissue equals the plant BAF multiplied by the maximum soil concentration of the contaminant.

Table S-3.2
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Great-horned owl*
Methylene chloride	6.9E-06	3.5E-05	1.7E-05	6.9E-07
Toluene	1.0E-05	5.2E-05	2.5E-05	1.0E-06
Xylene (total)	8.8E-06	4.5E-05	2.2E-05	8.8E-07
Acenaphthene	9.9E-04	3.9E-03	2.0E-03	1.6E-04
Anthracene	1.3E-03	5.2E-03	2.7E-03	2.1E-04
Benzo(a)anthracene	1.4E-03	5.5E-03	2.8E-03	2.3E-04
Benzo(a)pyrene	1.4E-03	5.4E-03	2.8E-03	2.3E-04
Benzo(b)fluoranthene	1.3E-03	5.3E-03	2.7E-03	2.2E-04
Benzo(g,h,i)perylene	1.1E-03	4.5E-03	2.3E-03	1.9E-04
Benzo(k)fluoranthene	1.8E-03	7.1E-03	3.7E-03	3.0E-04
Butylbenzylphthalate	1.1E-04	5.2E-04	2.6E-04	1.0E-04
Carbazole	1.6E-03	3.3E-03	2.2E-03	1.0E-04
Chrysene	1.4E-03	5.6E-03	2.9E-03	2.3E-04
Dibenz(a,h)anthracene	9.0E-04	3.6E-03	1.9E-03	1.5E-04
Dibenzofuran	4.6E-04	1.2E-03	7.1E-04	3.7E-05
Di-n-butylphthalate	7.6E-04	3.6E-03	1.8E-03	7.1E-04
bis(2-Ethylhexyl)phthalate	1.3E-03	6.3E-03	3.1E-03	1.3E-03
Fluoranthene	1.7E-03	6.8E-03	3.5E-03	2.8E-04
Fluorene	9.9E-04	3.9E-03	2.0E-03	1.6E-04
Indeno(1,2,3-cd)pyrene	1.1E-03	4.4E-03	2.3E-03	1.8E-04
Naphthalene	1.4E-04	5.6E-04	2.9E-04	2.3E-05
Phenanthrene	1.8E-03	7.1E-03	3.7E-03	2.9E-04
Pyrene	1.6E-03	6.3E-03	3.3E-03	2.6E-04
Aroclor-1260	3.4E-03	5.3E-03	4.0E-03	2.6E-03
alpha-Chlordane	1.4E-04	5.8E-04	2.9E-04	4.1E-05
gamma-Chlordane	2.7E-04	1.2E-03	5.9E-04	8.4E-05
4,4'-DDD	2.3E-04	8.5E-04	4.5E-04	1.2E-04
4,4'-DDE	8.2E-05	3.1E-04	1.6E-04	4.2E-05
4,4'-DDT	2.6E-04	9.9E-04	5.2E-04	1.4E-04
Dieldrin	9.1E-06	2.9E-05	1.6E-05	5.0E-06
Heptachlor	1.8E-04	5.1E-04	3.0E-04	1.1E-05
Heptachlor epoxide	1.2E-04	4.8E-04	2.5E-04	2.5E-05

Table S--3.2
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short--tailed shrew*	*Meadowlark*	*Great-horned owl*
Aluminum	3.5E+00	1.7E+01	8.5E+00	4.6E-01
Arsenic	1.9E-02	2.2E-02	2.0E-02	4.4E-04
Barium	9.1E-02	2.4E-01	1.4E-01	3.9E-03
Cadmium	2.0E+01	1.9E+01	1.9E+01	6.5E+00
Chromium	2.4E-02	1.2E-01	5.7E-02	5.3E-03
Cobalt	4.4E-02	1.9E-01	9.7E-02	2.2E-02
Copper	1.6E+00	1.7E+00	1.6E+00	1.6E-01
Lead	1.6E-01	8.2E-01	4.0E-01	1.7E-02
Manganese	1.7E-01	3.7E-01	2.4E-01	5.9E-03
Mercury	3.3E-03	4.4E-03	3.6E-03	3.9E-05
Selenium	4.4E-04	1.7E-03	8.8E-04	1.5E-04
Silver	6.5E-03	1.2E-02	8.3E-03	3.5E-04
Vanadium	1.0E-02	5.1E-02	2.5E-02	1.6E-03
Zinc	8.6E+00	9.3E+00	8.7E+00	3.0E+00

[d] Calculated by summing the products of individual prey type concentrations and percent in diet, multiplying by the ingestion rate, and dividing by body weight (Table 7-11).

Table S-3.3
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	MAXIMUM EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
Acetone	6.2E-03						
Benzene	3.7E-03						
Carbon disulfide	3.4E-03						
1,2-Dichloroethene (total)	2.0E-03						
Methylene chloride	4.7E-03						
Toluene	3.6E-03						
Xylene (total)	4.2E-03						
Acenaphthene	2.7E-01	5.0E-02	1.3E-02	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Acenaphthylene	1.6E-01	5.0E-02	8.0E-03	7.6E-03	1.2E-03	2.4E-01	2.4E-01
Anthracene	3.0E-01	5.0E-02	1.5E-02	7.6E-03	2.3E-03	2.4E-01	2.4E-01
Benzo(a)anthracene	4.2E-01	5.0E-02	2.1E-02	7.6E-03	3.2E-03	2.4E-01	2.4E-01
Benzo(a)pyrene	4.3E-01	5.0E-02	2.2E-02	7.6E-03	3.3E-03	2.4E-01	2.4E-01
Benzo(b)fluoranthene	4.1E-01	5.0E-02	2.0E-02	7.6E-03	3.1E-03	2.4E-01	2.4E-01
Benzo(g,h,i)perylene	4.0E-01	5.0E-02	2.0E-02	7.6E-03	3.0E-03	2.4E-01	2.4E-01
Benzo(k)fluoranthene	4.0E-01	5.0E-02	2.0E-02	7.6E-03	3.1E-03	2.4E-01	2.4E-01
Benzoic acid	1.8E+00	5.0E-02	9.0E-02	6.2E-01	1.1E+00	1.5E-01	1.5E-01
Butylbenzylphthalate	1.2E-01	5.0E-02	6.0E-03	2.3E-03	2.8E-04	1.9E+00	1.9E+00
Chrysene	4.2E-01	5.0E-02	2.1E-02	7.6E-03	3.2E-03	2.4E-01	2.4E-01
Dibenz(a,h)anthracene	1.6E-01	5.0E-02	8.0E-03	7.6E-03	1.2E-03	2.4E-01	2.4E-01
Dibenzofuran	2.4E-01	5.0E-02	1.2E-02	3.3E-02	7.8E-03	1.5E-01	1.5E-01
Di-n-butylphthalate	2.3E-01	5.0E-02	1.2E-02	2.3E-03	5.4E-04	1.9E+00	1.9E+00
bis(2-Ethylhexyl)phthalate	5.6E-01	5.0E-02	2.8E-02	2.3E-03	1.3E-03	1.9E+00	1.9E+00
Fluoranthene	4.2E-01	5.0E-02	2.1E-02	7.6E-03	3.2E-03	2.4E-01	2.4E-01
Fluorene	2.6E-01	5.0E-02	1.3E-02	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Indeno(1,2,3-cd)pyrene	3.6E-01	5.0E-02	1.8E-02	7.6E-03	2.8E-03	2.4E-01	2.4E-01
Phenanthrene	3.7E-01	5.0E-02	1.9E-02	7.6E-03	2.8E-03	2.4E-01	2.4E-01
Pyrene	3.9E-01	5.0E-02	1.9E-02	7.6E-03	3.0E-03	2.4E-01	2.4E-01
Aldrin	3.5E-03	5.6E-01	2.0E-03	1.4E-01	5.0E-04	2.3E-01	1.2E+00
Aroclor-1254	4.8E-01	5.8E+00	2.8E+00	1.2E-01	5.7E-02	3.8E+00	3.2E-01
Aroclor-1260	4.4E+00	5.8E+00	2.6E+01	1.2E-01	5.3E-01	3.8E+00	3.2E-01
alpha-BHC	2.9E-03	2.6E+00	7.5E-03	4.9E-02	1.4E-04	1.5E-06	2.1E-01
alpha-Chlordane	1.5E-02	1.6E+00	2.4E-02	5.1E-03	7.7E-05	5.5E-01	1.8E+00

Table S-3.3
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	MAXIMUM EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
gamma-Chlordane	1.2E-02	1.6E+00	1.9E-02	5.1E-03	6.2E-05	5.5E-01	1.8E+00
4,4'-DDD	2.0E-02	3.3E+00	6.7E-02	1.0E-02	2.0E-04	1.2E+00	2.9E+00
4,4'-DDE	4.5E-02	1.7E+00	7.5E-02	1.0E-02	4.5E-04	1.2E+00	2.9E+00
4,4'-DDT	3.6E-01	5.7E-01	2.0E-01	1.0E-02	3.6E-03	1.2E+00	2.9E+00
Dieldrin	8.2E-03	5.5E+00	4.5E-02	1.7E-02	1.4E-04	1.5E+00	4.4E-01
Aluminum	3.3E+03	7.5E-02	2.5E+02	8.0E-04	2.7E+00	7.5E-02	7.5E-02
Antimony	7.0E+00	5.0E-02	3.5E-01	4.0E-02	2.8E-01	5.0E-02	5.0E-02
Arsenic	4.1E+00	6.6E-03	2.7E-02	3.0E-01	1.2E+00	1.0E-01	1.0E-01
Barium	3.5E+01	7.5E-03	2.6E-01	3.0E-02	1.1E+00	7.5E-03	7.5E-03
Beryllium	1.3E+00	5.0E-02	6.5E-02	2.0E-03	2.6E-03	5.0E-02	5.0E-02
Cadmium	2.1E+01	1.4E+00	2.9E+01	3.3E+01	6.9E+02	2.1E+00	3.8E-01
Chromium	7.1E+01	1.6E-01	1.1E+01	1.5E-03	1.1E-01	2.8E-01	2.8E-01
Cobalt	2.6E+00	1.0E+00	2.6E+00	4.0E-03	1.0E-02	1.0E+00	1.0E+00
Copper	7.7E+01	1.6E-01	1.2E+01	7.8E-01	6.0E+01	6.0E-01	6.0E-01
Cyanide	7.5E+00	0.0E+00	0.0E+00	1.0E+00	7.5E+00	0.0E+00	0.0E+00
Lead	2.5E+02	7.8E-02	2.0E+01	NA	0.0E+00	1.5E-02	1.5E-02
Manganese	7.8E+01	2.0E-02	1.6E+00	5.0E-02	3.9E+00	2.0E-02	2.0E-02
Mercury	1.5E-01	6.8E-02	1.0E-02	1.8E-01	2.7E-02	1.0E-02	2.3E+00
Nickel	3.7E+01	2.3E-01	8.4E+00	1.2E-02	4.4E-01	3.0E-01	3.0E-01
Selenium	1.3E+00	7.6E-01	9.9E-01	9.0E-03	1.2E-02	7.5E-01	5.1E-01
Silver	5.9E+00	1.5E-01	8.9E-01	8.0E-02	4.7E-01	1.5E-01	1.5E-01
Vanadium	7.5E+00	1.3E-01	9.4E-01	1.1E-03	8.3E-03	1.3E-01	1.3E-01
Zinc	2.7E+02	1.8E+00	4.7E+02	6.1E-01	1.6E+02	2.1E+00	2.1E+00
1,2,3,4,6,7,8-HpCDD	3.1E-04	1.4E-02	4.3E-06	0.0E+00	0.0E+00	1.3E-02	1.3E-02
1,2,3,4,6,7,8-HpCDF	3.3E-04	1.4E-03	4.7E-07	0.0E+00	0.0E+00	1.3E-03	1.3E-03
OCDF	2.0E-06	2.4E-03	4.8E-09	0.0E+00	0.0E+00	2.2E-03	2.2E-03

CPC = Contaminant of Potential Concern

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2

[b] CPC concentrations in invertebrate tissue equals the invertebrate BAF multiplied by the maximum soil concentration of the contaminant.

[c] CPC concentrations in plant tissue equals the plant BAF multiplied by the maximum soil concentration of the contaminant.

Table S-3.3
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Red fox*	*Great-horned owl*
Acetone	1.7E-05	8.8E-05	4.2E-05	8.0E-08	3.0E-06
Benzene	1.0E-05	5.2E-05	2.5E-05	4.8E-08	1.8E-06
Carbon disulfide	9.4E-06	4.8E-05	2.3E-05	4.4E-08	1.6E-06
1,2-Dichloroethene (total)	5.5E-06	2.8E-05	1.4E-05	2.6E-08	9.6E-07
Methylene chloride	1.3E-05	6.6E-05	3.2E-05	6.1E-08	2.3E-06
Toluene	9.9E-06	5.1E-05	2.5E-05	4.6E-08	1.7E-06
Xylene (total)	1.2E-05	5.9E-05	2.9E-05	5.4E-08	2.0E-06
Acenaphthene	1.2E-03	5.3E-03	3.3E-03	6.0E-06	3.9E-04
Acenaphthylene	7.0E-04	3.2E-03	1.9E-03	3.6E-06	2.3E-04
Anthracene	1.3E-03	6.0E-03	3.7E-03	6.8E-06	4.4E-04
Benzo(a)anthracene	1.8E-03	8.2E-03	5.1E-03	9.4E-06	6.1E-04
Benzo(a)pyrene	1.9E-03	8.6E-03	5.3E-03	9.8E-06	6.3E-04
Benzo(b)fluoranthene	1.8E-03	8.0E-03	5.0E-03	9.2E-06	6.0E-04
Benzo(g,h,i)perylene	1.7E-03	7.8E-03	4.8E-03	8.9E-06	5.8E-04
Benzo(k)fluoranthene	1.7E-03	7.9E-03	4.9E-03	9.0E-06	5.8E-04
Benzoic acid	1.4E-01	5.4E-02	5.2E-02	1.0E-04	5.4E-03
Butylbenzylphthalate	4.5E-04	2.4E-03	1.4E-03	6.7E-06	9.7E-04
Chrysene	1.9E-03	8.4E-03	5.2E-03	9.6E-06	6.2E-04
Dibenz(a,h)anthracene	7.0E-04	3.2E-03	1.9E-03	3.6E-06	2.3E-04
Dibenzofuran	1.8E-03	4.8E-03	3.1E-03	5.3E-06	2.8E-04
Di-n-butylphthalate	8.7E-04	4.6E-03	2.8E-03	1.3E-05	1.9E-03
bis(2-Ethylhexyl)phthalate	2.1E-03	1.1E-02	6.7E-03	3.1E-05	4.5E-03
Fluoranthene	1.8E-03	8.3E-03	5.1E-03	9.5E-06	6.1E-04
Fluorene	1.1E-03	5.1E-03	3.2E-03	5.9E-06	3.8E-04
Indeno(1,2,3-cd)pyrene	1.6E-03	7.1E-03	4.4E-03	8.1E-06	5.3E-04
Phenanthrene	1.6E-03	7.3E-03	4.5E-03	8.3E-06	5.4E-04
Pyrene	1.7E-03	7.7E-03	4.7E-03	8.7E-06	5.7E-04
Aldrin	9.8E-05	2.7E-04	2.4E-04	3.1E-07	3.3E-05
Aroclor-1254	4.7E-02	3.1E-01	2.9E-01	1.4E-03	1.9E-01
Aroclor-1260	4.3E-01	2.9E+00	2.7E+00	1.3E-02	1.8E+00
alpha-BHC	1.3E-04	8.7E-04	7.9E-04	6.9E-07	1.3E-05
alpha-Chlordane	3.8E-04	2.9E-03	2.6E-03	3.8E-06	5.6E-04

Table S-3.3
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Red fox*	*Great-horned owl*
gamma-Chlordane	3.1E-04	2.3E-03	2.1E-03	3.1E-06	4.5E-04
4,4'-DDD	1.0E-03	7.6E-03	7.0E-03	1.5E-05	2.8E-03
4,4'-DDE	1.2E-03	8.9E-03	8.0E-03	1.8E-05	3.2E-03
4,4'-DDT	4.2E-03	2.8E-02	2.3E-02	5.6E-05	9.9E-03
Dieldrin	6.7E-04	5.1E-03	4.7E-03	1.2E-05	1.3E-03
Aluminum	1.3E+01	7.5E+01	4.8E+01	7.0E-02	2.7E+00
Antimony	5.8E-02	1.4E-01	9.1E-02	1.4E-04	5.0E-03
Arsenic	1.6E-01	8.2E-02	6.4E-02	1.3E-04	5.8E-03
Barium	2.3E-01	5.4E-01	3.0E-01	5.3E-04	1.8E-02
Beryllium	4.8E-03	2.6E-02	1.6E-02	2.4E-05	8.8E-04
Cadmium	8.4E+01	1.5E+01	2.2E+01	2.2E-01	3.0E+01
Chromium	3.6E-01	2.2E+00	1.6E+00	2.5E-03	1.6E-01
Cobalt	4.4E-02	3.2E-01	2.8E-01	5.8E-04	7.0E-02
Copper	7.7E+00	3.4E+00	3.4E+00	1.0E-02	1.1E+00
Cyanide	9.3E-01	2.3E-01	2.6E-01	4.2E-04	3.6E-03
Lead	9.6E-01	5.7E+00	3.7E+00	5.0E-03	1.4E-01
Manganese	7.1E-01	1.3E+00	8.0E-01	1.3E-03	4.4E-02
Mercury	3.8E-03	3.7E-03	2.8E-03	4.0E-06	5.1E-04
Nickel	2.7E-01	1.5E+00	1.1E+00	1.7E-03	1.1E-01
Selenium	1.9E-02	1.3E-01	1.1E-01	2.0E-04	1.9E-02
Silver	8.6E-02	1.9E-01	1.4E-01	2.1E-04	9.9E-03
Vanadium	3.5E-02	2.1E-01	1.5E-01	2.0E-04	9.0E-03
Zinc	2.7E+01	5.8E+01	5.4E+01	2.1E-01	3.2E+01
1,2,3,4,6,7,8-HpCDD	9.0E-07	4.8E-06	2.5E-06	4.4E-09	1.6E-07
1,2,3,4,6,7,8-HpCDF	9.0E-07	4.6E-06	2.3E-06	4.2E-09	1.6E-07
OCDF	5.6E-09	2.9E-08	1.4E-08	2.6E-11	9.7E-10

[d] Calculated by summing the products of individual prey type concentrations and percent in diet, multiplying by the ingestion rate, and dividing by body weight (Table 7-11).

Table S-3.4
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	AVERAGE EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
Acetone	6.0E-03						
Benzene	3.4E-03						
Carbon disulfide	3.0E-03						
1,2-Dichloroethene (total)	2.0E-03						
Methylene chloride	4.1E-03						
Toluene	2.9E-03						
Xylene (total)	3.8E-03						
Acenaphthene	2.7E-01	5.0E-02	1.3E-02	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Acenaphthylene	1.6E-01	5.0E-02	8.0E-03	7.6E-03	1.2E-03	2.4E-01	2.4E-01
Anthracene	3.0E-01	5.0E-02	1.5E-02	7.6E-03	2.3E-03	2.4E-01	2.4E-01
Benzo(a)anthracene	2.7E-01	5.0E-02	1.3E-02	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Benzo(a)pyrene	2.9E-01	5.0E-02	1.4E-02	7.6E-03	2.2E-03	2.4E-01	2.4E-01
Benzo(b)fluoranthene	3.0E-01	5.0E-02	1.5E-02	7.6E-03	2.3E-03	2.4E-01	2.4E-01
Benzo(g,h,i)perylene	2.9E-01	5.0E-02	1.5E-02	7.6E-03	2.2E-03	2.4E-01	2.4E-01
Benzo(k)fluoranthene	3.3E-01	5.0E-02	1.7E-02	7.6E-03	2.5E-03	2.4E-01	2.4E-01
Benzoic acid	1.5E+00	5.0E-02	7.7E-02	6.2E-01	9.5E-01	1.5E-01	1.5E-01
Butylbenzylphthalate	1.2E-01	5.0E-02	6.0E-03	2.3E-03	2.8E-04	1.9E+00	1.9E+00
Chrysene	2.9E-01	5.0E-02	1.5E-02	7.6E-03	2.2E-03	2.4E-01	2.4E-01
Dibenz(a,h)anthracene	1.6E-01	5.0E-02	8.0E-03	7.6E-03	1.2E-03	2.4E-01	2.4E-01
Dibenzofuran	2.4E-01	5.0E-02	1.2E-02	3.3E-02	7.8E-03	1.5E-01	1.5E-01
Di-n-butylphthalate	2.3E-01	5.0E-02	1.2E-02	2.3E-03	5.4E-04	1.9E+00	1.9E+00
bis(2-Ethylhexyl)phthalate	3.3E-01	5.0E-02	1.7E-02	2.3E-03	7.7E-04	1.9E+00	1.9E+00
Fluoranthene	3.0E-01	5.0E-02	1.5E-02	7.6E-03	2.3E-03	2.4E-01	2.4E-01
Fluorene	2.6E-01	5.0E-02	1.3E-02	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Indeno(1,2,3-cd)pyrene	2.7E-01	5.0E-02	1.3E-02	7.6E-03	2.0E-03	2.4E-01	2.4E-01
Phenanthrene	2.8E-01	5.0E-02	1.4E-02	7.6E-03	2.1E-03	2.4E-01	2.4E-01
Pyrene	2.8E-01	5.0E-02	1.4E-02	7.6E-03	2.1E-03	2.4E-01	2.4E-01
Aldrin	3.5E-03	5.6E-01	2.0E-03	1.4E-01	5.0E-04	2.3E-01	1.2E+00
Aroclor-1254	4.3E-01	5.8E+00	2.5E+00	1.2E-01	5.2E-02	3.8E+00	3.2E-01
Aroclor-1260	1.3E+00	5.8E+00	7.8E+00	1.2E-01	1.6E-01	3.8E+00	3.2E-01
alpha-BHC	2.9E-03	2.6E+00	7.5E-03	4.9E-02	1.4E-04	1.5E-06	2.1E-01
alpha-Chlordane	1.5E-02	1.6E+00	2.4E-02	5.1E-03	7.7E-05	5.5E-01	1.8E+00

Table S-3.4
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA		ESTIMATED CONTAMINANT CONCENTRATIONS IN PRIMARY FOOD ITEMS				BAF VALUES FOR OTHER FOOD ITEMS	
ANALYTE	AVERAGE EXPOSURE POINT CONCENTRATION (mg/kg)	Invert BAF [a]	Concentration in Invertebrate Tissue [b] (mg/kg)	Plant BAF [a]	Concentration in Plant Tissue [c] (mg/kg)	Small Mammal BAF [a]	Small Bird BAF [a]
gamma-Chlordane	1.2E-02	1.6E+00	1.9E-02	5.1E-03	6.2E-05	5.5E-01	1.8E+00
4,4'-DDD	2.0E-02	3.3E+00	6.7E-02	1.0E-02	2.0E-04	1.2E+00	2.9E+00
4,4'-DDE	4.5E-02	1.7E+00	7.5E-02	1.0E-02	4.5E-04	1.2E+00	2.9E+00
4,4'-DDT	3.6E-01	5.7E-01	2.0E-01	1.0E-02	3.6E-03	1.2E+00	2.9E+00
Dieldrin	8.2E-03	5.5E+00	4.5E-02	1.7E-02	1.4E-04	1.5E+00	4.4E-01
Aluminum	1.9E+03	7.5E-02	1.4E+02	8.0E-04	1.5E+00	7.5E-02	7.5E-02
Antimony	7.0E+00	5.0E-02	3.5E-01	4.0E-02	2.8E-01	5.0E-02	5.0E-02
Arsenic	2.4E+00	6.6E-03	1.6E-02	3.0E-01	7.2E-01	1.0E-01	1.0E-01
Barium	2.4E+01	7.5E-03	1.8E-01	3.0E-02	7.1E-01	7.5E-03	7.5E-03
Beryllium	1.3E+00	5.0E-02	6.5E-02	2.0E-03	2.6E-03	5.0E-02	5.0E-02
Cadmium	1.3E+01	1.4E+00	1.9E+01	3.3E+01	4.4E+02	2.1E+00	3.8E-01
Chromium	4.7E+01	1.6E-01	7.5E+00	1.5E-03	7.0E-02	2.8E-01	2.8E-01
Cobalt	2.6E+00	1.0E+00	2.6E+00	4.0E-03	1.0E-02	1.0E+00	1.0E+00
Copper	3.3E+01	1.6E-01	5.3E+00	7.8E-01	2.6E+01	6.0E-01	6.0E-01
Cyanide	4.9E+00	0.0E+00	0.0E+00	1.0E+00	4.9E+00	0.0E+00	0.0E+00
Lead	1.3E+02	7.8E-02	1.0E+01	NA	0.0E+00	1.5E-02	1.5E-02
Manganese	4.5E+01	2.0E-02	9.0E-01	5.0E-02	2.3E+00	2.0E-02	2.0E-02
Mercury	1.3E-01	6.8E-02	8.8E-03	1.8E-01	2.3E-02	1.0E-02	2.3E+00
Nickel	2.9E+01	2.3E-01	6.7E+00	1.2E-02	3.5E-01	3.0E-01	3.0E-01
Selenium	1.3E+00	7.6E-01	9.9E-01	9.0E-03	1.2E-02	7.5E-01	5.1E-01
Silver	3.7E+00	1.5E-01	5.6E-01	8.0E-02	3.0E-01	1.5E-01	1.5E-01
Vanadium	5.4E+00	1.3E-01	6.8E-01	1.1E-03	5.9E-03	1.3E-01	1.3E-01
Zinc	1.1E+02	1.8E+00	1.9E+02	6.1E-01	6.6E+01	2.1E+00	2.1E+00
1,2,3,4,6,7,8-HpCDD	9.8E-05	1.4E-02	1.4E-06	0.0E+00	0.0E+00	1.3E-02	1.3E-02
1,2,3,4,6,7,8-HpCDF	7.2E-05	1.4E-03	1.0E-07	0.0E+00	0.0E+00	1.3E-03	1.3E-03
OCDF	2.0E-06	2.4E-03	4.8E-09	0.0E+00	0.0E+00	2.2E-03	2.2E-03

CPC = Contaminant of Potential Concern

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2

[b] CPC concentrations in invertebrate tissue equals the invertebrate BAF multiplied by the maximum soil concentration of the contaminant.

[c] CPC concentrations in plant tissue equals the plant BAF multiplied by the maximum soil concentration of the contaminant.

Table S-3.4
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Red fox*	*Great-horned owl*
Acetone	1.7E-05	8.5E-05	4.1E-05	7.7E-08	2.9E-06
Benzene	9.4E-06	4.8E-05	2.3E-05	4.4E-08	1.6E-06
Carbon disulfide	8.3E-06	4.2E-05	2.1E-05	3.9E-08	1.4E-06
1,2-Dichloroethene (total)	5.5E-06	2.8E-05	1.4E-05	2.6E-08	9.6E-07
Methylene chloride	1.1E-05	5.8E-05	2.8E-05	5.3E-08	2.0E-06
Toluene	8.0E-06	4.1E-05	2.0E-05	3.7E-08	1.4E-06
Xylene (total)	1.0E-05	5.4E-05	2.6E-05	4.9E-08	1.8E-06
Acenaphthene	1.2E-03	5.3E-03	3.3E-03	6.0E-06	3.9E-04
Acenaphthylene	7.0E-04	3.2E-03	1.9E-03	3.6E-06	2.3E-04
Anthracene	1.3E-03	6.0E-03	3.7E-03	6.8E-06	4.4E-04
Benzo(a)anthracene	1.2E-03	5.3E-03	3.3E-03	6.0E-06	3.9E-04
Benzo(a)pyrene	1.3E-03	5.6E-03	3.5E-03	6.4E-06	4.2E-04
Benzo(b)fluoranthene	1.3E-03	6.0E-03	3.7E-03	6.9E-06	4.4E-04
Benzo(g,h,i)perylene	1.3E-03	5.8E-03	3.6E-03	6.6E-06	4.3E-04
Benzo(k)fluoranthene	1.4E-03	6.5E-03	4.0E-03	7.4E-06	4.8E-04
Benzoic acid	1.2E-01	4.6E-02	4.4E-02	8.9E-05	4.6E-03
Butylbenzylphthalate	4.5E-04	2.4E-03	1.4E-03	6.7E-06	9.7E-04
Chrysene	1.3E-03	5.7E-03	3.5E-03	6.5E-06	4.2E-04
Dibenz(a,h)anthracene	7.0E-04	3.2E-03	1.9E-03	3.6E-06	2.3E-04
Dibenzofuran	1.8E-03	4.8E-03	3.1E-03	5.3E-06	2.8E-04
Di-n-butylphthalate	8.7E-04	4.6E-03	2.8E-03	1.3E-05	1.9E-03
bis(2-Ethylhexyl)phthalate	1.2E-03	6.5E-03	4.0E-03	1.9E-05	2.7E-03
Fluoranthene	1.3E-03	5.9E-03	3.7E-03	6.8E-06	4.4E-04
Fluorene	1.1E-03	5.1E-03	3.2E-03	5.9E-06	3.8E-04
Indeno(1,2,3-cd)pyrene	1.2E-03	5.3E-03	3.3E-03	6.0E-06	3.9E-04
Phenanthrene	1.2E-03	5.5E-03	3.4E-03	6.3E-06	4.1E-04
Pyrene	1.2E-03	5.5E-03	3.4E-03	6.3E-06	4.1E-04
Aldrin	9.8E-05	2.7E-04	2.4E-04	3.1E-07	3.3E-05
Aroclor-1254	4.2E-02	2.8E-01	2.6E-01	1.3E-03	1.7E-01
Aroclor-1260	1.3E-01	8.8E-01	8.1E-01	4.0E-03	5.4E-01
alpha-BHC	1.3E-04	8.7E-04	7.9E-04	6.9E-07	1.3E-05
alpha-Chlordane	3.8E-04	2.9E-03	2.6E-03	3.8E-06	5.6E-04

Table S-3.4
Estimated Chronic Exposure to Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food and Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW/day) [d]

ANALYTE	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Red fox*	*Great-horned owl*
gamma-Chlordane	3.1E-04	2.3E-03	2.1E-03	3.1E-06	4.5E-04
4,4'-DDD	1.0E-03	7.6E-03	7.0E-03	1.5E-05	2.8E-03
4,4'-DDE	1.2E-03	8.9E-03	8.0E-03	1.8E-05	3.2E-03
4,4'-DDT	4.2E-03	2.8E-02	2.3E-02	5.6E-05	9.9E-03
Dieldrin	6.7E-04	5.1E-03	4.7E-03	1.2E-05	1.3E-03
Aluminum	7.4E+00	4.3E+01	2.8E+01	4.0E-02	1.6E+00
Antimony	5.8E-02	1.4E-01	9.1E-02	1.4E-04	5.0E-03
Arsenic	9.4E-02	4.8E-02	3.8E-02	7.6E-05	3.4E-03
Barium	1.5E-01	3.6E-01	2.0E-01	3.5E-04	1.2E-02
Beryllium	4.8E-03	2.6E-02	1.6E-02	2.4E-05	8.8E-04
Cadmium	5.4E+01	9.7E+00	1.4E+01	1.4E-01	1.9E+01
Chromium	2.4E-01	1.5E+00	1.1E+00	1.7E-03	1.1E-01
Cobalt	4.4E-02	3.2E-01	2.8E-01	5.8E-04	7.0E-02
Copper	3.3E+00	1.5E+00	1.5E+00	4.5E-03	4.7E-01
Cyanide	6.1E-01	1.5E-01	1.7E-01	2.7E-04	2.4E-03
Lead	5.0E-01	3.0E+00	1.9E+00	2.6E-03	7.1E-02
Manganese	4.1E-01	7.7E-01	4.6E-01	7.7E-04	2.5E-02
Mercury	3.3E-03	3.2E-03	2.4E-03	3.5E-06	4.5E-04
Nickel	2.2E-01	1.2E+00	9.0E-01	1.3E-03	8.8E-02
Selenium	1.9E-02	1.3E-01	1.1E-01	2.0E-04	1.9E-02
Silver	5.4E-02	1.2E-01	9.0E-02	1.3E-04	6.2E-03
Vanadium	2.5E-02	1.5E-01	1.1E-01	1.5E-04	6.5E-03
Zinc	1.1E+01	2.4E+01	2.2E+01	8.5E-02	1.3E+01
1,2,3,4,6,7,8-HpCDD	2.9E-07	1.5E-06	8.1E-07	1.4E-09	5.1E-08
1,2,3,4,6,7,8-HpCDF	2.0E-07	1.0E-06	5.1E-07	9.4E-10	3.5E-08
OCDF	5.6E-09	2.9E-08	1.4E-08	2.6E-11	9.7E-10

[d] Calculated by summing the products of individual prey type concentrations and percent in diet, multiplying by the ingestion rate, and dividing by body weight (Table 7-11).

Table S-3.5
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	MAXIMUM SEDIMENT CONCENTRATION (mg/kg)	MAXIMUM SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Acetone	8.7E-01	1.4E-02					
Benzene	2.0E-03	4.0E-03					
2-Butanone	3.3E-01						
Chlorobenzene		1.0E-03					
1,2-Dichloroethylene	7.0E-03	1.2E-02					
Ethylbenzene		2.0E-03					
Methylene chloride	4.3E-02						
Toluene	4.0E-03	2.0E-03					
Trichloroethylene	2.0E-03	3.0E-03					
Vinyl Chloride	3.0E-03	7.0E-03					
Benzo(a)anthracene	2.4E-01		1.3E+04	2.4E-01	5.7E-02	2.4E-01	2.4E-01
Benzo(a)pyrene	2.9E-01		3.0E+01	2.4E-01	6.9E-02	2.4E-01	2.4E-01
Benzo(b)fluoranthene	5.3E-01		2.6E+04	2.4E-01	1.3E-01	2.4E-01	2.4E-01
Benzo(g,h,i)perylene	1.7E-01		6.5E+04	2.4E-01	4.1E-02	2.4E-01	2.4E-01
Benzo(k)fluoranthene	3.7E-01		2.6E+04	2.4E-01	8.8E-02	2.4E-01	2.4E-01
Chrysene	6.5E-01		1.3E+04	2.4E-01	1.6E-01	2.4E-01	2.4E-01
Fluoranthene	1.7E+00		3.2E+03	2.4E-01	4.1E-01	2.4E-01	2.4E-01
Indeno(1,2,3-cd)Pyrene	2.2E-01		6.5E+04	2.4E-01	5.3E-02	2.4E-01	2.4E-01
Phenanthrene	1.2E+00		1.4E+03	2.4E-01	2.9E-01	2.4E-01	2.4E-01
Pyrene	1.2E+00		6.1E+03	2.4E-01	2.9E-01	2.4E-01	2.4E-01
Aroclor-1260	4.2E-01		1.0E+07	1.2E+01	5.1E+00	3.8E+00	3.2E-01
alpha-Chlordane	6.2E-03		3.8E+04	5.5E-01	3.4E-03	5.5E-01	1.8E+00
gamma-Chlordane	4.1E-03		3.8E+04	5.5E-01	2.3E-03	5.5E-01	1.8E+00
4,4'-DDE	1.0E-02		5.1E+04	2.1E+01	2.1E-01	1.2E+00	2.9E+00
Aluminum	8.4E+03	1.7E+00	9.5E+01	7.5E-02	6.3E+02	7.5E-02	7.5E-02
Arsenic	1.0E+01	9.8E-03	2.8E+02	1.0E-01	2.7E+00	1.0E-01	1.0E-01
Barium	7.8E+01	1.2E-01	4.0E+00	7.5E-03	5.9E-01	7.5E-03	7.5E-03
Beryllium		7.5E-04	2.0E+00	5.0E-02	1.5E-03	5.0E-02	5.0E-02
Cadmium	1.3E+00	4.0E-04	2.5E+01	2.1E+00	2.7E+00	2.1E+00	3.8E-01
Chromium	1.5E+01	3.3E-03	2.0E+02	2.8E-01	4.1E+00	2.8E-01	2.8E-01

Table S-3.5
Estimated Chronic Exposure to Semi--Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	MAXIMUM SEDIMENT CONCENTRATION (mg/kg)	MAXIMUM SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Lead	4.6E+01		4.0E+00	1.5E-02	7.0E-01	1.5E-02	1.5E-02
Manganese	9.9E+01	1.1E-01	1.5E+03	2.0E-02	1.7E+02	2.0E-02	2.0E-02
Silver	1.3E+00	3.3E-04	2.0E+00	1.5E-01	2.0E-01	1.5E-01	1.5E-01
Vanadium	1.4E+01		1.0E-02	1.3E-01	1.7E+00	1.3E-01	1.3E-01
Zinc	6.1E+01		1.6E+02	2.1E+00	1.3E+02	2.1E+00	2.1E+00

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2 BAFs are multiplied by sediment concentrations and BCFs are multiplied by surface water concentrations. The aquatic organism tissue level is equal to the greater of the two products.

Table S-3.5
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW-day) [b]

CHEMICAL	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Great Horned Owl*
Acetone	3.3E-03	1.9E-03	1.9E-04	1.2E-05
Benzene	5.9E-04	1.9E-04	2.1E-05	2.7E-06
2-Butanone	4.6E-04	4.9E-04	4.5E-05	1.1E-06
Chlorobenzene	1.5E-04	4.8E-05	5.1E-06	6.8E-07
1,2-Dichloroethylene	1.8E-03	5.8E-04	6.2E-05	8.2E-06
Ethylbenzene	3.0E-04	9.6E-05	1.0E-05	1.4E-06
Methylene chloride	5.9E-05	6.3E-05	5.9E-06	1.4E-07
Toluene	3.0E-04	1.0E-04	1.1E-05	1.4E-06
Trichloroethylene	4.5E-04	1.5E-04	1.5E-05	2.0E-06
Vinyl Chloride	1.0E-03	3.4E-04	3.6E-05	4.8E-06
Benzo(a)anthracene	3.3E-04	3.5E-04	3.3E-05	1.1E-06
Benzo(a)pyrene	4.0E-04	4.3E-04	4.0E-05	1.3E-06
Benzo(b)fluoranthene	7.3E-04	7.8E-04	7.2E-05	2.5E-06
Benzo(g,h,i)perylene	2.3E-04	2.5E-04	2.3E-05	7.9E-07
Benzo(k)fluoranthene	5.1E-04	5.4E-04	5.1E-05	1.7E-06
Chrysene	9.0E-04	9.6E-04	8.9E-05	3.0E-06
Fluoranthene	2.3E-03	2.5E-03	2.3E-04	7.9E-06
Indeno(1,2,3-cd)Pyrene	3.0E-04	3.2E-04	3.0E-05	1.0E-06
Phenanthrene	1.7E-03	1.8E-03	1.6E-04	5.6E-06
Pyrene	1.7E-03	1.8E-03	1.6E-04	5.6E-06
Aroclor-1260	5.8E-04	6.2E-04	5.7E-05	1.0E-05
alpha-Chlordane	8.6E-06	9.1E-06	8.5E-07	4.0E-08
gamma-Chlordane	5.7E-06	6.0E-06	5.6E-07	2.7E-08
4,4'-DDE	1.4E-05	1.5E-05	1.4E-06	1.0E-07
Aluminum	1.2E+01	1.2E+01	1.2E+00	3.2E-02
Arsenic	1.6E-02	1.6E-02	1.5E-03	4.7E-05
Barium	1.3E-01	1.2E-01	1.1E-02	3.4E-04
Beryllium	1.1E-04	3.6E-05	3.8E-06	5.2E-07
Cadmium	1.9E-03	1.9E-03	1.8E-04	2.0E-05
Chromium	2.1E-02	2.1E-02	2.0E-03	7.3E-05

Table S-3.5
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW-day) [b]

CHEMICAL	*Cotton mouse*	*Short-tailed shrew*	*Meadowlark*	*Great Horned Owl*
Lead	6.4E-02	6.8E-02	6.3E-03	1.6E-04
Manganese	1.5E-01	1.5E-01	1.4E-02	4.2E-04
Silver	1.8E-03	1.9E-03	1.8E-04	5.6E-06
Vanadium	1.9E-02	2.0E-02	1.9E-03	5.5E-05
Zinc	8.4E-02	9.0E-02	8.3E-03	9.1E-04

[b] Calculated by summing the products of individual prey type concentrations and percent in diet with surface water and sediment exposures, multiplying by the exposure duration, SFF and ingestion rate, and dividing by body weight.

Table S-3.6
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	MAXIMUM SEDIMENT CONCENTRATION (mg/kg)	MAXIMUM SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Acetone	6.0E-02	6.8E-03					
Benzene	6.0E-03	4.7E-03					
2-Butanone	1.6E-02						
Chlorobenzene	8.8E-03	3.0E-03					
1,1-Dichloroethane	4.0E-03	2.0E-03					
1,2-Dichloroethylene	8.8E-03	5.3E-03					
Methylene chloride	1.5E-02	4.7E-03					
1,1,2,2-Tetrachloroethane		2.0E-03					
Tetrachloroethylene	1.1E-02						
Toluene	9.2E-03						
Trichloroethylene	8.9E-03	7.2E-03					
Vinyl chloride		5.3E-03					
Xylenes (total)	7.0E-03						
Acenaphthene	2.5E-01	2.0E-03	3.9E+02	2.4E-01	7.8E-01	2.4E-01	2.4E-01
Benzo(a)anthracene	1.9E-01		1.3E+04	2.4E-01	4.5E-02	2.4E-01	2.4E-01
Benzo(a)pyrene	2.8E-01		3.0E+01	2.4E-01	6.7E-02	2.4E-01	2.4E-01
Benzo(b)fluoranthene	1.8E-01		2.6E+04	2.4E-01	4.3E-02	2.4E-01	2.4E-01
Benzo(g,h,i)perylene	1.3E-01		6.5E+04	2.4E-01	3.1E-02	2.4E-01	2.4E-01
Benzo(k)fluoranthene	1.6E-01		2.6E+04	2.4E-01	3.8E-02	2.4E-01	2.4E-01
Chrysene	3.0E-01		1.3E+04	2.4E-01	7.1E-02	2.4E-01	2.4E-01
Dibenzofuran		1.0E-03	6.9E+02	1.5E-01	6.9E-01	1.5E-01	1.5E-01
Di-n-butylphthalate		3.5E-03	5.1E+03	1.9E+00	1.8E+01	1.9E+00	1.9E+00
Di-n-octylphthalate	2.1E-01	3.0E-03	9.3E+03	1.9E+00	2.8E+01	1.9E+00	1.9E+00
bis(2-Ethylhexyl) phthalate	8.5E-01	3.0E-03	3.1E+02	1.9E+00	1.6E+00	1.9E+00	1.9E+00
Fluoranthene	4.1E-01		3.2E+03	2.4E-01	9.8E-02	2.4E-01	2.4E-01
Indeno(1,2,3-cd)pyrene	1.2E-01		6.5E+04	2.4E-01	2.9E-02	2.4E-01	2.4E-01
Phenanthrene	1.2E-01		1.4E+03	2.4E-01	2.9E-02	2.4E-01	2.4E-01
Phenol	1.2E-01	2.0E-03	7.8E+02	1.5E-01	1.6E+00	1.5E-01	1.5E-01
Pyrene	3.9E-01		6.1E+03	2.4E-01	9.3E-02	2.4E-01	2.4E-01
Aroclor-1248	3.2E-01		7.1E+03	1.2E+01	3.9E+00	3.8E+00	3.2E-01

Table S-3.6
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	MAXIMUM SEDIMENT CONCENTRATION (mg/kg)	MAXIMUM SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Aroclor-1260	6.6E+00		1.0E+07	1.2E+01	8.1E+01	3.8E+00	3.2E-01
alpha-Chlordane	2.1E-02		3.8E+04	5.5E-01	1.2E-02	5.5E-01	1.8E+00
gamma-Chlordane	1.4E-02		3.8E+04	5.5E-01	7.5E-03	5.5E-01	1.8E+00
4,4'-DDD	7.9E-02		1.7E+05	2.1E+01	1.7E+00	1.2E+00	2.9E+00
4,4'-DDE	5.3E-02		5.1E+04	2.1E+01	1.1E+00	1.2E+00	2.9E+00
4,4'-DDT	3.1E-02		3.4E+03	2.1E+01	6.5E-01	1.2E+00	2.9E+00
Aluminum	3.8E+03	4.9E-01	9.5E+01	7.5E-02	2.9E+02	7.5E-02	7.5E-02
Antimony		2.4E-02	1.0E+00	5.0E-02	2.4E-02	5.0E-02	5.0E-02
Arsenic	1.9E+00	8.4E-03	2.8E+02	1.0E-01	2.4E+00	1.0E-01	1.0E-01
Barium	2.4E+01	1.1E-01	4.0E+00	7.5E-03	4.2E-01	7.5E-03	7.5E-03
Beryllium	9.0E-01	5.5E-04	2.0E+00	5.0E-02	4.5E-02	5.0E-02	5.0E-02
Cadmium	1.6E+00	3.5E-03	2.5E+01	2.1E+00	3.4E+00	2.1E+00	3.8E-01
Chromium	1.8E+01	3.9E-03	2.0E+02	2.8E-01	5.2E+00	2.8E-01	2.8E-01
Cobalt		4.6E-03	3.0E+02	1.0E+00	1.4E+00	1.0E+00	1.0E+00
Copper	2.7E+01	2.0E-02	1.0E+01	6.0E-01	1.6E+01	6.0E-01	6.0E-01
Cyanide	2.6E-01	6.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Lead	5.4E+01	6.0E-03	4.0E+00	1.5E-02	8.1E-01	1.5E-02	1.5E-02
Manganese	3.3E+01	1.1E-01	1.5E+03	2.0E-02	1.6E+02	2.0E-02	2.0E-02
Mercury	4.0E-01		6.3E+04	1.7E+01	6.7E+00	1.0E-02	2.3E+00
Nickel		1.4E-02	1.0E+02	3.0E-01	1.4E+00	3.0E-01	3.0E-01
Selenium	1.8E+00	2.4E-03	8.0E+00	7.5E-01	1.4E+00	7.5E-01	5.1E-01
Silver	2.7E+00	2.7E-03	2.0E+00	1.5E-01	4.1E-01	1.5E-01	1.5E-01
Thallium	2.6E+00	1.5E-03	NA	2.0E+00	5.2E+00	2.0E+00	2.0E+00
Vanadium	8.5E+00		1.0E-02	1.3E-01	1.1E+00	1.3E-01	1.3E-01
Zinc	8.5E+01	2.9E-02	1.6E+02	2.1E+00	1.8E+02	2.1E+00	2.1E+00
OCDD	9.7E-04		NA	5.4E-03	5.2E-06	8.6E-03	8.6E-03
2,3,7,8-TCDF	5.4E-05		NA	3.2E-01	1.7E-05	5.2E-01	5.2E-01

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2 BAFs are multiplied by sediment concentrations and BCFs are multiplied by surface water concentrations. The aquatic organism tissue level is equal to the greater of the two products.

Table S-3.6
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW-day) [b]

CHEMICAL	*Short-tailed shrew*	*American woodcock*	*Raccoon*	*Great Horned Owl*	*Great Blue Heron*
Acetone	2.0E-03	4.1E-05	7.2E-06	8.2E-05	5.2E-04
Benzene	1.1E-03	2.1E-05	3.8E-06	5.5E-05	2.3E-04
2-Butanone	1.2E-04	3.5E-06	5.4E-07	9.2E-07	5.9E-05
Chlorobenzene	7.5E-04	1.4E-05	2.6E-06	3.5E-05	1.7E-04
1,1-Dichloroethane	4.9E-04	9.0E-06	1.7E-06	2.3E-05	1.0E-04
1,2-Dichloroethylene	1.3E-03	2.4E-05	4.3E-06	6.2E-05	2.7E-04
Methylene chloride	1.2E-03	2.2E-05	4.1E-06	5.5E-05	2.7E-04
1,1,2,2-Tetrachloroethane	4.6E-04	8.2E-06	1.5E-06	2.3E-05	9.1E-05
Tetrachloroethylene	7.8E-05	2.4E-06	3.7E-07	6.3E-07	4.0E-05
Toluene	6.5E-05	2.0E-06	3.1E-07	5.2E-07	3.3E-05
Trichloroethylene	1.7E-03	3.1E-05	5.8E-06	8.4E-05	3.6E-04
Vinyl chloride	1.2E-03	2.2E-05	4.0E-06	6.1E-05	2.4E-04
Xylenes (total)	4.9E-05	1.5E-06	2.3E-07	3.9E-07	2.5E-05
Acenaphthene	2.2E-03	6.2E-05	3.5E-04	7.1E-05	1.4E-01
Benzo(a)anthracene	1.3E-03	4.1E-05	2.6E-05	3.1E-05	8.7E-03
Benzo(a)pyrene	2.0E-03	6.0E-05	3.9E-05	4.6E-05	1.3E-02
Benzo(b)fluoranthene	1.3E-03	3.9E-05	2.5E-05	3.0E-05	8.2E-03
Benzo(g,h,i)perylene	9.2E-04	2.8E-05	1.8E-05	2.1E-05	5.9E-03
Benzo(k)fluoranthene	1.1E-03	3.4E-05	2.2E-05	2.6E-05	7.3E-03
Chrysene	2.1E-03	6.4E-05	4.1E-05	4.9E-05	1.4E-02
Dibenzofuran	2.3E-04	4.1E-06	3.0E-04	1.4E-05	1.2E-01
Di-n-butylphthalate	8.0E-04	1.4E-05	7.9E-03	1.4E-04	3.1E+00
Di-n-octylphthalate	2.2E-03	5.8E-05	1.2E-02	3.1E-04	4.9E+00
bis(2-Ethylhexyl) phthalate	6.7E-03	1.9E-04	7.4E-04	9.0E-04	2.9E-01
Fluoranthene	2.9E-03	8.9E-05	5.7E-05	6.8E-05	1.9E-02
Indeno(1,2,3-cd)pyrene	8.5E-04	2.6E-05	1.7E-05	2.0E-05	5.5E-03
Phenanthrene	8.6E-04	2.6E-05	1.7E-05	2.0E-05	5.6E-03
Phenol	1.3E-03	3.4E-05	6.9E-04	4.3E-05	2.8E-01
Pyrene	2.8E-03	8.4E-05	5.4E-05	6.4E-05	1.8E-02
Aroclor-1248	2.2E-03	6.8E-05	1.7E-03	5.6E-04	6.8E-01

Table S–3.6
Estimated Chronic Exposure to Semi–Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW–day) [b]

CHEMICAL	*Short–tailed shrew*	*American woodcock*	*Raccoon*	*Great Horned Owl*	*Great Blue Heron*
Aroclor–1260	4.7E–02	1.4E–03	3.6E–02	1.2E–02	1.4E+01
alpha–Chlordane	1.5E–04	4.6E–06	5.9E–06	6.7E–06	2.1E–03
gamma–Chlordane	9.7E–05	3.0E–06	3.8E–06	4.3E–06	1.4E–03
4,4'–DDD	5.6E–04	1.7E–05	7.3E–04	4.8E–05	2.9E–01
4,4'–DDE	3.7E–04	1.1E–05	4.9E–04	3.2E–05	2.0E–01
4,4'–DDT	2.2E–04	6.7E–06	2.9E–04	1.9E–05	1.1E–01
Aluminum	2.7E+01	8.3E–01	2.5E–01	3.5E–01	6.4E+01
Antimony	5.5E–03	9.9E–05	2.9E–05	3.0E–04	5.3E–03
Arsenic	1.5E–02	4.4E–04	1.1E–03	3.0E–04	4.2E–01
Barium	2.0E–01	5.7E–03	1.1E–03	2.7E–03	1.7E–01
Beryllium	6.5E–03	2.0E–04	5.0E–05	7.8E–05	1.1E–02
Cadmium	1.2E–02	3.6E–04	1.5E–03	1.8E–03	6.0E–01
Chromium	1.3E–01	4.0E–03	2.9E–03	3.4E–03	9.7E–01
Cobalt	1.1E–03	1.9E–05	6.1E–04	1.2E–04	2.4E–01
Copper	2.0E–01	6.0E–03	8.2E–03	9.4E–03	3.0E+00
Cyanide	3.3E–03	8.1E–05	1.3E–05	8.6E–05	1.2E–03
Lead	3.8E–01	1.2E–02	2.2E–03	3.5E–03	3.4E–01
Manganese	2.6E–01	7.5E–03	7.3E–02	3.4E–03	2.9E+01
Mercury	2.8E–03	8.6E–05	3.0E–03	2.9E–05	1.2E+00
Nickel	3.3E–03	5.9E–05	6.4E–04	2.3E–04	2.5E–01
Selenium	1.3E–02	4.0E–04	6.6E–04	7.7E–04	2.4E–01
Silver	2.0E–02	5.9E–04	2.7E–04	3.7E–04	8.1E–02
Thallium	1.9E–02	5.7E–04	2.4E–03	2.6E–03	9.3E–01
Vanadium	6.0E–02	1.8E–03	7.5E–04	9.6E–04	2.2E–01
Zinc	6.1E–01	1.8E–02	8.1E–02	8.7E–02	3.2E+01
OCDD	6.8E–06	2.1E–07	3.4E–08	5.8E–08	4.4E–06
2,3,7,8–TCDF	3.8E–07	1.2E–08	9.4E–09	1.6E–08	3.2E–06

[b] Calculated by summing the products of individual prey type concentrations and percent in diet with surface water and sediment exposures, multiplying by the exposure duration, SFF and ingestion rate, and dividing by body weight.

Table S-3.7
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	AVERAGE SEDIMENT CONCENTRATION (mg/kg)	AVERAGE SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Acetone	4.2E-02	5.9E-03					
Benzene	6.0E-03	4.1E-03					
2-Butanone	1.3E-02						
Chlorobenzene	7.1E-03	3.0E-03					
1,1-Dichloroethane	4.0E-03	2.0E-03					
1,2-Dichloroethylene	7.2E-03	4.4E-03					
Methylene chloride	1.2E-02	4.1E-03					
1,1,2,2-Tetrachloroethane		2.0E-03					
Tetrachloroethylene	8.7E-03						
Toluene	7.1E-03						
Trichloroethylene	7.2E-03	5.8E-03					
Vinyl chloride		5.1E-03					
Xylenes (total)	7.0E-03						
Acenaphthene	2.5E-01	2.0E-03	3.9E+02	2.4E-01	7.8E-01	2.4E-01	2.4E-01
Benzo(a)anthracene	1.9E-01		1.3E+04	2.4E-01	4.5E-02	2.4E-01	2.4E-01
Benzo(a)pyrene	2.8E-01		3.0E+01	2.4E-01	6.7E-02	2.4E-01	2.4E-01
Benzo(b)fluoranthene	1.8E-01		2.6E+04	2.4E-01	4.3E-02	2.4E-01	2.4E-01
Benzo(g,h,i)perylene	1.3E-01		6.5E+04	2.4E-01	3.1E-02	2.4E-01	2.4E-01
Benzo(k)fluoranthene	1.6E-01		2.6E+04	2.4E-01	3.8E-02	2.4E-01	2.4E-01
Chrysene	3.0E-01		1.3E+04	2.4E-01	7.1E-02	2.4E-01	2.4E-01
Dibenzofuran		1.0E-03	6.9E+02	1.5E-01	6.9E-01	1.5E-01	1.5E-01
Di-n-butylphthalate		3.5E-03	5.1E+03	1.9E+00	1.8E+01	1.9E+00	1.9E+00
Di-n-octylphthalate	2.1E-01	3.0E-03	9.3E+03	1.9E+00	2.8E+01	1.9E+00	1.9E+00
bis(2-Ethylhexyl) phthalate	7.0E-01	3.0E-03	3.1E+02	1.9E+00	1.3E+00	1.9E+00	1.9E+00
Fluoranthene	3.1E-01		3.2E+03	2.4E-01	7.3E-02	2.4E-01	2.4E-01
Indeno(1,2,3-cd)pyrene	1.2E-01		6.5E+04	2.4E-01	2.9E-02	2.4E-01	2.4E-01
Phenanthrene	1.2E-01		1.4E+03	2.4E-01	2.9E-02	2.4E-01	2.4E-01
Phenol	1.2E-01	2.0E-03	7.8E+02	1.5E-01	1.6E+00	1.5E-01	1.5E-01
Pyrene	3.0E-01		6.1E+03	2.4E-01	7.2E-02	2.4E-01	2.4E-01
Aroclor-1248	1.7E-01		7.1E+03	1.2E+01	2.1E+00	3.8E+00	3.2E-01

Table S-3.7
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	AVERAGE SEDIMENT CONCENTRATION (mg/kg)	AVERAGE SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Aroclor-1260	1.2E+00		1.0E+07	1.2E+01	1.5E+01	3.8E+00	3.2E-01
alpha-Chlordane	1.3E-02		3.8E+04	5.5E-01	7.0E-03	5.5E-01	1.8E+00
gamma-Chlordane	8.5E-03		3.8E+04	5.5E-01	4.7E-03	5.5E-01	1.8E+00
4,4'-DDD	3.9E-02		1.7E+05	2.1E+01	8.3E-01	1.2E+00	2.9E+00
4,4'-DDE	2.1E-02		5.1E+04	2.1E+01	4.5E-01	1.2E+00	2.9E+00
4,4'-DDT	2.6E-02		3.4E+03	2.1E+01	5.4E-01	1.2E+00	2.9E+00
Aluminum	2.6E+03	2.6E-01	9.5E+01	7.5E-02	1.9E+02	7.5E-02	7.5E-02
Antimony		1.9E-02	1.0E+00	5.0E-02	1.9E-02	5.0E-02	5.0E-02
Arsenic	1.2E+00	5.0E-03	2.8E+02	1.0E-01	1.4E+00	1.0E-01	1.0E-01
Barium	1.6E+01	9.1E-02	4.0E+00	7.5E-03	3.7E-01	7.5E-03	7.5E-03
Beryllium	9.0E-01	5.5E-04	2.0E+00	5.0E-02	4.5E-02	5.0E-02	5.0E-02
Cadmium	1.1E+00	2.1E-03	2.5E+01	2.1E+00	2.3E+00	2.1E+00	3.8E-01
Chromium	8.4E+00	3.3E-03	2.0E+02	2.8E-01	2.4E+00	2.8E-01	2.8E-01
Cobalt		4.6E-03	3.0E+02	1.0E+00	1.4E+00	1.0E+00	1.0E+00
Copper	8.3E+00	9.3E-03	1.0E+01	6.0E-01	5.0E+00	6.0E-01	6.0E-01
Cyanide	2.6E-01	3.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Lead	2.5E+01	3.4E-03	4.0E+00	1.5E-02	3.7E-01	1.5E-02	1.5E-02
Manganese	1.4E+01	7.6E-02	1.5E+03	2.0E-02	1.1E+02	2.0E-02	2.0E-02
Mercury	3.3E-01		6.3E+04	1.7E+01	5.5E+00	1.0E-02	2.3E+00
Nickel		1.1E-02	1.0E+02	3.0E-01	1.1E+00	3.0E-01	3.0E-01
Selenium	1.0E+00	1.9E-03	8.0E+00	7.5E-01	7.5E-01	7.5E-01	5.1E-01
Silver	2.2E+00	2.6E-03	2.0E+00	1.5E-01	3.3E-01	1.5E-01	1.5E-01
Thallium	1.9E+00	1.5E-03	NA	2.0E+00	3.8E+00	2.0E+00	2.0E+00
Vanadium	5.9E+00		1.0E-02	1.3E-01	7.4E-01	1.3E-01	1.3E-01
Zinc	3.3E+01	2.0E-02	1.6E+02	2.1E+00	7.0E+01	2.1E+00	2.1E+00
OCDD	5.2E-04		NA	5.4E-03	2.8E-06	8.6E-03	8.6E-03
2,3,7,8-TCDF	3.0E-05		NA	3.2E-01	9.5E-06	5.2E-01	5.2E-01

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2 BAFs are multiplied by sediment concentrations and BCFs are multiplied by surface water concentrations. The aquatic organism tissue level is equal to the greater of the two products.

Table S-3.7
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW-day) [b]

CHEMICAL	*Short-tailed shrew*	*Raccoon*	*Great Blue Heron*
Acetone	1.7E-03	5.9E-06	4.2E-04
Benzene	9.8E-04	3.3E-06	2.1E-04
2-Butanone	8.8E-05	4.1E-07	4.5E-05
Chlorobenzene	7.4E-04	2.5E-06	1.6E-04
1,1-Dichloroethane	4.9E-04	1.7E-06	1.0E-04
1,2-Dichloroethylene	1.1E-03	3.6E-06	2.3E-04
Methylene chloride	1.0E-03	3.5E-06	2.3E-04
1,1,2,2-Tetrachloroethane	4.6E-04	1.5E-06	9.1E-05
Tetrachloroethylene	6.1E-05	2.9E-07	3.1E-05
Toluene	5.0E-05	2.4E-07	2.6E-05
Trichloroethylene	1.4E-03	4.7E-06	2.9E-04
Vinyl chloride	1.2E-03	3.9E-06	2.3E-04
Xylenes (total)	4.9E-05	2.3E-07	2.5E-05
Acenaphthene	2.2E-03	3.5E-04	1.4E-01
Benzo(a)anthracene	1.3E-03	2.6E-05	8.7E-03
Benzo(a)pyrene	2.0E-03	3.9E-05	1.3E-02
Benzo(b)fluoranthene	1.3E-03	2.5E-05	8.2E-03
Benzo(g,h,i)perylene	9.2E-04	1.8E-05	5.9E-03
Benzo(k)fluoranthene	1.1E-03	2.2E-05	7.3E-03
Chrysene	2.1E-03	4.1E-05	1.4E-02
Dibenzofuran	2.3E-04	3.0E-04	1.2E-01
Di-n-butylphthalate	8.0E-04	7.9E-03	3.1E+00
Di-n-octylphthalate	2.2E-03	1.2E-02	4.9E+00
bis(2-Ethylhexyl) phthalate	5.6E-03	6.1E-04	2.4E-01
Fluoranthene	2.2E-03	4.2E-05	1.4E-02
Indeno(1,2,3-cd)pyrene	8.5E-04	1.7E-05	5.5E-03
Phenanthrene	8.6E-04	1.7E-05	5.6E-03
Phenol	1.3E-03	6.9E-04	2.8E-01
Pyrene	2.1E-03	4.2E-05	1.4E-02
Aroclor-1248	1.2E-03	9.2E-04	3.7E-01

Table S-3.7
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Average Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW-day) [b]

CHEMICAL	*Short-tailed shrew*	*Raccoon*	*Great Blue Heron*
Aroclor-1260	8.5E-03	6.5E-03	2.6E+00
alpha-Chlordane	9.0E-05	3.5E-06	1.3E-03
gamma-Chlordane	6.0E-05	2.3E-06	8.5E-04
4,4'-DDD	2.8E-04	3.7E-04	1.5E-01
4,4'-DDE	1.5E-04	2.0E-04	7.9E-02
4,4'-DDT	1.8E-04	2.4E-04	9.6E-02
Aluminum	1.8E+01	1.7E-01	4.3E+01
Antimony	4.4E-03	2.3E-05	4.2E-03
Arsenic	9.6E-03	6.6E-04	2.5E-01
Barium	1.3E-01	7.4E-04	1.2E-01
Beryllium	6.5E-03	5.0E-05	1.1E-02
Cadmium	8.2E-03	1.1E-03	4.1E-01
Chromium	6.0E-02	1.3E-03	4.4E-01
Cobalt	1.1E-03	6.1E-04	2.4E-01
Copper	6.1E-02	2.5E-03	9.1E-01
Cyanide	2.7E-03	1.1E-05	1.1E-03
Lead	1.7E-01	9.8E-04	1.5E-01
Manganese	1.1E-01	5.0E-02	2.0E+01
Mercury	2.3E-03	2.4E-03	9.7E-01
Nickel	2.6E-03	5.1E-04	2.0E-01
Selenium	7.5E-03	3.6E-04	1.4E-01
Silver	1.6E-02	2.2E-04	6.6E-02
Thallium	1.4E-02	1.7E-03	6.8E-01
Vanadium	4.2E-02	5.2E-04	1.5E-01
Zinc	2.4E-01	3.2E-02	1.2E+01
OCDD	3.7E-06	1.9E-08	2.4E-06
2,3,7,8-TCDF	2.1E-07	5.2E-09	1.8E-06

[b] Calculated by summing the products of individual prey type concentrations and percent in diet with surface water and sediment exposures, multiplying by the exposure duration, SFF and ingestion rate, and dividing by body weight.

Table S-3.8
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	MAXIMUM SEDIMENT CONCENTRATION (mg/kg)	MAXIMUM SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Carbon disulfide	2.0E-03						
Acenaphthene	3.1E-01		3.9E+02	2.4E-01	7.3E-02	2.4E-01	2.4E-01
Benzo(a)anthracene	1.2E-01		1.3E+04	2.4E-01	2.9E-02	2.4E-01	2.4E-01
Benzo(b)fluoranthene	3.1E-01		2.6E+04	2.4E-01	7.3E-02	2.4E-01	2.4E-01
Chrysene	1.5E-01		1.3E+04	2.4E-01	3.6E-02	2.4E-01	2.4E-01
bis(2-Ethylhexyl) phthalate	4.0E-01	3.0E-03	3.1E+02	1.9E+00	9.3E-01	1.9E+00	1.9E+00
Fluoranthene	4.0E-01		3.2E+03	2.4E-01	9.6E-02	2.4E-01	2.4E-01
Pyrene	3.5E-01		6.1E+03	2.4E-01	8.2E-02	2.4E-01	2.4E-01
Aroclor-1260	2.8E-01		1.0E+07	1.2E+01	3.4E+00	3.8E+00	3.2E-01
gamma-BHC (Lindane)	2.0E-03		4.5E+02	1.3E-01	2.6E-04	1.3E-01	1.5E-01
alpha-Chlordane	3.2E-03		3.8E+04	5.5E-01	1.8E-03	5.5E-01	1.8E+00
gamma-Chlordane	2.7E-03		3.8E+04	5.5E-01	1.5E-03	5.5E-01	1.8E+00
4,4'-DDE	2.4E-03		5.1E+04	2.1E+01	5.0E-02	1.2E+00	2.9E+00
Aluminum	1.6E+03	3.9E-01	9.5E+01	7.5E-02	1.2E+02	7.5E-02	7.5E-02
Antimony		1.2E-02	1.0E+00	5.0E-02	1.2E-02	5.0E-02	5.0E-02
Arsenic	8.1E-01		2.8E+02	1.0E-01	8.1E-02	1.0E-01	1.0E-01
Barium	9.4E+00	5.2E-02	4.0E+00	7.5E-03	2.1E-01	7.5E-03	7.5E-03
Beryllium	2.9E+00		2.0E+00	5.0E-02	1.5E-01	5.0E-02	5.0E-02
Cadmium	3.9E-01	1.5E-04	2.5E+01	2.1E+00	8.2E-01	2.1E+00	3.8E-01
Chromium	6.4E+00		2.0E+02	2.8E-01	1.8E+00	2.8E-01	2.8E-01
Cobalt	1.1E+00	6.3E-03	3.0E+02	1.0E+00	1.9E+00	1.0E+00	1.0E+00
Copper	6.1E+00	4.9E-03	1.0E+01	6.0E-01	3.7E+00	6.0E-01	6.0E-01
Lead	1.5E+01	4.8E-03	4.0E+00	1.5E-02	2.3E-01	1.5E-02	1.5E-02
Manganese	1.6E+01	5.0E-02	1.5E+03	2.0E-02	7.4E+01	2.0E-02	2.0E-02
Selenium	1.4E+00		8.0E+00	7.5E-01	1.1E+00	7.5E-01	5.1E-01

Table S-3.8
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE CONCENTRATION DATA			ESTIMATED TISSUE LEVELS IN PRIMARY PREY ITEMS				
			Aquatic Organism				
CHEMICAL	MAXIMUM SEDIMENT CONCENTRATION (mg/kg)	MAXIMUM SURFACE WATER CONCENTRATION (mg/L)	Aquatic Organism BCF [a]	Aquatic Organism BAF [a]	Tissue Level (mg/kg)	Mammal BAF [a]	Bird BAF [a]
Vanadium	4.4E+00		1.0E-02	1.3E-01	5.5E-01	1.3E-01	1.3E-01
Zinc	3.2E+01	1.6E-02	1.6E+02	2.1E+00	6.6E+01	2.1E+00	2.1E+00
1,2,3,4,6,7,8-HpCDD	5.1E-04		NA	8.1E-03	4.1E-06	1.3E-02	1.3E-02
OCDD	3.4E-03		NA	5.4E-03	1.8E-05	8.6E-03	8.6E-03
OCDF	5.0E-04		NA	1.4E-03	7.0E-07	2.2E-03	2.2E-03

[a] Bioaccumulation data presented in: Appendix S, Table S-2.2 BAFs are multiplied by sediment concentrations and BCFs are multiplied by surface water concentrations. The aquatic organism tissue level is equal to the greater of the two products.

Table S-3.8
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW-day) [b]

CHEMICAL	*Muskrat*	*Spotted sandpiper*	*Raccoon*	*Great Blue Heron*	*Osprey*
Carbon disulfide	1.3E-05	9.9E-07	3.9E-09	9.6E-07	0.0E+00
Acenaphthene	2.0E-03	6.3E-04	2.5E-06	1.9E-03	6.5E-04
Benzo(a)anthracene	7.9E-04	2.5E-04	9.8E-07	7.3E-04	2.6E-04
Benzo(b)fluoranthene	2.0E-03	6.3E-04	2.5E-06	1.9E-03	6.5E-04
Chrysene	9.9E-04	3.1E-04	1.2E-06	9.1E-04	3.2E-04
bis(2-Ethylhexyl) phthalate	2.9E-03	6.3E-03	2.5E-05	2.2E-02	8.3E-03
Fluoranthene	2.6E-03	8.2E-04	3.3E-06	2.4E-03	8.6E-04
Pyrene	2.3E-03	7.1E-04	2.8E-06	2.1E-03	7.4E-04
Aroclor-1260	1.9E-03	2.3E-02	8.9E-05	8.0E-02	3.1E-02
gamma-BHC (Lindane)	1.3E-05	2.7E-06	1.1E-08	7.1E-06	2.3E-06
alpha-Chlordane	2.1E-05	1.3E-05	5.2E-08	4.3E-05	1.6E-05
gamma-Chlordane	1.8E-05	1.1E-05	4.4E-08	3.6E-05	1.3E-05
4,4'-DDE	1.6E-05	3.3E-04	1.3E-06	1.2E-03	4.5E-04
Aluminum	1.1E+01	1.6E+00	6.4E-03	3.7E+00	1.1E+00
Antimony	1.1E-03	1.5E-04	8.1E-07	3.4E-04	1.2E-04
Arsenic	5.4E-03	9.3E-04	3.7E-06	2.3E-03	7.3E-04
Barium	6.7E-02	6.4E-03	2.6E-05	9.7E-03	1.9E-03
Beryllium	1.9E-02	2.4E-03	9.4E-06	4.8E-03	1.3E-03
Cadmium	2.6E-03	5.6E-03	2.2E-05	1.9E-02	7.3E-03
Chromium	4.2E-02	1.5E-02	5.9E-05	4.5E-02	1.6E-02
Cobalt	7.9E-03	1.3E-02	5.1E-05	4.5E-02	1.7E-02
Copper	4.1E-02	2.7E-02	1.1E-04	8.9E-02	3.3E-02
Lead	1.0E-01	9.0E-03	3.6E-05	1.3E-02	2.1E-03
Manganese	1.1E-01	5.0E-01	2.0E-03	1.8E+00	6.7E-01
Selenium	9.3E-03	7.6E-03	3.0E-05	2.5E-02	9.4E-03

Table S-3.8
Estimated Chronic Exposure to Semi-Terrestrial Receptors from Ingestion of Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

POTENTIAL DIETARY EXPOSURE (mg/kgBW-day) [b]

CHEMICAL	*Muskrat*	*Spotted sandpiper*	*Raccoon*	*Great Blue Heron*	*Osprey*
Vanadium	2.9E-02	5.8E-03	2.3E-05	1.5E-02	4.9E-03
Zinc	2.1E-01	4.5E-01	1.8E-03	1.6E+00	5.9E-01
1,2,3,4,6,7,8-HpCDD	3.4E-06	2.8E-07	1.1E-09	3.4E-07	3.7E-08
OCDD	2.2E-05	1.8E-06	7.0E-09	2.0E-06	1.6E-07
OCDF	3.3E-06	2.5E-07	1.0E-09	2.6E-07	6.3E-09

[b] Calculated by summing the products of individual prey type concentrations and percent in diet with surface water and sediment exposures, multiplying by the exposure duration, SFF and ingestion rate, and dividing by body weight.

Table S-3.9
Exposure Parameters and Assumptions for Terrestrial Receptors [a]
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Representative Wildlife Species		Percent Prey in Diet: Inverts	Plants	Small Mammals	Small Birds	Soil	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Food Ingestion Rate (kg/day)	Body Weight (kg)
Cotton mouse	(Small herb. mammal)	10%	88%	0%	0%	2%	0.147	1	1.00E+00	0.0029	0.021
Short-tailed shrew	(Small omn. bird)	78%	12%	0%	0%	10%	0.96	1	1.00E+00	0.0024	0.017
Meadowlark	(Small herb. bird)	75%	20%	0%	0%	5%	5	1	1.00E+00	0.0119	0.087
Red fox	(Predatory mammal)	20%	10%	57%	10%	3%	1,727	1	4.81E-03	0.24	4.69
Great-horned owl	(Predatory bird)	0%	0%	80%	19%	1%	15	1	5.53E-01	0.079	1.59

NOTES:

SITE AREA:	8.3 acres

[a] Documentation of exposure parameters presented in: Appendix S, Table S-2.1

[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area). ED is assumed to be 1 for this risk assessment.

[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0)). SFF is assumed to be 1 for lethal exposure scenario.

Table S-3.10
Exposure Parameters and Assumptions for Terrestrial Receptors [a]
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Representative Wildlife Species		Percent Prey in Diet: Inverts	Plants	Small Mammals	Small Birds	Soil	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Food Ingestion Rate (kg/day)	Body Weight (kg)
Cotton mouse	(Small herb. mammal)	10%	88%	0%	0%	2%	0.147	1	1.00E+00	0.0029	0.021
Short-tailed shrew	(Small omn. bird)	78%	12%	0%	0%	10%	0.96	1	1.00E+00	0.0024	0.017
Meadowlark	(Small herb. bird)	75%	20%	0%	0%	5%	5	1	1.00E+00	0.0119	0.087
Great-horned owl	(Predatory bird)	0%	0%	80%	19%	1%	15	1	5.53E-01	0.079	1.59

NOTES:

SITE AREA:	8.3 acres

[a] Documentation of exposure parameters presented in: Appendix S, Table S-2.1

[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area). ED is assumed to be 1 for this risk assessment.

[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0)). SFF is assumed to be 1 for lethal exposure scenario.

Table S-3.11
Exposure Parameters and Assumptions for Terrestrial Receptors [a]
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Representative Wildlife Species		Percent Prey in Diet: Inverts	Plants	Small Mammals	Small Birds	Soil	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Food Ingestion Rate (kg/day)	Body Weight (kg)
Cotton mouse	(Small herb. mammal)	10%	88%	0%	0%	2%	0.147	1	1.00E+00	0.0029	0.021
Short-tailed shrew	(Small omn. bird)	78%	12%	0%	0%	10%	0.96	1	1.00E+00	0.0024	0.017
Meadowlark	(Small herb. bird)	75%	20%	0%	0%	5%	5	1	1.00E+00	0.0119	0.087
Red fox	(Predatory mammal)	20%	10%	57%	10%	3%	1,727	1	8.40E-03	0.24	4.69
Great-horned owl	(Predatory bird)	0%	0%	80%	19%	1%	15	1	9.67E-01	0.079	1.59

NOTES:

SITE AREA:	14.5 acres

[a] Documentation of exposure parameters presented in: Appendix S, Table S-2.1

[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area). ED is assumed to be 1 for this risk assessment.

[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0)). SFF is assumed to be 1 for lethal exposure scenario.

Table S-3.12
Exposure Parameters and Assumptions for Terrestrial Receptors [a]
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

Representative Wildlife Species		Percent Prey in Diet: Inverts	Plants	Small Mammals	Small Birds	Soil	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Food Ingestion Rate (kg/day)	Body Weight (kg)
Cotton mouse	(Small herb. mammal)	10%	88%	0%	0%	2%	0.147	1	1.00E+00	0.0029	0.021
Short-tailed shrew	(Small omn. bird)	78%	12%	0%	0%	10%	0.96	1	1.00E+00	0.0024	0.017
Meadowlark	(Small herb. bird)	75%	20%	0%	0%	5%	5	1	1.00E+00	0.0119	0.087
Red fox	(Predatory mammal)	20%	10%	57%	10%	3%	1,727	1	8.40E-03	0.24	4.69
Great-horned owl	(Predatory bird)	0%	0%	80%	19%	1%	15	1	9.67E-01	0.079	1.59

NOTES:

SITE AREA:	14.5 acres

[a] Documentation of exposure parameters presented in: Appendix S, Table S-2.1

[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area). ED is assumed to be 1 for this risk assessment.

[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0)). SFF is assumed to be 1 for lethal exposure scenario.

Table S-3.13
Exposure Parameters and Assumptions for Terrestrial Receptors [a] in the Grassy Drainage Ditch Habitat
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE PARAMETERS [a]

Indicator Species		Percent Prey in Diet: Aquatic Organisms	Small Mammals	Small Birds	Sediment	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (L/day)	Body Weight (kg)
Cotton mouse	(Small mammal)	0%	0%	0%	1%	0.147	1.0	1.00E+00	0.0029	0.0031	0.021
Short-tailed shrew	(Small mammal)	0%	0%	0%	5%	0.96	1.0	2.08E-01	0.0024	0.0039	0.017
Meadowlark	(Small bird)	0%	0%	0%	2.5%	5	1.0	4.00E-02	0.0119	0.011	0.087
Great Horned Owl	(Carnivorous bird)	0%	80%	19%	0.5%	15	1.0	1.33E-02	0.079	0.081	1.59

NOTES:
[a] Documentation of exposure parameters presented in: Appendix S, Table S-2.1
[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area)
[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0))

SITE AREA:	0.2 acres

Table S-3.14
Exposure Parameters and Assumptions for Terrestrial Receptors [a] in the Forested Stream Habitat
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE PARAMETERS [a]

Indicator Species		Percent Prey in Diet: Aquatic Organisms	Small Mammals	Small Birds	Sediment	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (L/day)	Body Weight (kg)
Short-tailed shrew	(Small mammal)	0%	0%	0%	5%	0.96	1.0	1.00E+00	0.0024	0.0039	0.017
American woodcock	(Small bird)	0%	0%	0%	5%	80.1	1.0	4.24E-02	0.02	0.019	0.197
Raccoon	(Omnivorous mammal)	93%	0%	0%	7%	385	1.0	8.83E-03	0.214	0.344	3.99
Great Horned Owl	(Carnivorous bird)	0%	80%	19%	0.5%	15	1.0	2.27E-01	0.079	0.081	1.59
Great Blue Heron	(Piscivorous bird)	98%	0%	0%	2%	1.5	1.0	1.00E+00	0.401	0.101	2.23

NOTES:

[a] Documentation of exposure parameters presented in: Appendix S, Table S-2.1

[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area)

[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0))

SITE AREA:	3.4 acres

Table S-3.1
Exposure Parameters and Assumptions for Terrestrial Receptors [a] in the Forested Stream Habitat
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE PARAMETERS [a]

Indicator Species		Percent Prey in Diet: Aquatic Organisms	Small Mammals	Small Birds	Sediment	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (L/day)	Body Weight (kg)
Short-tailed shrew	(Small mammal)	0%	0%	0%	5%	0.96	1.0	1.00E+00	0.0024	0.0039	0.017
Raccoon	(Omnivorous mammal)	93%	0%	0%	7%	385	1.0	8.83E-03	0.214	0.344	3.99
Great Blue Heron	(Piscivorous bird)	98%	0%	0%	2%	1.5	1.0	1.00E+00	0.401	0.101	2.23

NOTES:
[a] Documentation of exposure parameters presented in: Appendix S, Table S-2.1
[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area)
[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0))

SITE AREA:	3.4 acres

Table S–3.16
Exposure Parameters and Assumptions for Terrestrial Receptors [a] in the Marine River Habitat
River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

EXPOSURE PARAMETERS [a]

Indicator Species		Percent Prey in Diet: Aquatic Organisms	Small Mammals	Small Birds	Sediment	Home Range (acres)	ED [b]	Site Foraging Frequency [c]	Dietary Ingestion Rate (kg/day)	Water Ingestion Rate (L/day)	Body Weight (kg)
Muskrat	(Small mammal)	0%	0%	0%	10%	0.20	1.0	1.00E+00	0.084	0.12	1.27
Spotted sandpiper	(Small bird)	93%	0%	0%	7%	5	1.0	4.00E–02	0.0074	0.0071	0.042
Raccoon	(Omnivorous mammal)	93%	0%	0%	7%	385	1.0	5.19E–04	0.214	0.344	3.99
Great Blue Heron	(Piscivorous bird)	98%	0%	0%	2%	1.5	1.0	1.33E–01	0.401	0.101	2.23
Osprey	(Piscivorous bird)	100%	0%	0%	0%	10	1.0	2.00E–02	0.61	0.072	1.36

NOTES:
[a] Documentation of exposure parameters presented in: Appendix S, Table S–2.1
[b] ED = Exposure Duration (percentage of year receptor is expected to be found at study area)
[c] SFF = Site Foraging Frequency (calculated by dividing site area by receptor home range (cannot exceed 1.0))

SITE AREA:	0.2 acres

Table S-3.17
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Cotton mouse*			*Short-tailed shrew*			*Meadowlark*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Methylene chloride	6.9E-06	5.3E+01	1.3E-07	3.5E-05	5.3E+01	6.7E-07	1.7E-05	5.3E+01	3.3E-07
Toluene	1.5E-05	7.6E+01	1.9E-07	7.5E-05	7.6E+01	9.8E-07	3.6E-05	7.6E+01	4.8E-07
Xylene (total)	9.7E-06	5.0E+02	1.9E-08	4.9E-05	5.0E+02	9.9E-08	2.4E-05	5.0E+02	4.8E-08
Acenaphthene	9.9E-04	1.0E+01	9.9E-05	3.9E-03	1.0E+01	3.9E-04	2.0E-03	1.0E+01	2.0E-04
Anthracene	1.3E-03	1.0E+01	1.3E-04	5.4E-03	1.0E+01	5.4E-04	2.8E-03	1.0E+01	2.8E-04
Benzo(a)anthracene	1.9E-03	1.0E+01	1.9E-04	7.7E-03	1.0E+01	7.7E-04	4.0E-03	1.0E+01	4.0E-04
Benzo(a)pyrene	1.8E-03	1.0E+01	1.8E-04	7.3E-03	1.0E+01	7.3E-04	3.8E-03	1.0E+01	3.8E-04
Benzo(b)fluoranthene	3.8E-03	1.0E+01	3.8E-04	1.5E-02	1.0E+01	1.5E-03	7.8E-03	1.0E+01	7.8E-04
Benzo(g,h,i)perylene	1.1E-03	1.0E+01	1.1E-04	4.5E-03	1.0E+01	4.5E-04	2.3E-03	1.0E+01	2.3E-04
Benzo(k)fluoranthene	2.8E-03	1.0E+01	2.8E-04	1.1E-02	1.0E+01	1.1E-03	5.8E-03	1.0E+01	5.8E-04
Butylbenzylphthalate	1.1E-04	4.7E+02	2.4E-07	5.2E-04	4.7E+02	1.1E-06	2.6E-04	4.7E+02	5.5E-07
Carbazole	1.6E-03	1.0E+02	1.6E-05	3.3E-03	1.0E+02	3.3E-05	2.2E-03	1.0E+02	2.2E-05
Chrysene	2.0E-03	1.0E+01	2.0E-04	7.8E-03	1.0E+01	7.8E-04	4.1E-03	1.0E+01	4.1E-04
Dibenz(a,h)anthracene	9.0E-04	1.0E+01	9.0E-05	3.6E-03	1.0E+01	3.6E-04	1.9E-03	1.0E+01	1.9E-04
Dibenzofuran	4.6E-04	6.0E+01	7.7E-06	1.2E-03	6.0E+01	2.0E-05	7.1E-04	6.0E+01	1.2E-05
Di-n-butylphthalate	7.6E-04	1.3E+02	6.1E-06	3.6E-03	1.3E+02	2.9E-05	1.8E-03	1.3E+02	1.4E-05
bis(2-Ethylhexyl)phthalate	2.5E-03	3.5E+01	7.2E-05	1.2E-02	3.5E+01	3.4E-04	5.9E-03	3.5E+01	1.7E-04
Fluoranthene	4.0E-03	1.0E+01	4.0E-04	1.6E-02	1.0E+01	1.6E-03	8.3E-03	1.0E+01	8.3E-04
Fluorene	9.9E-04	1.0E+01	9.9E-05	3.9E-03	1.0E+01	3.9E-04	2.0E-03	1.0E+01	2.0E-04
Indeno(1,2,3-cd)pyrene	1.1E-03	1.0E+01	1.1E-04	4.4E-03	1.0E+01	4.4E-04	2.3E-03	1.0E+01	2.3E-04
Naphthalene	1.4E-04	1.0E+01	1.4E-05	5.6E-04	1.0E+01	5.6E-05	2.9E-04	1.0E+01	2.9E-05
Phenanthrene	3.1E-03	1.0E+01	3.1E-04	1.2E-02	1.0E+01	1.2E-03	6.3E-03	1.0E+01	6.3E-04
Pyrene	3.3E-03	1.0E+01	3.3E-04	1.3E-02	1.0E+01	1.3E-03	6.8E-03	1.0E+01	6.8E-04
Aroclor-1260	7.6E-03	6.4E+00	1.2E-03	1.2E-02	6.4E+00	1.8E-03	9.0E-03	9.0E-01	1.0E-02
alpha-Chlordane	1.6E-04	1.6E+01	1.0E-05	6.9E-04	1.6E+01	4.3E-05	3.5E-04	3.1E-02	1.1E-02
gamma-Chlordane	3.9E-04	1.6E+01	2.4E-05	1.7E-03	1.6E+01	1.0E-04	8.5E-04	3.1E-02	2.7E-02
4,4'-DDD	4.9E-04	2.0E-01	2.4E-03	1.8E-03	2.0E-01	9.2E-03	9.7E-04	1.4E-01	6.9E-03
4,4'-DDE	1.4E-04	2.0E-01	7.0E-04	5.2E-04	2.0E-01	2.6E-03	2.8E-04	5.8E-01	4.8E-04
4,4'-DDT	5.3E-04	2.0E-01	2.7E-03	2.0E-03	2.0E-01	1.0E-02	1.1E-03	1.4E-01	7.6E-03
Dieldrin	9.1E-06	6.5E-01	1.4E-05	2.9E-05	6.5E-01	4.5E-05	1.6E-05	6.0E-01	2.7E-05
Heptachlor	2.6E-04	3.5E-01	7.4E-04	7.3E-04	3.5E-01	2.1E-03	4.3E-04	3.5E-01	1.2E-03
Heptachlor epoxide	1.7E-04	3.5E-01	4.7E-04	6.9E-04	3.5E-01	2.0E-03	3.5E-04	3.5E-01	1.0E-03

Table S-3.17
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Cotton mouse*			*Short-tailed shrew*			*Meadowlark*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Aluminum	5.2E+00	4.3E+02	1.2E-02	2.6E+01	4.3E+02	6.0E-02	1.3E+01	4.3E+02	3.0E-02
Arsenic	6.1E-02	5.8E-01	1.0E-01	7.3E-02	5.8E-01	1.3E-01	6.4E-02	1.0E+00	6.4E-02
Barium	2.5E-01	2.0E+02	1.3E-03	6.6E-01	2.0E+02	3.3E-03	3.9E-01	2.0E+02	2.0E-03
Cadmium	1.1E+02	2.2E+01	4.9E+00	1.0E+02	2.2E+01	4.7E+00	1.0E+02	1.0E+01	1.0E+01
Chromium	3.5E-02	2.5E+01	1.4E-03	1.7E-01	2.5E+01	6.8E-03	8.4E-02	2.5E+01	3.3E-03
Cobalt	4.4E-02	1.3E+01	3.4E-03	1.9E-01	1.3E+01	1.5E-02	9.7E-02	1.3E+01	7.5E-03
Copper	7.8E+00	1.0E+02	7.8E-02	8.1E+00	1.0E+02	8.1E-02	7.8E+00	1.0E+02	7.8E-02
Lead	5.7E-01	2.5E+00	2.3E-01	2.9E+00	2.5E+00	1.2E+00	1.4E+00	6.3E+00	2.2E-01
Manganese	5.0E-01	1.4E+02	3.6E-03	1.1E+00	1.4E+02	7.7E-03	7.0E-01	1.4E+02	5.0E-03
Mercury	7.1E-03	5.0E-01	1.4E-02	9.6E-03	5.0E-01	1.9E-02	7.9E-03	6.4E-02	1.2E-01
Selenium	4.4E-04	4.5E-02	9.7E-03	1.7E-03	4.5E-02	3.7E-02	8.8E-04	6.0E-01	1.5E-03
Silver	6.5E-03	6.8E+00	9.6E-04	1.2E-02	6.8E+00	1.7E-03	8.3E-03	6.8E+00	1.2E-03
Vanadium	1.3E-02	8.4E+00	1.5E-03	6.3E-02	8.4E+00	7.5E-03	3.1E-02	1.1E+01	2.8E-03
Zinc	3.2E+01	2.0E+02	1.6E-01	3.5E+01	2.0E+02	1.7E-01	3.2E+01	2.0E+02	1.6E-01
SUMMARY HAZARD INDEX			5.6E+00			6.4E+00			1.1E+01

PDE = Potential Dietary Exposure (mg/kgBW/day) RTV = Reference Toxicity Value (mg/kgBW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.17
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Red fox*			*Great-horned owl*		
	PDE	RTV	HQ	PDE	RTV	HQ
Methylene chloride	1.8E-08	5.3E+01	3.5E-10	6.9E-07	5.3E+01	1.3E-08
Toluene	3.9E-08	7.6E+01	5.1E-10	1.5E-06	7.6E+01	1.9E-08
Xylene (total)	2.6E-08	5.0E+02	5.2E-11	9.6E-07	5.0E+02	1.9E-09
Acenaphthene	2.6E-06	1.0E+01	2.6E-07	1.8E-04	1.0E+01	1.8E-05
Anthracene	3.6E-06	1.0E+01	3.6E-07	2.5E-04	1.0E+01	2.5E-05
Benzo(a)anthracene	5.2E-06	1.0E+01	5.2E-07	3.6E-04	1.0E+01	3.6E-05
Benzo(a)pyrene	4.9E-06	1.0E+01	4.9E-07	3.4E-04	1.0E+01	3.4E-05
Benzo(b)fluoranthene	1.0E-05	1.0E+01	1.0E-06	7.0E-04	1.0E+01	7.0E-05
Benzo(g,h,i)perylene	3.0E-06	1.0E+01	3.0E-07	2.1E-04	1.0E+01	2.1E-05
Benzo(k)fluoranthene	7.5E-06	1.0E+01	7.5E-07	5.1E-04	1.0E+01	5.1E-05
Butylbenzylphthalate	8.7E-07	4.7E+02	1.9E-09	1.2E-04	4.7E+02	2.6E-07
Carbazole	2.2E-06	1.0E+02	2.2E-08	1.1E-04	1.0E+02	1.1E-06
Chrysene	5.3E-06	1.0E+01	5.3E-07	3.6E-04	1.0E+01	3.6E-05
Dibenz(a,h)anthracene	2.4E-06	1.0E+01	2.4E-07	1.7E-04	1.0E+01	1.7E-05
Dibenzofuran	7.5E-07	6.0E+01	1.3E-08	4.1E-05	6.0E+01	6.8E-07
Di-n-butylphthalate	6.0E-06	1.3E+02	4.8E-08	8.4E-04	1.3E+02	6.7E-06
bis(2-Ethylhexyl)phthalate	2.0E-05	3.5E+01	5.6E-07	2.8E-03	3.5E+01	7.9E-05
Fluoranthene	1.1E-05	1.0E+01	1.1E-06	7.4E-04	1.0E+01	7.4E-05
Fluorene	2.6E-06	1.0E+01	2.6E-07	1.8E-04	1.0E+01	1.8E-05
Indeno(1,2,3-cd)pyrene	3.0E-06	1.0E+01	3.0E-07	2.0E-04	1.0E+01	2.0E-05
Naphthalene	3.8E-07	1.0E+01	3.8E-08	2.6E-05	1.0E+01	2.6E-06
Phenanthrene	8.2E-06	1.0E+01	8.2E-07	5.6E-04	1.0E+01	5.6E-05
Pyrene	8.8E-06	1.0E+01	8.8E-07	6.0E-04	1.0E+01	6.0E-05
Aroclor-1260	4.3E-05	7.5E-03	5.8E-03	6.0E-03	9.0E+00	6.7E-04
alpha-Chlordane	6.0E-07	1.6E+01	3.7E-08	7.4E-05	3.1E-02	2.4E-03
gamma-Chlordane	1.4E-06	1.6E+01	9.0E-08	1.8E-04	3.1E-02	5.7E-03
4,4'-DDD	2.4E-06	1.7E+01	1.4E-07	3.6E-04	1.4E-01	2.6E-03
4,4'-DDE	6.7E-07	1.4E+02	4.8E-09	1.0E-04	5.8E-01	1.8E-04
4,4'-DDT	2.6E-06	1.7E+01	1.5E-07	3.9E-04	1.4E-01	2.8E-03
Dieldrin	4.4E-08	6.5E-01	6.8E-08	5.3E-06	6.0E-01	8.8E-06
Heptachlor	4.1E-07	3.5E-01	1.2E-06	2.5E-05	3.5E-01	7.1E-05
Heptachlor epoxide	5.1E-07	3.5E-01	1.5E-06	5.5E-05	3.5E-01	1.6E-04
Aluminum	1.5E-02	4.3E+02	3.4E-05	7.1E-01	4.3E+02	1.7E-03

Table S-3.17
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Red fox*			*Great-horned owl*		
	PDE	RTV	HQ	PDE	RTV	HQ
Arsenic	4.8E-05	5.8E-01	8.3E-05	1.7E-03	1.0E+00	1.7E-03
Barium	3.5E-04	2.0E+02	1.8E-06	1.1E-02	2.0E+02	5.4E-05
Cadmium	2.8E-01	2.2E+01	1.3E-02	3.6E+01	1.0E+01	3.6E+00
Chromium	1.2E-04	2.5E+01	4.7E-06	8.7E-03	2.5E+01	3.4E-04
Cobalt	2.2E-04	1.3E+01	1.7E-05	2.6E-02	1.3E+01	2.0E-03
Copper	9.5E-03	1.0E+02	9.5E-05	9.5E-01	1.0E+02	9.5E-03
Lead	1.5E-03	2.5E+00	6.2E-04	6.1E-02	5.0E+01	1.2E-03
Manganese	6.0E-04	1.4E+02	4.3E-06	1.8E-02	1.4E+02	1.3E-04
Mercury	5.5E-06	1.0E-01	5.5E-05	7.7E-04	6.4E-02	1.2E-02
Selenium	1.7E-06	2.0E-01	8.4E-06	1.7E-04	6.0E-01	2.9E-04
Silver	7.7E-06	6.8E+00	1.1E-06	3.9E-04	6.8E+00	5.8E-05
Vanadium	3.8E-05	8.4E+00	4.5E-06	2.1E-03	1.1E+01	1.9E-04
Zinc	9.0E-02	2.0E+02	4.5E-04	1.4E+01	2.0E+02	6.9E-02
SUMMARY HAZARD INDEX			2.0E-02			3.7E+00

PDE = Potential Dietary Exposure (mg/kgBW/day) RTV = Reference Toxicity Value (mg/kgBW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.18
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	Cotton mouse			Short-tailed shrew			Meadowlark		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Methylene chloride	6.9E-06	5.3E+01	1.3E-07	3.5E-05	5.3E+01	6.7E-07	1.7E-05	5.3E+01	3.3E-07
Toluene	1.0E-05	7.6E+01	1.3E-07	5.2E-05	7.6E+01	6.9E-07	2.5E-05	7.6E+01	3.3E-07
Xylene (total)	8.8E-06	5.0E+02	1.8E-08	4.5E-05	5.0E+02	9.0E-08	2.2E-05	5.0E+02	4.4E-08
Acenaphthene	9.9E-04	1.0E+01	9.9E-05	3.9E-03	1.0E+01	3.9E-04	2.0E-03	1.0E+01	2.0E-04
Anthracene	1.3E-03	1.0E+01	1.3E-04	5.2E-03	1.0E+01	5.2E-04	2.7E-03	1.0E+01	2.7E-04
Benzo(a)anthracene	1.4E-03	1.0E+01	1.4E-04	5.5E-03	1.0E+01	5.5E-04	2.8E-03	1.0E+01	2.8E-04
Benzo(a)pyrene	1.4E-03	1.0E+01	1.4E-04	5.4E-03	1.0E+01	5.4E-04	2.8E-03	1.0E+01	2.8E-04
Benzo(b)fluoranthene	1.3E-03	1.0E+01	1.3E-04	5.3E-03	1.0E+01	5.3E-04	2.7E-03	1.0E+01	2.7E-04
Benzo(g,h,i)perylene	1.1E-03	1.0E+01	1.1E-04	4.5E-03	1.0E+01	4.5E-04	2.3E-03	1.0E+01	2.3E-04
Benzo(k)fluoranthene	1.8E-03	1.0E+01	1.8E-04	7.1E-03	1.0E+01	7.1E-04	3.7E-03	1.0E+01	3.7E-04
Butylbenzylphthalate	1.1E-04	4.7E+02	2.4E-07	5.2E-04	4.7E+02	1.1E-06	2.6E-04	4.7E+02	5.5E-07
Carbazole	1.6E-03	1.0E+02	1.6E-05	3.3E-03	1.0E+02	3.3E-05	2.2E-03	1.0E+02	2.2E-05
Chrysene	1.4E-03	1.0E+01	1.4E-04	5.6E-03	1.0E+01	5.6E-04	2.9E-03	1.0E+01	2.9E-04
Dibenz(a,h)anthracene	9.0E-04	1.0E+01	9.0E-05	3.6E-03	1.0E+01	3.6E-04	1.9E-03	1.0E+01	1.9E-04
Dibenzofuran	4.6E-04	6.0E+01	7.7E-06	1.2E-03	6.0E+01	2.0E-05	7.1E-04	6.0E+01	1.2E-05
Di-n-butylphthalate	7.6E-04	1.3E+02	6.1E-06	3.6E-03	1.3E+02	2.9E-05	1.8E-03	1.3E+02	1.4E-05
bis(2-Ethylhexyl)phthalate	1.3E-03	3.5E+01	3.8E-05	6.3E-03	3.5E+01	1.8E-04	3.1E-03	3.5E+01	8.9E-05
Fluoranthene	1.7E-03	1.0E+01	1.7E-04	6.8E-03	1.0E+01	6.8E-04	3.5E-03	1.0E+01	3.5E-04
Fluorene	9.9E-04	1.0E+01	9.9E-05	3.9E-03	1.0E+01	3.9E-04	2.0E-03	1.0E+01	2.0E-04
Indeno(1,2,3-cd)pyrene	1.1E-03	1.0E+01	1.1E-04	4.4E-03	1.0E+01	4.4E-04	2.3E-03	1.0E+01	2.3E-04
Naphthalene	1.4E-04	1.0E+01	1.4E-05	5.6E-04	1.0E+01	5.6E-05	2.9E-04	1.0E+01	2.9E-05
Phenanthrene	1.8E-03	1.0E+01	1.8E-04	7.1E-03	1.0E+01	7.1E-04	3.7E-03	1.0E+01	3.7E-04
Pyrene	1.6E-03	1.0E+01	1.6E-04	6.3E-03	1.0E+01	6.3E-04	3.3E-03	1.0E+01	3.3E-04
Aroclor-1260	3.4E-03	6.4E+00	5.3E-04	5.3E-03	6.4E+00	8.2E-04	4.0E-03	9.0E-01	4.5E-03
alpha-Chlordane	1.4E-04	1.6E+01	8.4E-06	5.8E-04	1.6E+01	3.6E-05	2.9E-04	3.1E-02	9.5E-03
gamma-Chlordane	2.7E-04	1.6E+01	1.7E-05	1.2E-03	1.6E+01	7.3E-05	5.9E-04	3.1E-02	1.9E-02
4,4'-DDD	2.3E-04	2.0E-01	1.1E-03	8.5E-04	2.0E-01	4.2E-03	4.5E-04	1.4E-01	3.2E-03
4,4'-DDE	8.2E-05	2.0E-01	4.1E-04	3.1E-04	2.0E-01	1.5E-03	1.6E-04	5.8E-01	2.8E-04
4,4'-DDT	2.6E-04	2.0E-01	1.3E-03	9.9E-04	2.0E-01	4.9E-03	5.2E-04	1.4E-01	3.7E-03
Dieldrin	9.1E-06	6.5E-01	1.4E-05	2.9E-05	6.5E-01	4.5E-05	1.6E-05	6.0E-01	2.7E-05
Heptachlor	1.8E-04	3.5E-01	5.3E-04	5.1E-04	3.5E-01	1.5E-03	3.0E-04	3.5E-01	8.6E-04
Heptachlor epoxide	1.2E-04	3.5E-01	3.3E-04	4.8E-04	3.5E-01	1.4E-03	2.5E-04	3.5E-01	7.0E-04

Table S-3.18
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Cotton mouse*			*Short-tailed shrew*			*Meadowlark*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Aluminum	3.5E+00	4.3E+02	8.3E-03	1.7E+01	4.3E+02	4.1E-02	8.5E+00	4.3E+02	2.0E-02
Arsenic	1.9E-02	5.8E-01	3.2E-02	2.2E-02	5.8E-01	3.9E-02	2.0E-02	1.0E+00	2.0E-02
Barium	9.1E-02	2.0E+02	4.6E-04	2.4E-01	2.0E+02	1.2E-03	1.4E-01	2.0E+02	7.2E-04
Cadmium	2.0E+01	2.2E+01	9.4E-01	1.9E+01	2.2E+01	8.8E-01	1.9E+01	1.0E+01	1.9E+00
Chromium	2.4E-02	2.5E+01	9.5E-04	1.2E-01	2.5E+01	4.6E-03	5.7E-02	2.5E+01	2.3E-03
Cobalt	4.4E-02	1.3E+01	3.4E-03	1.9E-01	1.3E+01	1.5E-02	9.7E-02	1.3E+01	7.5E-03
Copper	1.6E+00	1.0E+02	1.6E-02	1.7E+00	1.0E+02	1.7E-02	1.6E+00	1.0E+02	1.6E-02
Lead	1.6E-01	2.5E+00	6.4E-02	8.2E-01	2.5E+00	3.3E-01	4.0E-01	6.3E+00	6.4E-02
Manganese	1.7E-01	1.4E+02	1.2E-03	3.7E-01	1.4E+02	2.7E-03	2.4E-01	1.4E+02	1.7E-03
Mercury	3.3E-03	5.0E-01	6.5E-03	4.4E-03	5.0E-01	8.9E-03	3.6E-03	6.4E-02	5.7E-02
Selenium	4.4E-04	4.5E-02	9.7E-03	1.7E-03	4.5E-02	3.7E-02	8.8E-04	6.0E-01	1.5E-03
Silver	6.5E-03	6.8E+00	9.6E-04	1.2E-02	6.8E+00	1.7E-03	8.3E-03	6.8E+00	1.2E-03
Vanadium	1.0E-02	8.4E+00	1.2E-03	5.1E-02	8.4E+00	6.1E-03	2.5E-02	1.1E+01	2.3E-03
Zinc	8.6E+00	2.0E+02	4.3E-02	9.3E+00	2.0E+02	4.6E-02	8.7E+00	2.0E+02	4.3E-02
SUMMARY HAZARD INDEX			1.1E+00			1.5E+00			2.2E+00

PDE = Potential Dietary Exposure (mg/kgBW/day) RTV = Reference Toxicity Value (mg/kgBW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.16
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Great-horned owl*		
	PDE	RTV	HQ
Methylene chloride	6.9E-07	5.3E+01	1.3E-08
Toluene	1.0E-06	7.6E+01	1.3E-08
Xylene (total)	8.8E-07	5.0E+02	1.8E-09
Acenaphthene	1.6E-04	1.0E+01	1.6E-05
Anthracene	2.1E-04	1.0E+01	2.1E-05
Benzo(a)anthracene	2.3E-04	1.0E+01	2.3E-05
Benzo(a)pyrene	2.3E-04	1.0E+01	2.3E-05
Benzo(b)fluoranthene	2.2E-04	1.0E+01	2.2E-05
Benzo(g,h,i)perylene	1.9E-04	1.0E+01	1.9E-05
Benzo(k)fluoranthene	3.0E-04	1.0E+01	3.0E-05
Butylbenzylphthalate	1.0E-04	4.7E+02	2.2E-07
Carbazole	1.0E-04	1.0E+02	1.0E-06
Chrysene	2.3E-04	1.0E+01	2.3E-05
Dibenz(a,h)anthracene	1.5E-04	1.0E+01	1.5E-05
Dibenzofuran	3.7E-05	6.0E+01	6.1E-07
Di-n-butylphthalate	7.1E-04	1.3E+02	5.7E-06
bis(2-Ethylhexyl)phthalate	1.3E-03	3.5E+01	3.6E-05
Fluoranthene	2.8E-04	1.0E+01	2.8E-05
Fluorene	1.6E-04	1.0E+01	1.6E-05
Indeno(1,2,3-cd)pyrene	1.8E-04	1.0E+01	1.8E-05
Naphthalene	2.3E-05	1.0E+01	2.3E-06
Phenanthrene	2.9E-04	1.0E+01	2.9E-05
Pyrene	2.6E-04	1.0E+01	2.6E-05
Aroclor-1260	2.6E-03	9.0E+00	2.9E-04
alpha-Chlordane	4.1E-05	3.1E-02	1.3E-03
gamma-Chlordane	8.4E-05	3.1E-02	2.7E-03
4,4'-DDD	1.2E-04	1.4E-01	8.3E-04
4,4'-DDE	4.2E-05	5.8E-01	7.3E-05
4,4'-DDT	1.4E-04	1.4E-01	9.7E-04
Dieldrin	5.0E-06	6.0E-01	8.3E-06
Heptachlor	1.1E-05	3.5E-01	3.1E-05
Heptachlor epoxide	2.5E-05	3.5E-01	7.2E-05
Aluminum	4.6E-01	4.3E+02	1.1E-03

Table S-3.18
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
North of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Great-horned owl*		
	PDE	RTV	HQ
Arsenic	4.4E-04	1.0E+00	4.4E-04
Barium	3.9E-03	2.0E+02	1.9E-05
Cadmium	6.5E+00	1.0E+01	6.5E-01
Chromium	5.3E-03	2.5E+01	2.1E-04
Cobalt	2.2E-02	1.3E+01	1.7E-03
Copper	1.6E-01	1.0E+02	1.6E-03
Lead	1.7E-02	5.0E+01	3.4E-04
Manganese	5.9E-03	1.4E+02	4.2E-05
Mercury	3.9E-05	6.4E-02	6.1E-04
Selenium	1.5E-04	6.0E-01	2.6E-04
Silver	3.5E-04	6.8E+00	5.1E-05
Vanadium	1.6E-03	1.1E+01	1.4E-04
Zinc	3.0E+00	2.0E+02	1.5E-02
SUMMARY HAZARD INDEX			6.7E-01

PDE = Potential Dietary Exposure (mg/kgBW/day) RTV = Reference Toxicity Value (mg/kgBW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.19
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Cotton mouse*			*Short-tailed shrew*			*Meadowlark*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	1.7E-05	6.0E+02	2.9E-08	8.8E-05	6.0E+02	1.5E-07	4.2E-05	6.0E+02	7.1E-08
Benzene	1.0E-05	1.0E+01	1.0E-06	5.2E-05	1.0E+01	5.2E-06	2.5E-05	1.0E+01	2.5E-06
Carbon disulfide	9.4E-06	1.1E+01	8.5E-07	4.8E-05	1.1E+01	4.4E-06	2.3E-05	1.1E+01	2.1E-06
1,2-Dichloroethene (total)	5.5E-06	9.0E+00	6.1E-07	2.8E-05	9.0E+00	3.1E-06	1.4E-05	9.0E+00	1.5E-06
Methylene chloride	1.3E-05	5.3E+01	2.5E-07	6.6E-05	5.3E+01	1.3E-06	3.2E-05	5.3E+01	6.1E-07
Toluene	9.9E-06	7.6E+01	1.3E-07	5.1E-05	7.6E+01	6.7E-07	2.5E-05	7.6E+01	3.2E-07
Xylene (total)	1.2E-05	5.0E+02	2.3E-08	5.9E-05	5.0E+02	1.2E-07	2.9E-05	5.0E+02	5.7E-08
Acenaphthene	1.2E-03	1.0E+01	1.2E-04	5.3E-03	1.0E+01	5.3E-04	3.3E-03	1.0E+01	3.3E-04
Acenaphthylene	7.0E-04	1.0E+01	7.0E-05	3.2E-03	1.0E+01	3.2E-04	1.9E-03	1.0E+01	1.9E-04
Anthracene	1.3E-03	1.0E+01	1.3E-04	6.0E-03	1.0E+01	6.0E-04	3.7E-03	1.0E+01	3.7E-04
Benzo(a)anthracene	1.8E-03	1.0E+01	1.8E-04	8.2E-03	1.0E+01	8.2E-04	5.1E-03	1.0E+01	5.1E-04
Benzo(a)pyrene	1.9E-03	1.0E+01	1.9E-04	8.6E-03	1.0E+01	8.6E-04	5.3E-03	1.0E+01	5.3E-04
Benzo(b)fluoranthene	1.8E-03	1.0E+01	1.8E-04	8.0E-03	1.0E+01	8.0E-04	5.0E-03	1.0E+01	5.0E-04
Benzo(g,h,i)perylene	1.7E-03	1.0E+01	1.7E-04	7.8E-03	1.0E+01	7.8E-04	4.8E-03	1.0E+01	4.8E-04
Benzo(k)fluoranthene	1.7E-03	1.0E+01	1.7E-04	7.9E-03	1.0E+01	7.9E-04	4.9E-03	1.0E+01	4.9E-04
Benzoic acid	1.4E-01	4.0E+01	3.5E-03	5.4E-02	4.0E+01	1.4E-03	5.2E-02	4.0E+01	1.3E-03
Butylbenzylphthalate	4.5E-04	4.7E+02	9.6E-07	2.4E-03	4.7E+02	5.1E-06	1.4E-03	4.7E+02	3.1E-06
Chrysene	1.9E-03	1.0E+01	1.9E-04	8.4E-03	1.0E+01	8.4E-04	5.2E-03	1.0E+01	5.2E-04
Dibenz(a,h)anthracene	7.0E-04	1.0E+01	7.0E-05	3.2E-03	1.0E+01	3.2E-04	1.9E-03	1.0E+01	1.9E-04
Dibenzofuran	1.8E-03	6.0E+01	3.0E-05	4.8E-03	6.0E+01	8.0E-05	3.1E-03	6.0E+01	5.1E-05
Di-n-butylphthalate	8.7E-04	1.3E+02	6.9E-06	4.6E-03	1.3E+02	3.6E-05	2.8E-03	1.3E+02	2.2E-05
bis(2-Ethylhexyl)phthalate	2.1E-03	3.5E+01	5.9E-05	1.1E-02	3.5E+01	3.1E-04	6.7E-03	3.5E+01	1.9E-04
Fluoranthene	1.8E-03	1.0E+01	1.8E-04	8.3E-03	1.0E+01	8.3E-04	5.1E-03	1.0E+01	5.1E-04
Fluorene	1.1E-03	1.0E+01	1.1E-04	5.1E-03	1.0E+01	5.1E-04	3.2E-03	1.0E+01	3.2E-04
Indeno(1,2,3-cd)pyrene	1.6E-03	1.0E+01	1.6E-04	7.1E-03	1.0E+01	7.1E-04	4.4E-03	1.0E+01	4.4E-04
Phenanthrene	1.6E-03	1.0E+01	1.6E-04	7.3E-03	1.0E+01	7.3E-04	4.5E-03	1.0E+01	4.5E-04
Pyrene	1.7E-03	1.0E+01	1.7E-04	7.7E-03	1.0E+01	7.7E-04	4.7E-03	1.0E+01	4.7E-04
Aldrin	9.8E-05	6.5E-01	1.5E-04	2.7E-04	6.5E-01	4.2E-04	2.4E-04	6.0E-01	4.0E-04
Aroclor-1254	4.7E-02	1.5E+00	3.0E-02	3.1E-01	1.5E+00	2.0E-01	2.9E-01	9.0E-01	3.2E-01
Aroclor-1260	4.3E-01	6.4E+00	6.7E-02	2.9E+00	6.4E+00	4.5E-01	2.7E+00	9.0E-01	3.0E+00
alpha-BHC	1.3E-04	5.0E+00	2.6E-05	8.7E-04	5.0E+00	1.7E-04	7.9E-04	5.0E+00	1.6E-04
alpha-Chlordane	3.8E-04	1.6E+01	2.4E-05	2.9E-03	1.6E+01	1.8E-04	2.6E-03	3.1E-02	8.3E-02

Table S-3.19
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Cotton mouse*			*Short-tailed shrew*			*Meadowlark*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
gamma-Chlordane	3.1E-04	1.6E+01	1.9E-05	2.3E-03	1.6E+01	1.4E-04	2.1E-03	3.1E-02	6.7E-02
4,4'-DDD	1.0E-03	2.0E-01	5.0E-03	7.6E-03	2.0E-01	3.8E-02	7.0E-03	1.4E-01	5.0E-02
4,4'-DDE	1.2E-03	2.0E-01	6.1E-03	8.9E-03	2.0E-01	4.4E-02	8.0E-03	5.8E-01	1.4E-02
4,4'-DDT	4.2E-03	2.0E-01	2.1E-02	2.8E-02	2.0E-01	1.4E-01	2.3E-02	1.4E-01	1.7E-01
Dieldrin	6.7E-04	6.5E-01	1.0E-03	5.1E-03	6.5E-01	7.9E-03	4.7E-03	6.0E-01	7.9E-03
Aluminum	1.3E+01	4.3E+02	3.0E-02	7.5E+01	4.3E+02	1.8E-01	4.8E+01	4.3E+02	1.1E-01
Antimony	5.8E-02	4.2E+01	1.4E-03	1.4E-01	4.2E+01	3.4E-03	9.1E-02	4.2E+01	2.2E-03
Arsenic	1.6E-01	5.8E-01	2.8E-01	8.2E-02	5.8E-01	1.4E-01	6.4E-02	1.0E+00	6.4E-02
Barium	2.3E-01	2.0E+02	1.2E-03	5.4E-01	2.0E+02	2.7E-03	3.0E-01	2.0E+02	1.5E-03
Beryllium	4.8E-03	8.5E-01	5.7E-03	2.6E-02	8.5E-01	3.0E-02	1.6E-02	8.5E-01	1.8E-02
Cadmium	8.4E+01	2.2E+01	3.9E+00	1.5E+01	2.2E+01	7.1E-01	2.2E+01	1.0E+01	2.2E+00
Chromium	3.6E-01	2.5E+01	1.4E-02	2.2E+00	2.5E+01	8.9E-02	1.6E+00	2.5E+01	6.5E-02
Cobalt	4.4E-02	1.3E+01	3.4E-03	3.2E-01	1.3E+01	2.5E-02	2.8E-01	1.3E+01	2.2E-02
Copper	7.7E+00	1.0E+02	7.7E-02	3.4E+00	1.0E+02	3.4E-02	3.4E+00	1.0E+02	3.4E-02
Cyanide	9.3E-01	1.7E+00	5.5E-01	2.3E-01	1.7E+00	1.4E-01	2.6E-01	1.1E+00	2.3E-01
Lead	9.6E-01	2.5E+00	3.8E-01	5.7E+00	2.5E+00	2.3E+00	3.7E+00	6.3E+00	5.9E-01
Manganese	7.1E-01	1.4E+02	5.0E-03	1.3E+00	1.4E+02	9.5E-03	8.0E-01	1.4E+02	5.7E-03
Mercury	3.8E-03	5.0E-01	7.7E-03	3.7E-03	5.0E-01	7.4E-03	2.8E-03	6.4E-02	4.4E-02
Nickel	2.7E-01	1.3E+01	2.1E-02	1.5E+00	1.3E+01	1.1E-01	1.1E+00	1.0E+02	1.1E-02
Selenium	1.9E-02	4.5E-02	4.1E-01	1.3E-01	4.5E-02	2.8E+00	1.1E-01	6.0E-01	1.8E-01
Silver	8.6E-02	6.8E+00	1.3E-02	1.9E-01	6.8E+00	2.8E-02	1.4E-01	6.8E+00	2.1E-02
Vanadium	3.5E-02	8.4E+00	4.1E-03	2.1E-01	8.4E+00	2.5E-02	1.5E-01	1.1E+01	1.3E-02
Zinc	2.7E+01	2.0E+02	1.3E-01	5.8E+01	2.0E+02	2.9E-01	5.4E+01	2.0E+02	2.7E-01
1,2,3,4,6,7,8-HpCDD	9.0E-07	1.0E-05	9.0E-02	4.8E-06	1.0E-05	4.8E-01	2.5E-06	1.4E-04	1.8E-02
1,2,3,4,6,7,8-HpCDF	9.0E-07	1.0E-05	9.0E-02	4.6E-06	1.0E-05	4.6E-01	2.3E-06	1.4E-04	1.6E-02
OCDF	5.6E-09	1.0E-04	5.6E-05	2.9E-08	1.0E-04	2.9E-04	1.4E-08	1.4E-03	1.0E-05
SUMMARY HAZARD INDEX			6.2E+00			8.8E+00			7.6E+00

PDE = Potential Dietary Exposure (mg/kg BW/day) RTV = Reference Toxicity Value (mg/kg BW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.19
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Red fox*			*Great-horned owl*		
	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	8.0E-08	6.0E+02	1.3E-10	3.0E-06	6.0E+02	5.0E-09
Benzene	4.8E-08	1.0E+01	4.8E-09	1.8E-06	1.0E+01	1.8E-07
Carbon disulfide	4.4E-08	1.1E+01	4.0E-09	1.6E-06	1.1E+01	1.5E-07
1,2-Dichloroethene (total)	2.6E-08	9.0E+00	2.9E-09	9.6E-07	9.0E+00	1.1E-07
Methylene chloride	6.1E-08	5.3E+01	1.2E-09	2.3E-06	5.3E+01	4.3E-08
Toluene	4.6E-08	7.6E+01	6.1E-10	1.7E-06	7.6E+01	2.3E-08
Xylene (total)	5.4E-08	5.0E+02	1.1E-10	2.0E-06	5.0E+02	4.0E-09
Acenaphthene	6.0E-06	1.0E+01	6.0E-07	3.9E-04	1.0E+01	3.9E-05
Acenaphthylene	3.6E-06	1.0E+01	3.6E-07	2.3E-04	1.0E+01	2.3E-05
Anthracene	6.8E-06	1.0E+01	6.8E-07	4.4E-04	1.0E+01	4.4E-05
Benzo(a)anthracene	9.4E-06	1.0E+01	9.4E-07	6.1E-04	1.0E+01	6.1E-05
Benzo(a)pyrene	9.8E-06	1.0E+01	9.8E-07	6.3E-04	1.0E+01	6.3E-05
Benzo(b)fluoranthene	9.2E-06	1.0E+01	9.2E-07	6.0E-04	1.0E+01	6.0E-05
Benzo(g,h,i)perylene	8.9E-06	1.0E+01	8.9E-07	5.8E-04	1.0E+01	5.8E-05
Benzo(k)fluoranthene	9.0E-06	1.0E+01	9.0E-07	5.8E-04	1.0E+01	5.8E-05
Benzoic acid	1.0E-04	4.0E+01	2.6E-06	5.4E-03	4.0E+01	1.4E-04
Butylbenzylphthalate	6.7E-06	4.7E+02	1.4E-08	9.7E-04	4.7E+02	2.1E-06
Chrysene	9.6E-06	1.0E+01	9.6E-07	6.2E-04	1.0E+01	6.2E-05
Dibenz(a,h)anthracene	3.6E-06	1.0E+01	3.6E-07	2.3E-04	1.0E+01	2.3E-05
Dibenzofuran	5.3E-06	6.0E+01	8.8E-08	2.8E-04	6.0E+01	4.6E-06
Di-n-butylphthalate	1.3E-05	1.3E+02	1.0E-07	1.9E-03	1.3E+02	1.5E-05
bis(2-Ethylhexyl)phthalate	3.1E-05	3.5E+01	8.9E-07	4.5E-03	3.5E+01	1.3E-04
Fluoranthene	9.5E-06	1.0E+01	9.5E-07	6.1E-04	1.0E+01	6.1E-05
Fluorene	5.9E-06	1.0E+01	5.9E-07	3.8E-04	1.0E+01	3.8E-05
Indeno(1,2,3-cd)pyrene	8.1E-06	1.0E+01	8.1E-07	5.3E-04	1.0E+01	5.3E-05
Phenanthrene	8.3E-06	1.0E+01	8.3E-07	5.4E-04	1.0E+01	5.4E-05
Pyrene	8.7E-06	1.0E+01	8.7E-07	5.7E-04	1.0E+01	5.7E-05
Aldrin	3.1E-07	6.5E-01	4.8E-07	3.3E-05	6.0E-01	5.5E-05
Aroclor-1254	1.4E-03	9.6E-02	1.5E-02	1.9E-01	9.0E+00	2.1E-02
Aroclor-1260	1.3E-02	7.5E-03	1.8E+00	1.8E+00	9.0E+00	2.0E-01
alpha-BHC	6.9E-07	5.0E+00	1.4E-07	1.3E-05	5.0E+00	2.5E-06
alpha-Chlordane	3.8E-06	1.6E+01	2.4E-07	5.6E-04	3.1E-02	1.8E-02
gamma-Chlordane	3.1E-06	1.6E+01	1.9E-07	4.5E-04	3.1E-02	1.4E-02

Table S-3.19
Risk from Potential Lethal Effects for Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Red fox*			*Great-horned owl*		
	PDE	RTV	HQ	PDE	RTV	HQ
4,4'-DDD	1.5E-05	1.7E+01	8.6E-07	2.8E-03	1.4E-01	2.0E-02
4,4'-DDE	1.8E-05	1.4E+02	1.3E-07	3.2E-03	5.8E-01	5.5E-03
4,4'-DDT	5.6E-05	1.7E+01	3.2E-06	9.9E-03	1.4E-01	7.1E-02
Dieldrin	1.2E-05	6.5E-01	1.8E-05	1.3E-03	6.0E-01	2.2E-03
Aluminum	7.0E-02	4.3E+02	1.7E-04	2.7E+00	4.3E+02	6.4E-03
Antimony	1.4E-04	4.2E+01	3.4E-06	5.0E-03	4.2E+01	1.2E-04
Arsenic	1.3E-04	5.8E-01	2.2E-04	5.8E-03	1.0E+00	5.8E-03
Barium	5.3E-04	2.0E+02	2.7E-06	1.8E-02	2.0E+02	9.0E-05
Beryllium	2.4E-05	8.5E-01	2.8E-05	8.8E-04	8.5E-01	1.0E-03
Cadmium	2.2E-01	2.2E+01	1.0E-02	3.0E+01	1.0E+01	3.0E+00
Chromium	2.5E-03	2.5E+01	1.0E-04	1.6E-01	2.5E+01	6.5E-03
Cobalt	5.8E-04	1.3E+01	4.4E-05	7.0E-02	1.3E+01	5.4E-03
Copper	1.0E-02	1.0E+02	1.0E-04	1.1E+00	1.0E+02	1.1E-02
Cyanide	4.2E-04	1.7E+00	2.5E-04	3.6E-03	1.1E+00	3.3E-03
Lead	5.0E-03	2.5E+00	2.0E-03	1.4E-01	5.0E+01	2.7E-03
Manganese	1.3E-03	1.4E+02	9.5E-06	4.4E-02	1.4E+02	3.1E-04
Mercury	4.0E-06	1.0E-01	4.0E-05	5.1E-04	6.4E-02	8.0E-03
Nickel	1.7E-03	1.3E+01	1.3E-04	1.1E-01	1.0E+02	1.1E-03
Selenium	2.0E-04	2.0E-01	9.9E-04	1.9E-02	6.0E-01	3.2E-02
Silver	2.1E-04	6.8E+00	3.1E-05	9.9E-03	6.8E+00	1.5E-03
Vanadium	2.0E-04	8.4E+00	2.4E-05	9.0E-03	1.1E+01	8.2E-04
Zinc	2.1E-01	2.0E+02	1.0E-03	3.2E+01	2.0E+02	1.6E-01
1,2,3,4,6,7,8-HpCDD	4.4E-09	1.0E-05	4.4E-04	1.6E-07	1.4E-04	1.1E-03
1,2,3,4,6,7,8-HpCDF	4.2E-09	1.0E-05	4.2E-04	1.6E-07	1.4E-04	1.1E-03
OCDF	2.6E-11	1.0E-04	2.6E-07	9.7E-10	1.4E-03	6.9E-07
SUMMARY HAZARD INDEX			1.8E+00			3.6E+00

PDE = Potential Dietary Exposure (mg/kgBW/day) RTV = Reference Toxicity Value (mg/kgBW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.20
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	Cotton mouse			Short-tailed shrew			Meadowlark		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	1.7E-05	6.0E+02	2.8E-08	8.5E-05	6.0E+02	1.4E-07	4.1E-05	6.0E+02	6.8E-08
Benzene	9.4E-06	1.0E+01	9.4E-07	4.8E-05	1.0E+01	4.8E-06	2.3E-05	1.0E+01	2.3E-06
Carbon disulfide	8.3E-06	1.1E+01	7.5E-07	4.2E-05	1.1E+01	3.9E-06	2.1E-05	1.1E+01	1.9E-06
1,2-Dichloroethene (total)	5.5E-06	9.0E+00	6.1E-07	2.8E-05	9.0E+00	3.1E-06	1.4E-05	9.0E+00	1.5E-06
Methylene chloride	1.1E-05	5.3E+01	2.2E-07	5.8E-05	5.3E+01	1.1E-06	2.8E-05	5.3E+01	5.3E-07
Toluene	8.0E-06	7.6E+01	1.1E-07	4.1E-05	7.6E+01	5.4E-07	2.0E-05	7.6E+01	2.6E-07
Xylene (total)	1.0E-05	5.0E+02	2.1E-08	5.4E-05	5.0E+02	1.1E-07	2.6E-05	5.0E+02	5.2E-08
Acenaphthene	1.2E-03	1.0E+01	1.2E-04	5.3E-03	1.0E+01	5.3E-04	3.3E-03	1.0E+01	3.3E-04
Acenaphthylene	7.0E-04	1.0E+01	7.0E-05	3.2E-03	1.0E+01	3.2E-04	1.9E-03	1.0E+01	1.9E-04
Anthracene	1.3E-03	1.0E+01	1.3E-04	6.0E-03	1.0E+01	6.0E-04	3.7E-03	1.0E+01	3.7E-04
Benzo(a)anthracene	1.2E-03	1.0E+01	1.2E-04	5.3E-03	1.0E+01	5.3E-04	3.3E-03	1.0E+01	3.3E-04
Benzo(a)pyrene	1.3E-03	1.0E+01	1.3E-04	5.6E-03	1.0E+01	5.6E-04	3.5E-03	1.0E+01	3.5E-04
Benzo(b)fluoranthene	1.3E-03	1.0E+01	1.3E-04	6.0E-03	1.0E+01	6.0E-04	3.7E-03	1.0E+01	3.7E-04
Benzo(g,h,i)perylene	1.3E-03	1.0E+01	1.3E-04	5.8E-03	1.0E+01	5.8E-04	3.6E-03	1.0E+01	3.6E-04
Benzo(k)fluoranthene	1.4E-03	1.0E+01	1.4E-04	6.5E-03	1.0E+01	6.5E-04	4.0E-03	1.0E+01	4.0E-04
Benzoic acid	1.2E-01	4.0E+01	3.0E-03	4.6E-02	4.0E+01	1.2E-03	4.4E-02	4.0E+01	1.1E-03
Butylbenzylphthalate	4.5E-04	4.7E+02	9.6E-07	2.4E-03	4.7E+02	5.1E-06	1.4E-03	4.7E+02	3.1E-06
Chrysene	1.3E-03	1.0E+01	1.3E-04	5.7E-03	1.0E+01	5.7E-04	3.5E-03	1.0E+01	3.5E-04
Dibenz(a,h)anthracene	7.0E-04	1.0E+01	7.0E-05	3.2E-03	1.0E+01	3.2E-04	1.9E-03	1.0E+01	1.9E-04
Dibenzofuran	1.8E-03	6.0E+01	3.0E-05	4.8E-03	6.0E+01	8.0E-05	3.1E-03	6.0E+01	5.1E-05
Di-n-butylphthalate	8.7E-04	1.3E+02	6.9E-06	4.6E-03	1.3E+02	3.6E-05	2.8E-03	1.3E+02	2.2E-05
bis(2-Ethylhexyl)phthalate	1.2E-03	3.5E+01	3.6E-05	6.5E-03	3.5E+01	1.9E-04	4.0E-03	3.5E+01	1.1E-04
Fluoranthene	1.3E-03	1.0E+01	1.3E-04	5.9E-03	1.0E+01	5.9E-04	3.7E-03	1.0E+01	3.7E-04
Fluorene	1.1E-03	1.0E+01	1.1E-04	5.1E-03	1.0E+01	5.1E-04	3.2E-03	1.0E+01	3.2E-04
Indeno(1,2,3-cd)pyrene	1.2E-03	1.0E+01	1.2E-04	5.3E-03	1.0E+01	5.3E-04	3.3E-03	1.0E+01	3.3E-04
Phenanthrene	1.2E-03	1.0E+01	1.2E-04	5.5E-03	1.0E+01	5.5E-04	3.4E-03	1.0E+01	3.4E-04
Pyrene	1.2E-03	1.0E+01	1.2E-04	5.5E-03	1.0E+01	5.5E-04	3.4E-03	1.0E+01	3.4E-04
Aldrin	9.8E-05	6.5E-01	1.5E-04	2.7E-04	6.5E-01	4.2E-04	2.4E-04	6.0E-01	4.0E-04
Aroclor-1254	4.2E-02	1.5E+00	2.7E-02	2.8E-01	1.5E+00	1.8E-01	2.6E-01	9.0E-01	2.9E-01
Aroclor-1260	1.3E-01	6.4E+00	2.0E-02	8.8E-01	6.4E+00	1.4E-01	8.1E-01	9.0E-01	9.0E-01
alpha-BHC	1.3E-04	5.0E+00	2.6E-05	8.7E-04	5.0E+00	1.7E-04	7.9E-04	5.0E+00	1.6E-04
alpha-Chlordane	3.8E-04	1.6E+01	2.4E-05	2.9E-03	1.6E+01	1.8E-04	2.6E-03	3.1E-02	8.3E-02

Table S-3.20
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Cotton mouse*			*Short-tailed shrew*			*Meadowlark*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
gamma-Chlordane	3.1E-04	1.6E+01	1.9E-05	2.3E-03	1.6E+01	1.4E-04	2.1E-03	3.1E-02	6.7E-02
4,4'-DDD	1.0E-03	2.0E-01	5.0E-03	7.6E-03	2.0E-01	3.8E-02	7.0E-03	1.4E-01	5.0E-02
4,4'-DDE	1.2E-03	2.0E-01	6.1E-03	8.9E-03	2.0E-01	4.4E-02	8.0E-03	5.8E-01	1.4E-02
4,4'-DDT	4.2E-03	2.0E-01	2.1E-02	2.8E-02	2.0E-01	1.4E-01	2.3E-02	1.4E-01	1.7E-01
Dieldrin	6.7E-04	6.5E-01	1.0E-03	5.1E-03	6.5E-01	7.9E-03	4.7E-03	6.0E-01	7.9E-03
Aluminum	7.4E+00	4.3E+02	1.7E-02	4.3E+01	4.3E+02	1.0E-01	2.8E+01	4.3E+02	6.5E-02
Antimony	5.8E-02	4.2E+01	1.4E-03	1.4E-01	4.2E+01	3.4E-03	9.1E-02	4.2E+01	2.2E-03
Arsenic	9.4E-02	5.8E-01	1.6E-01	4.8E-02	5.8E-01	8.2E-02	3.8E-02	1.0E+00	3.8E-02
Barium	1.5E-01	2.0E+02	7.8E-04	3.6E-01	2.0E+02	1.8E-03	2.0E-01	2.0E+02	1.0E-03
Beryllium	4.8E-03	8.5E-01	5.7E-03	2.6E-02	8.5E-01	3.0E-02	1.6E-02	8.5E-01	1.8E-02
Cadmium	5.4E+01	2.2E+01	2.5E+00	9.7E+00	2.2E+01	4.5E-01	1.4E+01	1.0E+01	1.4E+00
Chromium	2.4E-01	2.5E+01	9.6E-03	1.5E+00	2.5E+01	5.9E-02	1.1E+00	2.5E+01	4.3E-02
Cobalt	4.4E-02	1.3E+01	3.4E-03	3.2E-01	1.3E+01	2.5E-02	2.8E-01	1.3E+01	2.2E-02
Copper	3.3E+00	1.0E+02	3.3E-02	1.5E+00	1.0E+02	1.5E-02	1.5E+00	1.0E+02	1.5E-02
Cyanide	6.1E-01	1.7E+00	3.6E-01	1.5E-01	1.7E+00	9.0E-02	1.7E-01	1.1E+00	1.5E-01
Lead	5.0E-01	2.5E+00	2.0E-01	3.0E+00	2.5E+00	1.2E+00	1.9E+00	6.3E+00	3.1E-01
Manganese	4.1E-01	1.4E+02	2.9E-03	7.7E-01	1.4E+02	5.5E-03	4.6E-01	1.4E+02	3.3E-03
Mercury	3.3E-03	5.0E-01	6.6E-03	3.2E-03	5.0E-01	6.4E-03	2.4E-03	6.4E-02	3.8E-02
Nickel	2.2E-01	1.3E+01	1.7E-02	1.2E+00	1.3E+01	8.9E-02	9.0E-01	1.0E+02	9.0E-03
Selenium	1.9E-02	4.5E-02	4.1E-01	1.3E-01	4.5E-02	2.8E+00	1.1E-01	6.0E-01	1.8E-01
Silver	5.4E-02	6.8E+00	7.9E-03	1.2E-01	6.8E+00	1.7E-02	9.0E-02	6.8E+00	1.3E-02
Vanadium	2.5E-02	8.4E+00	3.0E-03	1.5E-01	8.4E+00	1.8E-02	1.1E-01	1.1E+01	9.7E-03
Zinc	1.1E+01	2.0E+02	5.5E-02	2.4E+01	2.0E+02	1.2E-01	2.2E+01	2.0E+02	1.1E-01
1,2,3,4,6,7,8-HpCDD	2.9E-07	1.0E-05	2.9E-02	1.5E-06	1.0E-05	1.5E-01	8.1E-07	1.4E-04	5.8E-03
1,2,3,4,6,7,8-HpCDF	2.0E-07	1.0E-05	2.0E-02	1.0E-06	1.0E-05	1.0E-01	5.1E-07	1.4E-04	3.6E-03
OCDF	5.6E-09	1.0E-04	5.6E-05	2.9E-08	1.0E-04	2.9E-04	1.4E-08	1.4E-03	1.0E-05
SUMMARY HAZARD INDEX			3.9E+00			5.9E+00			4.0E+00

PDE = Potential Dietary Exposure (mg/kgBW/day) RTV = Reference Toxicity Value (mg/kgBW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.20
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Red fox*			*Great-horned owl*		
	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	7.7E-08	6.0E+02	1.3E-10	2.9E-06	6.0E+02	4.8E-09
Benzene	4.4E-08	1.0E+01	4.4E-09	1.6E-06	1.0E+01	1.6E-07
Carbon disulfide	3.9E-08	1.1E+01	3.5E-09	1.4E-06	1.1E+01	1.3E-07
1,2-Dichloroethene (total)	2.6E-08	9.0E+00	2.9E-09	9.6E-07	9.0E+00	1.1E-07
Methylene chloride	5.3E-08	5.3E+01	1.0E-09	2.0E-06	5.3E+01	3.7E-08
Toluene	3.7E-08	7.6E+01	4.9E-10	1.4E-06	7.6E+01	1.8E-08
Xylene (total)	4.9E-08	5.0E+02	9.8E-11	1.8E-06	5.0E+02	3.7E-09
Acenaphthene	6.0E-06	1.0E+01	6.0E-07	3.9E-04	1.0E+01	3.9E-05
Acenaphthylene	3.6E-06	1.0E+01	3.6E-07	2.3E-04	1.0E+01	2.3E-05
Anthracene	6.8E-06	1.0E+01	6.8E-07	4.4E-04	1.0E+01	4.4E-05
Benzo(a)anthracene	6.0E-06	1.0E+01	6.0E-07	3.9E-04	1.0E+01	3.9E-05
Benzo(a)pyrene	6.4E-06	1.0E+01	6.4E-07	4.2E-04	1.0E+01	4.2E-05
Benzo(b)fluoranthene	6.9E-06	1.0E+01	6.9E-07	4.4E-04	1.0E+01	4.4E-05
Benzo(g,h,i)perylene	6.6E-06	1.0E+01	6.6E-07	4.3E-04	1.0E+01	4.3E-05
Benzo(k)fluoranthene	7.4E-06	1.0E+01	7.4E-07	4.8E-04	1.0E+01	4.8E-05
Benzoic acid	8.9E-05	4.0E+01	2.2E-06	4.6E-03	4.0E+01	1.2E-04
Butylbenzylphthalate	6.7E-06	4.7E+02	1.4E-08	9.7E-04	4.7E+02	2.1E-06
Chrysene	6.5E-06	1.0E+01	6.5E-07	4.2E-04	1.0E+01	4.2E-05
Dibenz(a,h)anthracene	3.6E-06	1.0E+01	3.6E-07	2.3E-04	1.0E+01	2.3E-05
Dibenzofuran	5.3E-06	6.0E+01	8.8E-08	2.8E-04	6.0E+01	4.6E-06
Di-n-butylphthalate	1.3E-05	1.3E+02	1.0E-07	1.9E-03	1.3E+02	1.5E-05
bis(2-Ethylhexyl)phthalate	1.9E-05	3.5E+01	5.3E-07	2.7E-03	3.5E+01	7.7E-05
Fluoranthene	6.8E-06	1.0E+01	6.8E-07	4.4E-04	1.0E+01	4.4E-05
Fluorene	5.9E-06	1.0E+01	5.9E-07	3.8E-04	1.0E+01	3.8E-05
Indeno(1,2,3-cd)pyrene	6.0E-06	1.0E+01	6.0E-07	3.9E-04	1.0E+01	3.9E-05
Phenanthrene	6.3E-06	1.0E+01	6.3E-07	4.1E-04	1.0E+01	4.1E-05
Pyrene	6.3E-06	1.0E+01	6.3E-07	4.1E-04	1.0E+01	4.1E-05
Aldrin	3.1E-07	6.5E-01	4.8E-07	3.3E-05	6.0E-01	5.5E-05
Aroclor-1254	1.3E-03	9.6E-02	1.3E-02	1.7E-01	9.0E+00	1.9E-02
Aroclor-1260	4.0E-03	7.5E-03	5.4E-01	5.4E-01	9.0E+00	6.0E-02
alpha-BHC	6.9E-07	5.0E+00	1.4E-07	1.3E-05	5.0E+00	2.5E-06
alpha-Chlordane	3.8E-06	1.6E+01	2.4E-07	5.6E-04	3.1E-02	1.8E-02
gamma-Chlordane	3.1E-06	1.6E+01	1.9E-07	4.5E-04	3.1E-02	1.4E-02

Table S-3.20
Risk from Potential Lethal Effects for Terrestrial Receptors from Average Exposure Concentrations of CPCs in Surface Soil
South of Child's Street
Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

ANALYTE	*Red fox*			*Great-horned owl*		
	PDE	RTV	HQ	PDE	RTV	HQ
4,4'-DDD	1.5E-05	1.7E+01	8.6E-07	2.8E-03	1.4E-01	2.0E-02
4,4'-DDE	1.8E-05	1.4E+02	1.3E-07	3.2E-03	5.8E-01	5.5E-03
4,4'-DDT	5.6E-05	1.7E+01	3.2E-06	9.9E-03	1.4E-01	7.1E-02
Dieldrin	1.2E-05	6.5E-01	1.8E-05	1.3E-03	6.0E-01	2.2E-03
Aluminum	4.0E-02	4.3E+02	9.5E-05	1.6E+00	4.3E+02	3.7E-03
Antimony	1.4E-04	4.2E+01	3.4E-06	5.0E-03	4.2E+01	1.2E-04
Arsenic	7.6E-05	5.8E-01	1.3E-04	3.4E-03	1.0E+00	3.4E-03
Barium	3.5E-04	2.0E+02	1.8E-06	1.2E-02	2.0E+02	6.0E-05
Beryllium	2.4E-05	8.5E-01	2.8E-05	8.8E-04	8.5E-01	1.0E-03
Cadmium	1.4E-01	2.2E+01	6.4E-03	1.9E+01	1.0E+01	1.9E+00
Chromium	1.7E-03	2.5E+01	6.6E-05	1.1E-01	2.5E+01	4.3E-03
Cobalt	5.8E-04	1.3E+01	4.4E-05	7.0E-02	1.3E+01	5.4E-03
Copper	4.5E-03	1.0E+02	4.5E-05	4.7E-01	1.0E+02	4.7E-03
Cyanide	2.7E-04	1.7E+00	1.6E-04	2.4E-03	1.1E+00	2.1E-03
Lead	2.6E-03	2.5E+00	1.0E-03	7.1E-02	5.0E+01	1.4E-03
Manganese	7.7E-04	1.4E+02	5.5E-06	2.5E-02	1.4E+02	1.8E-04
Mercury	3.5E-06	1.0E-01	3.5E-05	4.5E-04	6.4E-02	7.0E-03
Nickel	1.3E-03	1.3E+01	1.0E-04	8.8E-02	1.0E+02	8.8E-04
Selenium	2.0E-04	2.0E-01	9.9E-04	1.9E-02	6.0E-01	3.2E-02
Silver	1.3E-04	6.8E+00	1.9E-05	6.2E-03	6.8E+00	9.1E-04
Vanadium	1.5E-04	8.4E+00	1.7E-05	6.5E-03	1.1E+01	5.9E-04
Zinc	8.5E-02	2.0E+02	4.2E-04	1.3E+01	2.0E+02	6.6E-02
1,2,3,4,6,7,8-HpCDD	1.4E-09	1.0E-05	1.4E-04	5.1E-08	1.4E-04	3.6E-04
1,2,3,4,6,7,8-HpCDF	9.4E-10	1.0E-05	9.4E-05	3.5E-08	1.4E-04	2.5E-04
OCDF	2.6E-11	1.0E-04	2.6E-07	9.7E-10	1.4E-03	6.9E-07
SUMMARY HAZARD INDEX			5.6E-01			2.2E+00

PDE = Potential Dietary Exposure (mg/kgBW/day) RTV = Reference Toxicity Value (mg/kgBW/day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.21
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	Cotton mouse			Short-tailed shrew			Meadowlark		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	3.3E-03	6.0E+02	5.4E-06	1.9E-03	6.0E+02	3.2E-06	1.9E-04	6.0E+02	3.2E-07
Benzene	5.9E-04	1.0E+01	5.9E-05	1.9E-04	1.0E+01	1.9E-05	2.1E-05	1.0E+01	2.1E-06
2-Butanone	4.6E-04	1.7E+02	2.6E-06	4.9E-04	1.7E+02	2.8E-06	4.5E-05	1.7E+02	2.6E-07
Chlorobenzene	1.5E-04	8.9E+01	1.7E-06	4.8E-05	8.9E+01	5.4E-07	5.1E-06	8.9E+01	5.7E-08
1,2-Dichloroethylene	1.8E-03	9.0E+00	2.0E-04	5.8E-04	9.0E+00	6.5E-05	6.2E-05	9.0E+00	6.8E-06
Ethylbenzene	3.0E-04	2.9E+02	1.0E-06	9.6E-05	2.9E+02	3.3E-07	1.0E-05	2.9E+02	3.5E-08
Methylene chloride	5.9E-05	5.3E+01	1.1E-06	6.3E-05	5.3E+01	1.2E-06	5.9E-06	5.3E+01	1.1E-07
Toluene	3.0E-04	7.6E+01	4.0E-06	1.0E-04	7.6E+01	1.3E-06	1.1E-05	7.6E+01	1.4E-07
Trichloroethylene	4.5E-04	4.8E+02	9.3E-07	1.5E-04	4.8E+02	3.0E-07	1.5E-05	4.8E+02	3.2E-08
Vinyl Chloride	1.0E-03	1.0E+02	1.0E-05	3.4E-04	1.0E+02	3.4E-06	3.6E-05	1.0E+02	3.6E-07
Benzo(a)anthracene	3.3E-04	1.0E+01	3.3E-05	3.5E-04	1.0E+01	3.5E-05	3.3E-05	1.0E+01	3.3E-06
Benzo(a)pyrene	4.0E-04	1.0E+01	4.0E-05	4.3E-04	1.0E+01	4.3E-05	4.0E-05	1.0E+01	4.0E-06
Benzo(b)fluoranthene	7.3E-04	1.0E+01	7.3E-05	7.8E-04	1.0E+01	7.8E-05	7.2E-05	1.0E+01	7.2E-06
Benzo(g,h,i)perylene	2.3E-04	1.0E+01	2.3E-05	2.5E-04	1.0E+01	2.5E-05	2.3E-05	1.0E+01	2.3E-06
Benzo(k)fluoranthene	5.1E-04	1.0E+01	5.1E-05	5.4E-04	1.0E+01	5.4E-05	5.1E-05	1.0E+01	5.1E-06
Chrysene	9.0E-04	1.0E+01	9.0E-05	9.6E-04	1.0E+01	9.6E-05	8.9E-05	1.0E+01	8.9E-06
Fluoranthene	2.3E-03	1.0E+01	2.3E-04	2.5E-03	1.0E+01	2.5E-04	2.3E-04	1.0E+01	2.3E-05
Indeno(1,2,3-cd)Pyrene	3.0E-04	1.0E+01	3.0E-05	3.2E-04	1.0E+01	3.2E-05	3.0E-05	1.0E+01	3.0E-06
Phenanthrene	1.7E-03	1.0E+01	1.7E-04	1.8E-03	1.0E+01	1.8E-04	1.6E-04	1.0E+01	1.6E-05
Pyrene	1.7E-03	1.0E+01	1.7E-04	1.8E-03	1.0E+01	1.8E-04	1.6E-04	1.0E+01	1.6E-05
Aroclor-1260	5.8E-04	6.4E+00	9.1E-05	6.2E-04	6.4E+00	9.7E-05	5.7E-05	9.0E-01	6.4E-05
alpha-Chlordane	8.6E-06	1.6E+01	5.4E-07	9.1E-06	1.6E+01	5.7E-07	8.5E-07	3.1E-02	2.7E-05
gamma-Chlordane	5.7E-06	1.6E+01	3.5E-07	6.0E-06	1.6E+01	3.8E-07	5.6E-07	3.1E-02	1.8E-05
4,4'-DDE	1.4E-05	2.0E-01	6.9E-05	1.5E-05	2.0E-01	7.4E-05	1.4E-06	5.8E-01	2.4E-06
Aluminum	1.2E+01	4.3E+02	2.8E-02	1.2E+01	4.3E+02	2.9E-02	1.2E+00	4.3E+02	2.7E-03
Arsenic	1.6E-02	5.8E-01	2.7E-02	1.6E-02	5.8E-01	2.7E-02	1.5E-03	1.0E+00	1.5E-03
Barium	1.3E-01	2.0E+02	6.3E-04	1.2E-01	2.0E+02	6.1E-04	1.1E-02	2.0E+02	5.7E-05
Beryllium	1.1E-04	8.5E-01	1.3E-04	3.6E-05	8.5E-01	4.2E-05	3.8E-06	8.5E-01	4.5E-06
Cadmium	1.9E-03	2.2E+01	8.6E-05	1.9E-03	2.2E+01	9.0E-05	1.8E-04	1.0E+01	1.8E-05
Chromium	2.1E-02	2.5E+01	8.1E-04	2.1E-02	2.5E+01	8.5E-04	2.0E-03	2.5E+01	7.9E-05

Table S-3.21
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Cotton mouse*			*Short-tailed shrew*			*Meadowlark*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Lead	6.4E-02	2.5E+00	2.6E-02	6.8E-02	2.5E+00	2.7E-02	6.3E-03	6.3E+00	1.0E-03
Manganese	1.5E-01	1.4E+02	1.1E-03	1.5E-01	1.4E+02	1.1E-03	1.4E-02	1.4E+02	1.0E-04
Silver	1.8E-03	6.8E+00	2.7E-04	1.9E-03	6.8E+00	2.8E-04	1.8E-04	6.8E+00	2.6E-05
Vanadium	1.9E-02	8.4E+00	2.3E-03	2.0E-02	8.4E+00	2.4E-03	1.9E-03	1.1E+01	1.7E-04
Zinc	8.4E-02	2.0E+02	4.2E-04	9.0E-02	2.0E+02	4.5E-04	8.3E-03	2.0E+02	4.2E-05
SUMMARY HAZARD INDEX			8.8E-02			9.0E-02			5.9E-03

PDE = Potential Dietary Exposure (mg/kgBW-day). RTV = Reference Toxicity Value (mg/kgBW-day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Great Horned Owl*		
	PDE	RTV	HQ
Acetone	1.2E-05	6.0E+02	2.1E-08
Benzene	2.7E-06	1.0E+01	2.7E-07
2-Butanone	1.1E-06	1.7E+02	6.3E-09
Chlorobenzene	6.8E-07	8.9E+01	7.6E-09
1,2-Dichloroethylene	8.2E-06	9.0E+00	9.1E-07
Ethylbenzene	1.4E-06	2.9E+02	4.7E-09
Methylene chloride	1.4E-07	5.3E+01	2.7E-09
Toluene	1.4E-06	7.6E+01	1.8E-08
Trichloroethylene	2.0E-06	4.8E+02	4.3E-09
Vinyl Chloride	4.8E-06	1.0E+02	4.8E-08
Benzo(a)anthracene	1.1E-06	1.0E+01	1.1E-07
Benzo(a)pyrene	1.3E-06	1.0E+01	1.3E-07
Benzo(b)fluoranthene	2.5E-06	1.0E+01	2.5E-07
Benzo(g,h,i)perylene	7.9E-07	1.0E+01	7.9E-08
Benzo(k)fluoranthene	1.7E-06	1.0E+01	1.7E-07
Chrysene	3.0E-06	1.0E+01	3.0E-07
Fluoranthene	7.9E-06	1.0E+01	7.9E-07
Indeno(1,2,3-cd)Pyrene	1.0E-06	1.0E+01	1.0E-07
Phenanthrene	5.6E-06	1.0E+01	5.6E-07
Pyrene	5.6E-06	1.0E+01	5.6E-07
Aroclor-1260	1.0E-05	9.0E+00	1.1E-06
alpha-Chlordane	4.0E-08	3.1E-02	1.3E-06
gamma-Chlordane	2.7E-08	3.1E-02	8.6E-07
4,4'-DDE	1.0E-07	5.8E-01	1.8E-07
Aluminum	3.2E-02	4.3E+02	7.6E-05
Arsenic	4.7E-05	1.0E+00	4.7E-05
Barium	3.4E-04	2.0E+02	1.7E-06
Beryllium	5.2E-07	8.5E-01	6.2E-07
Cadmium	2.0E-05	1.0E+01	2.0E-06
Chromium	7.3E-05	2.5E+01	2.9E-06

Table S-3.21
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Grassy Drainage Ditches

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Great Horned Owl*		
	PDE	RTV	HQ
Lead	1.6E-04	5.0E+01	3.2E-06
Manganese	4.2E-04	1.4E+02	3.0E-06
Silver	5.6E-06	6.8E+00	8.3E-07
Vanadium	5.5E-05	1.1E+01	5.0E-06
Zinc	9.1E-04	2.0E+02	4.6E-06
SUMMARY HAZARD INDEX			1.5E-04

PDE = Potential Dietary Exposure (mg/kgBW-day). RTV = Reference Toxicity Value (mg/kgBW-day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-[illegible]
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Short-tailed shrew*			*American woodcock*			*Raccoon*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	2.0E-03	6.0E+02	3.3E-06	4.1E-05	6.0E+02	6.8E-08	7.2E-06	6.0E+02	1.2E-08
Benzene	1.1E-03	1.0E+01	1.1E-04	2.1E-05	1.0E+01	2.1E-06	3.8E-06	1.0E+01	3.8E-07
2-Butanone	1.2E-04	1.7E+02	6.7E-07	3.5E-06	1.7E+02	2.0E-08	5.4E-07	1.7E+02	3.1E-09
Chlorobenzene	7.5E-04	8.9E+01	8.4E-06	1.4E-05	8.9E+01	1.6E-07	2.6E-06	8.9E+01	2.9E-08
1,1-Dichloroethane	4.9E-04	9.8E+01	5.0E-06	9.0E-06	9.8E+01	9.2E-08	1.7E-06	9.8E+01	1.7E-08
1,2-Dichloroethylene	1.3E-03	9.0E+00	1.4E-04	2.4E-05	9.0E+00	2.6E-06	4.3E-06	9.0E+00	4.8E-07
Methylene chloride	1.2E-03	5.3E+01	2.3E-05	2.2E-05	5.3E+01	4.3E-07	4.1E-06	5.3E+01	7.7E-08
1,1,2,2-Tetrachloroethane	4.6E-04	3.2E+00	1.4E-04	8.2E-06	3.2E+00	2.6E-06	1.5E-06	3.2E+00	4.8E-07
Tetrachloroethylene	7.8E-05	1.0E+02	7.8E-07	2.4E-06	1.0E+02	2.4E-08	3.7E-07	1.0E+02	3.7E-09
Toluene	6.5E-05	7.6E+01	8.5E-07	2.0E-06	7.6E+01	2.6E-08	3.1E-07	7.6E+01	4.0E-09
Trichloroethylene	1.7E-03	4.8E+02	3.6E-06	3.1E-05	4.8E+02	6.5E-08	5.8E-06	4.8E+02	1.2E-08
Vinyl chloride	1.2E-03	1.0E+02	1.2E-05	2.2E-05	1.0E+02	2.2E-07	4.0E-06	1.0E+02	4.0E-08
Xylenes (total)	4.9E-05	5.0E+02	9.9E-08	1.5E-06	5.0E+02	3.0E-09	2.3E-07	5.0E+02	4.6E-10
Acenaphthene	2.2E-03	1.0E+01	2.2E-04	6.2E-05	1.0E+01	6.2E-06	3.5E-04	1.0E+01	3.5E-05
Benzo(a)anthracene	1.3E-03	1.0E+01	1.3E-04	4.1E-05	1.0E+01	4.1E-06	2.6E-05	1.0E+01	2.6E-06
Benzo(a)pyrene	2.0E-03	1.0E+01	2.0E-04	6.0E-05	1.0E+01	6.0E-06	3.9E-05	1.0E+01	3.9E-06
Benzo(b)fluoranthene	1.3E-03	1.0E+01	1.3E-04	3.9E-05	1.0E+01	3.9E-06	2.5E-05	1.0E+01	2.5E-06
Benzo(g,h,i)perylene	9.2E-04	1.0E+01	9.2E-05	2.8E-05	1.0E+01	2.8E-06	1.8E-05	1.0E+01	1.8E-06
Benzo(k)fluoranthene	1.1E-03	1.0E+01	1.1E-04	3.4E-05	1.0E+01	3.4E-06	2.2E-05	1.0E+01	2.2E-06
Chrysene	2.1E-03	1.0E+01	2.1E-04	6.4E-05	1.0E+01	6.4E-06	4.1E-05	1.0E+01	4.1E-06
Dibenzofuran	2.3E-04	6.0E+01	3.8E-06	4.1E-06	6.0E+01	6.8E-08	3.0E-04	6.0E+01	5.1E-06
Di-n-butylphthalate	8.0E-04	1.3E+02	6.4E-06	1.4E-05	1.3E+02	1.1E-07	7.9E-03	1.3E+02	6.3E-05
Di-n-octylphthalate	2.2E-03	1.3E+02	1.7E-05	5.8E-05	1.3E+02	4.6E-07	1.2E-02	1.3E+02	9.8E-05
bis(2-Ethylhexyl) phthalate	6.7E-03	3.5E+01	1.9E-04	1.9E-04	3.5E+01	5.6E-06	7.4E-04	3.5E+01	2.1E-05
Fluoranthene	2.9E-03	1.0E+01	2.9E-04	8.9E-05	1.0E+01	8.9E-06	5.7E-05	1.0E+01	5.7E-06
Indeno(1,2,3-cd)pyrene	8.5E-04	1.0E+01	8.5E-05	2.6E-05	1.0E+01	2.6E-06	1.7E-05	1.0E+01	1.7E-06
Phenanthrene	8.6E-04	1.0E+01	8.6E-05	2.6E-05	1.0E+01	2.6E-06	1.7E-05	1.0E+01	1.7E-06
Phenol	1.3E-03	2.0E+01	6.6E-05	3.4E-05	2.0E+01	1.7E-06	6.9E-04	2.0E+01	3.5E-05
Pyrene	2.8E-03	1.0E+01	2.8E-04	8.4E-05	1.0E+01	8.4E-06	5.4E-05	1.0E+01	5.4E-06
Aroclor-1248	2.2E-03	6.4E+00	3.5E-04	6.8E-05	9.0E-01	7.6E-05	1.7E-03	7.5E-03	2.3E-01

Table S-3.22
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Short-tailed shrew*			*American woodcock*			*Raccoon*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Aroclor-1260	4.7E-02	6.4E+00	7.3E-03	1.4E-03	9.0E-01	1.6E-03	3.6E-02	7.5E-03	4.8E+00
alpha-Chlordane	1.5E-04	1.6E+01	9.4E-06	4.6E-06	3.1E-02	1.5E-04	5.9E-06	1.6E+01	3.7E-07
gamma-Chlordane	9.7E-05	1.6E+01	6.0E-06	3.0E-06	3.1E-02	9.5E-05	3.8E-06	1.6E+01	2.4E-07
4,4'-DDD	5.6E-04	2.0E-01	2.8E-03	1.7E-05	1.4E-01	1.2E-04	7.3E-04	1.7E+01	4.2E-05
4,4'-DDE	3.7E-04	2.0E-01	1.9E-03	1.1E-05	5.8E-01	2.0E-05	4.9E-04	1.4E+02	3.5E-06
4,4'-DDT	2.2E-04	2.0E-01	1.1E-03	6.7E-06	1.4E-01	4.8E-05	2.9E-04	1.7E+01	1.7E-05
Aluminum	2.7E+01	4.3E+02	6.4E-02	8.3E-01	4.3E+02	1.9E-03	2.5E-01	4.3E+02	6.0E-04
Antimony	5.5E-03	4.2E+01	1.3E-04	9.9E-05	4.2E+01	2.4E-06	2.9E-05	4.2E+01	6.9E-07
Arsenic	1.5E-02	5.8E-01	2.6E-02	4.4E-04	1.0E+00	4.4E-04	1.1E-03	5.8E-01	1.9E-03
Barium	2.0E-01	2.0E+02	9.9E-04	5.7E-03	2.0E+02	2.9E-05	1.1E-03	2.0E+02	5.4E-06
Beryllium	6.5E-03	8.5E-01	7.6E-03	2.0E-04	8.5E-01	2.3E-04	5.0E-05	8.5E-01	5.9E-05
Cadmium	1.2E-02	2.2E+01	5.6E-04	3.6E-04	1.0E+01	3.6E-05	1.5E-03	2.2E+01	7.1E-05
Chromium	1.3E-01	2.5E+01	5.2E-03	4.0E-03	2.5E+01	1.6E-04	2.9E-03	2.5E+01	1.1E-04
Cobalt	1.1E-03	1.3E+01	8.1E-05	1.9E-05	1.3E+01	1.4E-06	6.1E-04	1.3E+01	4.7E-05
Copper	2.0E-01	1.0E+02	2.0E-03	6.0E-03	1.0E+02	6.0E-05	8.2E-03	1.0E+02	8.2E-05
Cyanide	3.3E-03	1.7E+00	1.9E-03	8.1E-05	1.1E+00	7.4E-05	1.3E-05	1.7E+00	7.8E-06
Lead	3.8E-01	2.5E+00	1.5E-01	1.2E-02	6.3E+00	1.9E-03	2.2E-03	2.5E+00	8.6E-04
Manganese	2.6E-01	1.4E+02	1.8E-03	7.5E-03	1.4E+02	5.4E-05	7.3E-02	1.4E+02	5.2E-04
Mercury	2.8E-03	5.0E-01	5.6E-03	8.6E-05	6.4E-02	1.3E-03	3.0E-03	1.0E-01	3.0E-02
Nickel	3.3E-03	1.3E+01	2.5E-04	5.9E-05	1.0E+02	5.9E-07	6.4E-04	1.3E+01	4.9E-05
Selenium	1.3E-02	4.5E-02	2.9E-01	4.0E-04	6.0E-01	6.6E-04	6.6E-04	2.0E-01	3.3E-03
Silver	2.0E-02	6.8E+00	2.9E-03	5.9E-04	6.8E+00	8.7E-05	2.7E-04	6.8E+00	4.0E-05
Thallium	1.9E-02	7.0E-01	2.7E-02	5.7E-04	7.0E-01	8.1E-04	2.4E-03	7.0E-01	3.4E-03
Vanadium	6.0E-02	8.4E+00	7.1E-03	1.8E-03	1.1E+01	1.7E-04	7.5E-04	8.4E+00	8.9E-05
Zinc	6.1E-01	2.0E+02	3.0E-03	1.8E-02	2.0E+02	9.2E-05	8.1E-02	2.0E+02	4.1E-04
OCDD	6.8E-06	1.0E-04	6.8E-02	2.1E-07	1.4E-03	1.5E-04	3.4E-08	1.0E-04	3.4E-04
2,3,7,8-TCDF	3.8E-07	1.0E-06	3.8E-01	1.2E-08	1.4E-05	8.3E-04	9.4E-09	1.0E-06	9.4E-03
SUMMARY HAZARD INDEX			1.1E+00			1.1E-02			5.1E+00

PDE = Potential Dietary Exposure (mg/kgBW-day). RTV = Reference Toxicity Value (mg/kgBW-day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.22
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Great Horned Owl*			*Great Blue Heron*		
	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	8.2E-05	6.0E+02	1.4E-07	5.2E-04	6.0E+02	8.7E-07
Benzene	5.5E-05	1.0E+01	5.5E-06	2.3E-04	1.0E+01	2.3E-05
2-Butanone	9.2E-07	1.7E+02	5.3E-09	5.9E-05	1.7E+02	3.4E-07
Chlorobenzene	3.5E-05	8.9E+01	3.9E-07	1.7E-04	8.9E+01	1.9E-06
1,1-Dichloroethane	2.3E-05	9.8E+01	2.4E-07	1.0E-04	9.8E+01	1.1E-06
1,2-Dichloroethylene	6.2E-05	9.0E+00	6.9E-06	2.7E-04	9.0E+00	3.0E-05
Methylene chloride	5.5E-05	5.3E+01	1.0E-06	2.7E-04	5.3E+01	5.1E-06
1,1,2,2-Tetrachloroethane	2.3E-05	3.2E+00	7.2E-06	9.1E-05	3.2E+00	2.8E-05
Tetrachloroethylene	6.3E-07	1.0E+02	6.3E-09	4.0E-05	1.0E+02	4.0E-07
Toluene	5.2E-07	7.6E+01	6.8E-09	3.3E-05	7.6E+01	4.4E-07
Trichloroethylene	8.4E-05	4.8E+02	1.7E-07	3.6E-04	4.8E+02	7.5E-07
Vinyl chloride	6.1E-05	1.0E+02	6.1E-07	2.4E-04	1.0E+02	2.4E-06
Xylenes (total)	3.9E-07	5.0E+02	7.9E-10	2.5E-05	5.0E+02	5.0E-08
Acenaphthene	7.1E-05	1.0E+01	7.1E-06	1.4E-01	1.0E+01	1.4E-02
Benzo(a)anthracene	3.1E-05	1.0E+01	3.1E-06	8.7E-03	1.0E+01	8.7E-04
Benzo(a)pyrene	4.6E-05	1.0E+01	4.6E-06	1.3E-02	1.0E+01	1.3E-03
Benzo(b)fluoranthene	3.0E-05	1.0E+01	3.0E-06	8.2E-03	1.0E+01	8.2E-04
Benzo(g,h,i)perylene	2.1E-05	1.0E+01	2.1E-06	5.9E-03	1.0E+01	5.9E-04
Benzo(k)fluoranthene	2.6E-05	1.0E+01	2.6E-06	7.3E-03	1.0E+01	7.3E-04
Chrysene	4.9E-05	1.0E+01	4.9E-06	1.4E-02	1.0E+01	1.4E-03
Dibenzofuran	1.4E-05	6.0E+01	2.3E-07	1.2E-01	6.0E+01	2.0E-03
Di-n-butylphthalate	1.4E-04	1.3E+02	1.1E-06	3.1E+00	1.3E+02	2.5E-02
Di-n-octylphthalate	3.1E-04	1.3E+02	2.5E-06	4.9E+00	1.3E+02	3.9E-02
bis(2-Ethylhexyl) phthalate	9.0E-04	3.5E+01	2.6E-05	2.9E-01	3.5E+01	8.2E-03
Fluoranthene	6.8E-05	1.0E+01	6.8E-06	1.9E-02	1.0E+01	1.9E-03
Indeno(1,2,3-cd)pyrene	2.0E-05	1.0E+01	2.0E-06	5.5E-03	1.0E+01	5.5E-04
Phenanthrene	2.0E-05	1.0E+01	2.0E-06	5.6E-03	1.0E+01	5.6E-04
Phenol	4.3E-05	2.0E+01	2.1E-06	2.8E-01	2.0E+01	1.4E-02
Pyrene	6.4E-05	1.0E+01	6.4E-06	1.8E-02	1.0E+01	1.8E-03
Aroclor-1248	5.6E-04	9.0E+00	6.2E-05	6.8E-01	9.0E+00	7.6E-02

Table S-3.22
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Great Horned Owl*			*Great Blue Heron*		
	PDE	RTV	HQ	PDE	RTV	HQ
Aroclor-1260	1.2E-02	9.0E+00	1.3E-03	1.4E+01	9.0E+00	1.6E+00
alpha-Chlordane	6.7E-06	3.1E-02	2.1E-04	2.1E-03	3.1E-02	6.9E-02
gamma-Chlordane	4.3E-06	3.1E-02	1.4E-04	1.4E-03	3.1E-02	4.4E-02
4,4'-DDD	4.8E-05	1.4E-01	3.4E-04	2.9E-01	1.4E-01	2.1E+00
4,4'-DDE	3.2E-05	5.8E-01	5.6E-05	2.0E-01	5.8E-01	3.4E-01
4,4'-DDT	1.9E-05	1.4E-01	1.4E-04	1.1E-01	1.4E-01	8.2E-01
Aluminum	3.5E-01	4.3E+02	8.3E-04	6.4E+01	4.3E+02	1.5E-01
Antimony	3.0E-04	4.2E+01	7.1E-06	5.3E-03	4.2E+01	1.3E-04
Arsenic	3.0E-04	1.0E+00	3.0E-04	4.2E-01	1.0E+00	4.2E-01
Barium	2.7E-03	2.0E+02	1.4E-05	1.7E-01	2.0E+02	8.4E-04
Beryllium	7.8E-05	8.5E-01	9.2E-05	1.1E-02	8.5E-01	1.3E-02
Cadmium	1.8E-03	1.0E+01	1.8E-04	6.0E-01	1.0E+01	6.0E-02
Chromium	3.4E-03	2.5E+01	1.4E-04	9.7E-01	2.5E+01	3.9E-02
Cobalt	1.2E-04	1.3E+01	9.3E-06	2.4E-01	1.3E+01	1.9E-02
Copper	9.4E-03	1.0E+02	9.4E-05	3.0E+00	1.0E+02	3.0E-02
Cyanide	8.6E-05	1.1E+00	7.8E-05	1.2E-03	1.1E+00	1.1E-03
Lead	3.5E-03	5.0E+01	7.0E-05	3.4E-01	5.0E+01	6.8E-03
Manganese	3.4E-03	1.4E+02	2.5E-05	2.9E+01	1.4E+02	2.1E-01
Mercury	2.9E-05	6.4E-02	4.5E-04	1.2E+00	6.4E-02	1.8E+01
Nickel	2.3E-04	1.0E+02	2.3E-06	2.5E-01	1.0E+02	2.5E-03
Selenium	7.7E-04	6.0E-01	1.3E-03	2.4E-01	6.0E-01	4.1E-01
Silver	3.7E-04	6.8E+00	5.5E-05	8.1E-02	6.8E+00	1.2E-02
Thallium	2.6E-03	7.0E-01	3.7E-03	9.3E-01	7.0E-01	1.3E+00
Vanadium	9.6E-04	1.1E+01	8.7E-05	2.2E-01	1.1E+01	2.0E-02
Zinc	8.7E-02	2.0E+02	4.4E-04	3.2E+01	2.0E+02	1.6E-01
OCDD	5.8E-08	1.4E-03	4.2E-05	4.4E-06	1.4E-03	3.2E-03
2,3,7,8-TCDF	1.6E-08	1.4E-05	1.1E-03	3.2E-06	1.4E-05	2.3E-01
SUMMARY HAZARD INDEX			1.1E-02			2.7E+01

PDE = Potential Dietary Exposure (mg/kgBW-day). RTV = Reference Toxicity Value (mg/kgBW-day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Average Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	Short-tailed shrew			Raccoon			Great Blue Heron		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Acetone	1.7E-03	6.0E+02	2.8E-06	5.9E-06	6.0E+02	9.8E-09	4.2E-04	6.0E+02	7.0E-07
Benzene	9.8E-04	1.0E+01	9.8E-05	3.3E-06	1.0E+01	3.3E-07	2.1E-04	1.0E+01	2.1E-05
2-Butanone	8.8E-05	1.7E+02	5.1E-07	4.1E-07	1.7E+02	2.4E-09	4.5E-05	1.7E+02	2.6E-07
Chlorobenzene	7.4E-04	8.9E+01	8.3E-06	2.5E-06	8.9E+01	2.8E-08	1.6E-04	8.9E+01	1.8E-06
1,1-Dichloroethane	4.9E-04	9.8E+01	5.0E-06	1.7E-06	9.8E+01	1.7E-08	1.0E-04	9.8E+01	1.1E-06
1,2-Dichloroethylene	1.1E-03	9.0E+00	1.2E-04	3.6E-06	9.0E+00	4.0E-07	2.3E-04	9.0E+00	2.5E-05
Methylene chloride	1.0E-03	5.3E+01	1.9E-05	3.5E-06	5.3E+01	6.7E-08	2.3E-04	5.3E+01	4.3E-06
1,1,2,2-Tetrachloroethane	4.6E-04	3.2E+00	1.4E-04	1.5E-06	3.2E+00	4.8E-07	9.1E-05	3.2E+00	2.8E-05
Tetrachloroethylene	6.1E-05	1.0E+02	6.1E-07	2.9E-07	1.0E+02	2.9E-09	3.1E-05	1.0E+02	3.1E-07
Toluene	5.0E-05	7.6E+01	6.6E-07	2.4E-07	7.6E+01	3.1E-09	2.6E-05	7.6E+01	3.4E-07
Trichloroethylene	1.4E-03	4.8E+02	2.9E-06	4.7E-06	4.8E+02	9.7E-09	2.9E-04	4.8E+02	6.0E-07
Vinyl chloride	1.2E-03	1.0E+02	1.2E-05	3.9E-06	1.0E+02	3.9E-08	2.3E-04	1.0E+02	2.3E-06
Xylenes (total)	4.9E-05	5.0E+02	9.9E-08	2.3E-07	5.0E+02	4.6E-10	2.5E-05	5.0E+02	5.0E-08
Acenaphthene	2.2E-03	1.0E+01	2.2E-04	3.5E-04	1.0E+01	3.5E-05	1.4E-01	1.0E+01	1.4E-02
Benzo(a)anthracene	1.3E-03	1.0E+01	1.3E-04	2.6E-05	1.0E+01	2.6E-06	8.7E-03	1.0E+01	8.7E-04
Benzo(a)pyrene	2.0E-03	1.0E+01	2.0E-04	3.9E-05	1.0E+01	3.9E-06	1.3E-02	1.0E+01	1.3E-03
Benzo(b)fluoranthene	1.3E-03	1.0E+01	1.3E-04	2.5E-05	1.0E+01	2.5E-06	8.2E-03	1.0E+01	8.2E-04
Benzo(g,h,i)perylene	9.2E-04	1.0E+01	9.2E-05	1.8E-05	1.0E+01	1.8E-06	5.9E-03	1.0E+01	5.9E-04
Benzo(k)fluoranthene	1.1E-03	1.0E+01	1.1E-04	2.2E-05	1.0E+01	2.2E-06	7.3E-03	1.0E+01	7.3E-04
Chrysene	2.1E-03	1.0E+01	2.1E-04	4.1E-05	1.0E+01	4.1E-06	1.4E-02	1.0E+01	1.4E-03
Dibenzofuran	2.3E-04	6.0E+01	3.8E-06	3.0E-04	6.0E+01	5.1E-06	1.2E-01	6.0E+01	2.0E-03
Di-n-butylphthalate	8.0E-04	1.3E+02	6.4E-06	7.9E-03	1.3E+02	6.3E-05	3.1E+00	1.3E+02	2.5E-02
Di-n-octylphthalate	2.2E-03	1.3E+02	1.7E-05	1.2E-02	1.3E+02	9.8E-05	4.9E+00	1.3E+02	3.9E-02
bis(2-Ethylhexyl) phthalate	5.6E-03	3.5E+01	1.6E-04	6.1E-04	3.5E+01	1.7E-05	2.4E-01	3.5E+01	6.7E-03
Fluoranthene	2.2E-03	1.0E+01	2.2E-04	4.2E-05	1.0E+01	4.2E-06	1.4E-02	1.0E+01	1.4E-03
Indeno(1,2,3-cd)pyrene	8.5E-04	1.0E+01	8.5E-05	1.7E-05	1.0E+01	1.7E-06	5.5E-03	1.0E+01	5.5E-04
Phenanthrene	8.6E-04	1.0E+01	8.6E-05	1.7E-05	1.0E+01	1.7E-06	5.6E-03	1.0E+01	5.6E-04
Phenol	1.3E-03	2.0E+01	6.6E-05	6.9E-04	2.0E+01	3.5E-05	2.8E-01	2.0E+01	1.4E-02
Pyrene	2.1E-03	1.0E+01	2.1E-04	4.2E-05	1.0E+01	4.2E-06	1.4E-02	1.0E+01	1.4E-03
Aroclor-1248	1.2E-03	6.4E+00	1.9E-04	9.2E-04	7.5E-03	1.2E-01	3.7E-01	9.0E+00	4.1E-02

Table S-3.23
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Average Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
Forested Streams

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Short-tailed shrew*			*Raccoon*			*Great Blue Heron*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Aroclor-1260	8.5E-03	6.4E+00	1.3E-03	6.5E-03	7.5E-03	8.7E-01	2.6E+00	9.0E+00	2.9E-01
alpha-Chlordane	9.0E-05	1.6E+01	5.6E-06	3.5E-06	1.6E+01	2.2E-07	1.3E-03	3.1E-02	4.1E-02
gamma-Chlordane	6.0E-05	1.6E+01	3.8E-06	2.3E-06	1.6E+01	1.5E-07	8.5E-04	3.1E-02	2.8E-02
4,4'-DDD	2.8E-04	2.0E-01	1.4E-03	3.7E-04	1.7E+01	2.1E-05	1.5E-01	1.4E-01	1.0E+00
4,4'-DDE	1.5E-04	2.0E-01	7.5E-04	2.0E-04	1.4E+02	1.4E-06	7.9E-02	5.8E-01	1.4E-01
4,4'-DDT	1.8E-04	2.0E-01	9.1E-04	2.4E-04	1.7E+01	1.4E-05	9.6E-02	1.4E-01	6.8E-01
Aluminum	1.8E+01	4.3E+02	4.3E-02	1.7E-01	4.3E+02	4.0E-04	4.3E+01	4.3E+02	1.0E-01
Antimony	4.4E-03	4.2E+01	1.0E-04	2.3E-05	4.2E+01	5.5E-07	4.2E-03	4.2E+01	1.0E-04
Arsenic	9.6E-03	5.8E-01	1.7E-02	6.6E-04	5.8E-01	1.1E-03	2.5E-01	1.0E+00	2.5E-01
Barium	1.3E-01	2.0E+02	6.6E-04	7.4E-04	2.0E+02	3.8E-06	1.2E-01	2.0E+02	6.3E-04
Beryllium	6.5E-03	8.5E-01	7.6E-03	5.0E-05	8.5E-01	5.9E-05	1.1E-02	8.5E-01	1.3E-02
Cadmium	8.2E-03	2.2E+01	3.8E-04	1.1E-03	2.2E+01	4.9E-05	4.1E-01	1.0E+01	4.1E-02
Chromium	6.0E-02	2.5E+01	2.4E-03	1.3E-03	2.5E+01	5.2E-05	4.4E-01	2.5E+01	1.8E-02
Cobalt	1.1E-03	1.3E+01	8.1E-05	6.1E-04	1.3E+01	4.7E-05	2.4E-01	1.3E+01	1.9E-02
Copper	6.1E-02	1.0E+02	6.1E-04	2.5E-03	1.0E+02	2.5E-05	9.1E-01	1.0E+02	9.1E-03
Cyanide	2.7E-03	1.7E+00	1.6E-03	1.1E-05	1.7E+00	6.7E-06	1.1E-03	1.1E+00	1.0E-03
Lead	1.7E-01	2.5E+00	6.9E-02	9.8E-04	2.5E+00	3.9E-04	1.5E-01	5.0E+01	3.1E-03
Manganese	1.1E-01	1.4E+02	8.1E-04	5.0E-02	1.4E+02	3.6E-04	2.0E+01	1.4E+02	1.4E-01
Mercury	2.3E-03	5.0E-01	4.7E-03	2.4E-03	1.0E-01	2.4E-02	9.7E-01	6.4E-02	1.5E+01
Nickel	2.6E-03	1.3E+01	2.0E-04	5.1E-04	1.3E+01	3.9E-05	2.0E-01	1.0E+02	2.0E-03
Selenium	7.5E-03	4.5E-02	1.7E-01	3.6E-04	2.0E-01	1.8E-03	1.4E-01	6.0E-01	2.3E-01
Silver	1.6E-02	6.8E+00	2.4E-03	2.2E-04	6.8E+00	3.2E-05	6.6E-02	6.8E+00	9.7E-03
Thallium	1.4E-02	7.0E-01	2.0E-02	1.7E-03	7.0E-01	2.5E-03	6.8E-01	7.0E-01	9.7E-01
Vanadium	4.2E-02	8.4E+00	5.0E-03	5.2E-04	8.4E+00	6.2E-05	1.5E-01	1.1E+01	1.4E-02
Zinc	2.4E-01	2.0E+02	1.2E-03	3.2E-02	2.0E+02	1.6E-04	1.2E+01	2.0E+02	6.2E-02
OCDD	3.7E-06	1.0E-04	3.7E-02	1.9E-08	1.0E-04	1.9E-04	2.4E-06	1.4E-03	1.7E-03
2,3,7,8-TCDF	2.1E-07	1.0E-06	2.1E-01	5.2E-09	1.0E-06	5.2E-03	1.8E-06	1.4E-05	1.3E-01
SUMMARY HAZARD INDEX			6.0E-01			1.0E+00			2.0E+01

PDE = Potential Dietary Exposure (mg/kgBW-day). RTV = Reference Toxicity Value (mg/kgBW-day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.24
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Muskrat*			*Spotted sandpiper*			*Raccoon*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Carbon disulfide	1.3E-05	1.1E+01	1.2E-06	9.9E-07	1.1E+01	9.0E-08	3.9E-09	1.1E+01	3.5E-10
Acenaphthene	2.0E-03	1.0E+01	2.0E-04	6.3E-04	1.0E+01	6.3E-05	2.5E-06	1.0E+01	2.5E-07
Benzo(a)anthracene	7.9E-04	1.0E+01	7.9E-05	2.5E-04	1.0E+01	2.5E-05	9.8E-07	1.0E+01	9.8E-08
Benzo(b)fluoranthene	2.0E-03	1.0E+01	2.0E-04	6.3E-04	1.0E+01	6.3E-05	2.5E-06	1.0E+01	2.5E-07
Chrysene	9.9E-04	1.0E+01	9.9E-05	3.1E-04	1.0E+01	3.1E-05	1.2E-06	1.0E+01	1.2E-07
bis(2-Ethylhexyl) phthalate	2.9E-03	3.5E+01	8.4E-05	6.3E-03	3.5E+01	1.8E-04	2.5E-05	3.5E+01	7.1E-07
Fluoranthene	2.6E-03	1.0E+01	2.6E-04	8.2E-04	1.0E+01	8.2E-05	3.3E-06	1.0E+01	3.3E-07
Pyrene	2.3E-03	1.0E+01	2.3E-04	7.1E-04	1.0E+01	7.1E-05	2.8E-06	1.0E+01	2.8E-07
Aroclor-1260	1.9E-03	6.4E+00	2.9E-04	2.3E-02	9.0E-01	2.5E-02	8.9E-05	7.5E-03	1.2E-02
gamma-BHC (Lindane)	1.3E-05	5.0E+00	2.6E-06	2.7E-06	5.0E+00	5.4E-07	1.1E-08	5.0E+00	2.1E-09
alpha-Chlordane	2.1E-05	1.6E+01	1.3E-06	1.3E-05	3.1E-02	4.2E-04	5.2E-08	1.6E+01	3.2E-09
gamma-Chlordane	1.8E-05	1.6E+01	1.1E-06	1.1E-05	3.1E-02	3.6E-04	4.4E-08	1.6E+01	2.7E-09
4,4'-DDE	1.6E-05	2.0E-01	7.9E-05	3.3E-04	5.8E-01	5.7E-04	1.3E-06	1.4E+02	9.4E-09
Aluminum	1.1E+01	4.3E+02	2.5E-02	1.6E+00	4.3E+02	3.8E-03	6.4E-03	4.3E+02	1.5E-05
Antimony	1.1E-03	4.2E+01	2.6E-05	1.5E-04	4.2E+01	3.7E-06	8.1E-07	4.2E+01	1.9E-08
Arsenic	5.4E-03	5.8E-01	9.2E-03	9.3E-04	1.0E+00	9.3E-04	3.7E-06	5.8E-01	6.3E-06
Barium	6.7E-02	2.0E+02	3.4E-04	6.4E-03	2.0E+02	3.2E-05	2.6E-05	2.0E+02	1.3E-07
Beryllium	1.9E-02	8.5E-01	2.3E-02	2.4E-03	8.5E-01	2.8E-03	9.4E-06	8.5E-01	1.1E-05
Cadmium	2.6E-03	2.2E+01	1.2E-04	5.6E-03	1.0E+01	5.6E-04	2.2E-05	2.2E+01	1.0E-06
Chromium	4.2E-02	2.5E+01	1.7E-03	1.5E-02	2.5E+01	5.9E-04	5.9E-05	2.5E+01	2.3E-06
Cobalt	7.9E-03	1.3E+01	6.1E-04	1.3E-02	1.3E+01	1.0E-03	5.1E-05	1.3E+01	4.0E-06
Copper	4.1E-02	1.0E+02	4.1E-04	2.7E-02	1.0E+02	2.7E-04	1.1E-04	1.0E+02	1.1E-06
Lead	1.0E-01	2.5E+00	4.0E-02	9.0E-03	6.3E+00	1.4E-03	3.6E-05	2.5E+00	1.4E-05
Manganese	1.1E-01	1.4E+02	8.0E-04	5.0E-01	1.4E+02	3.5E-03	2.0E-03	1.4E+02	1.4E-05
Selenium	9.3E-03	4.5E-02	2.1E-01	7.6E-03	6.0E-01	1.3E-02	3.0E-05	2.0E-01	1.5E-04

Table S-3.24
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment
River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Muskrat*			*Spotted sandpiper*			*Raccoon*		
	PDE	RTV	HQ	PDE	RTV	HQ	PDE	RTV	HQ
Vanadium	2.9E-02	8.4E+00	3.5E-03	5.8E-03	1.1E+01	5.3E-04	2.3E-05	8.4E+00	2.7E-06
Zinc	2.1E-01	2.0E+02	1.0E-03	4.5E-01	2.0E+02	2.2E-03	1.8E-03	2.0E+02	8.9E-06
1,2,3,4,6,7,8-HpCDD	3.4E-06	1.0E-05	3.4E-01	2.8E-07	1.4E-04	2.0E-03	1.1E-09	1.0E-05	1.1E-04
OCDD	2.2E-05	1.0E-04	2.2E-01	1.8E-06	1.4E-03	1.3E-03	7.0E-09	1.0E-04	7.0E-05
OCDF	3.3E-06	1.0E-04	3.3E-02	2.5E-07	1.4E-03	1.8E-04	1.0E-09	1.0E-04	1.0E-05
SUMMARY HAZARD INDEX			9.1E-01			6.1E-02			1.2E-02

PDE = Potential Dietary Exposure (mg/kgBW-day). RTV = Reference Toxicity Value (mg/kgBW-day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

Table S-3.24
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Great Blue Heron*			*Osprey*		
	PDE	RTV	HQ	PDE	RTV	HQ
Carbon disulfide	9.6E-07	1.1E+01	8.7E-08	0.0E+00	1.1E+01	0.0E+00
Acenaphthene	1.9E-03	1.0E+01	1.9E-04	6.5E-04	1.0E+01	6.5E-05
Benzo(a)anthracene	7.3E-04	1.0E+01	7.3E-05	2.6E-04	1.0E+01	2.6E-05
Benzo(b)fluoranthene	1.9E-03	1.0E+01	1.9E-04	6.5E-04	1.0E+01	6.5E-05
Chrysene	9.1E-04	1.0E+01	9.1E-05	3.2E-04	1.0E+01	3.2E-05
bis(2-Ethylhexyl) phthalate	2.2E-02	3.5E+01	6.3E-04	8.3E-03	3.5E+01	2.4E-04
Fluoranthene	2.4E-03	1.0E+01	2.4E-04	8.6E-04	1.0E+01	8.6E-05
Pyrene	2.1E-03	1.0E+01	2.1E-04	7.4E-04	1.0E+01	7.4E-05
Aroclor-1260	8.0E-02	9.0E+00	8.9E-03	3.1E-02	9.0E+00	3.4E-03
gamma-BHC (Lindane)	7.1E-06	5.0E+00	1.4E-06	2.3E-06	5.0E+00	4.7E-07
alpha-Chlordane	4.3E-05	3.1E-02	1.4E-03	1.6E-05	3.1E-02	5.1E-04
gamma-Chlordane	3.6E-05	3.1E-02	1.2E-03	1.3E-05	3.1E-02	4.3E-04
4,4'-DDE	1.2E-03	5.8E-01	2.0E-03	4.5E-04	5.8E-01	7.8E-04
Aluminum	3.7E+00	4.3E+02	8.6E-03	1.1E+00	4.3E+02	2.6E-03
Antimony	3.4E-04	4.2E+01	8.1E-06	1.2E-04	4.2E+01	2.8E-06
Arsenic	2.3E-03	1.0E+00	2.3E-03	7.3E-04	1.0E+00	7.3E-04
Barium	9.7E-03	2.0E+02	4.9E-05	1.9E-03	2.0E+02	9.7E-06
Beryllium	4.8E-03	8.5E-01	5.6E-03	1.3E-03	8.5E-01	1.5E-03
Cadmium	1.9E-02	1.0E+01	1.9E-03	7.3E-03	1.0E+01	7.3E-04
Chromium	4.5E-02	2.5E+01	1.8E-03	1.6E-02	2.5E+01	6.4E-04
Cobalt	4.5E-02	1.3E+01	3.5E-03	1.7E-02	1.3E+01	1.3E-03
Copper	8.9E-02	1.0E+02	8.9E-04	3.3E-02	1.0E+02	3.3E-04
Lead	1.3E-02	5.0E+01	2.5E-04	2.1E-03	5.0E+01	4.1E-05
Manganese	1.8E+00	1.4E+02	1.3E-02	6.7E-01	1.4E+02	4.8E-03
Selenium	2.5E-02	6.0E-01	4.2E-02	9.4E-03	6.0E-01	1.6E-02

Table S-3.24
Risk from Sublethal Effects for Semi-Terrestrial Receptors from Maximum Exposure Concentrations of CPCs in Food, Surface Water, and Sediment River

Baseline Risk Assessment for Operable Unit 1
NAS Jacksonville, Jacksonville, Florida

CHEMICAL	*Great Blue Heron*			*Osprey*		
	PDE	RTV	HQ	PDE	RTV	HQ
Vanadium	1.5E-02	1.1E+01	1.4E-03	4.9E-03	1.1E+01	4.5E-04
Zinc	1.6E+00	2.0E+02	7.8E-03	5.9E-01	2.0E+02	3.0E-03
1,2,3,4,6,7,8-HpCDD	3.4E-07	1.4E-04	2.4E-03	3.7E-08	1.4E-04	2.6E-04
OCDD	2.0E-06	1.4E-03	1.5E-03	1.6E-07	1.4E-03	1.2E-04
OCDF	2.6E-07	1.4E-03	1.8E-04	6.3E-09	1.4E-03	4.5E-06
SUMMARY HAZARD INDEX			1.1E-01			3.8E-02

PDE = Potential Dietary Exposure (mg/kgBW-day). RTV = Reference Toxicity Value (mg/kgBW-day) HQ = Hazard Quotient (calculated by dividing PDE by RTV)

APPENDIX S-4

MODEL OF POTENTIAL EXPOSURES AND RISKS FOR REPRESENTATIVE WILDLIFE SPECIES TO RADIOLOGICAL CPCs

TABLE S-4.1
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO TERRESTRIAL ORGANISMS
SURFACE SOIL OUTSIDE OF PRESUMPTIVE REMEDY - SOUTH OF CHILDS STREET
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

EXPOSURE CONCENTRATION DATA

RADIONUCLIDE	ACTIVITY Surface Soil (pCi/g)	BAF [a] Soil:Plant	BAF [a] Plant:Animal	PREY TISSUE ACTIVITY pCi/g [b]	AVERAGE ENERGY OF DECAY (MeV) [c] alpha	beta	gamma	total [b]
Radium-226	0.89	2.3E-03	1.3E-02	1.1E-02	1.7E+01	3.6E-03	6.9E-03	1.7E+01

[a] Transfer factors are derived as described in text.
[b] Estimated using the higher of the product of sediment activity and plant:animal transfer factor and the product of surface water activity and BCF.
[c] Average energies shown for each radionuclide include energies for all members of the decay chain (see Appendix S, Table S-2.10).

EXPOSURE PARAMETERS FOR TERRESTRIAL RECEPTORS

INDICATOR SPECIES		Percent Prey in Diet: Inverts	Plants	Small Mammals	Fish	Birds	Sediment	Home Range (acres)	Site Foraging Frequency [a]	Ingestion Rate (kg/day)
Cotton mouse	(herbivorous mammal)	10%	88%	0%	0%	0%	1%	0.147	1.0E+00	0.0029
Short-tailed shrew	(omnivorous mammal)	78%	12%	0%	93%	0%	5%	0.96	1.0E+00	0.0024
Meadowlark	(omnivorous bird)	75%	20%	0%	0%	0%	2.5%	5	1.0E+00	0.0119
Great-horned owl	(carnivorous bird)	0%	0%	80%	0%	19%	0.5%	15	1.0E+00	0.079
Red fox	(omnivorous mammal)	20%	10%	57%	0%	10%	2.8%	1727	1.2E-02	0.24

SITE AREA: 20.0

[a] Site Foraging Frequency (SFF). Calculated by dividing site area by receptor home range (cannot exceed 1.0)

TABLE S-4.1
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO TERRESTRIAL ORGANISMS
SURFACE SOIL OUTSIDE OF PRESUMPTIVE REMEDY - SOUTH OF CHILDS STREET
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

ESTIMATION OF INTERNAL EXPOSURES VIA FOOD AND SURFACE SOIL INGESTION (rad/year) [a]

RADIONUCLIDE	REPRESENTATIVE TERRESTRIAL WILDLIFE RECEPTOR				
	Cotton mouse	Short-tailed shrew	Meadowlark	Great-horned owl	Red fox
Radium-226	4.6E-05	2.5E-04	1.2E-04	1.9E-05	1.2E-06

[a] Calculated by summing the intake from all sources, and multiplying by the plant:animal transfer factor, the SFF, the sum of average alpha, beta, and gamma energies of the detected radionuclide (including energies for all members of decay chain), and a factor to convert dose to rad/year. See text for further details.

ESTIMATION OF EXTERNAL EXPOSURES FROM SURFACE SOIL (rad/year)

RADIONUCLIDE	REPRESENTATIVE TERRESTRIAL WILDLIFE RECEPTOR				
	Cotton mouse	Short-tailed shrew	Meadowlark	Great-horned owl	Red fox
Radium-226	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.3E-06

[a] Calculated by multiplying the soil radionuclide activity by the SFF, the gamma energy of the detected radionuclide, and a factor to convert dose to rad/year. See text for further details.

HAZARD INDEX [a]

RADIONUCLIDE	REPRESENTATIVE TERRESTRIAL WILDLIFE RECEPTOR				
	Cotton mouse	Short-tailed shrew	Meadowlark	Great-horned owl	Red fox
Radium-226	4.4E-06	9.9E-06	6.4E-06	3.7E-06	7.0E-08
Hazard Index:	4.4E-06	9.9E-06	6.4E-06	3.7E-06	7.0E-08

NOTES:
[a] Hazard Index calculated by summing the internal and external exposures and dividing by the internal dose benchmark of 3.65E+01 rad/year.

TABLE S-4.2
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO SEMI-TERRESTRIAL ORGANISMS
GRASSY DRAINAGE DITCH
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

EXPOSURE CONCENTRATION DATA

RADIONUCLIDE	ACTIVITY Sediment (pCi/g)	ACTIVITY Surface Water (pCi/l)	BAF [a] Sediment:Plan	BAF [a] Plant:Animal	BCF [b] (l/g)	AQUATIC PREY TISSUE ACTIVITY pCi/g [c]	AVERAGE ENERGY OF DECAY (MeV) [d] alpha	beta	gamma	total [c]
Lead-214	[e]	24.8	6.8E-03	1.5E-02	3.0E-01	7.4E+00	1.5E+01	9.8E-01	1.7E+00	1.7E+01
Radium-228	0.3	0.7	2.3E-03	1.3E-02	5.0E-02	3.5E-02	NA	4.8E-01	9.3E-01	1.4E+00

[a] Transfer factors are derived as described in text.
[b] Fish BCFs as presented in Appendix S, Table S-2.9.
[c] Estimated using the higher of the product of sediment activity and plant:animal transfer factor and the product of surface water activity and BCF.
[d] Average energies shown for each radionuclide include energies for all members of the decay chain (see Appendix S, Table S-2.10).
[e] Radionuclide not a CPC in this medium.

EXPOSURE PARAMETERS FOR SEMI-TERRESTRIAL RECEPTORS

INDICATOR SPECIES		Percent Prey in Diet: Inverts	Plants	Small Mammals	Fish	Birds	Sediment	Home Range (acres)	Site Foraging Frequency [a]	Ingestion Rate (kg/day)
Cotton mouse	(herbivorous mammal)	10%	88%	0%	0%	0%	1%	0.147	1.0E+00	0.0029
Short-tailed shrew	(omnivorous mammal)	78%	12%	0%	93%	0%	5%	0.96	2.1E-01	0.0024
Meadowlark	(omnivorous bird)	75%	20%	0%	0%	0%	2.5%	5	4.0E-02	0.0119
Great-horned owl	(carnivorous bird)	0%	0%	80%	0%	19%	0.5%	15	1.3E-02	0.079

SITE AREA: 0.2

[a] Site Foraging Frequency (SFF). Calculated by dividing site area by receptor home range (cannot exceed 1.0)

TABLE S-4.2
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO SEMI-TERRESTRIAL ORGANISMS
GRASSY DRAINAGE DITCH
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

ESTIMATION OF INTERNAL EXPOSURES VIA FOOD, SEDIMENT, AND SURFACE WATER INGESTION (rad/year) [a]

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR			
	Cotton mouse	Short-tailed shrew	Meadowlark	Great-horned owl
Lead-214	4.0E-02	2.0E-02	2.5E-03	4.9E-04
Radium-228	1.4E-05	7.3E-06	8.8E-07	1.6E-07

[a] Calculated by summing the intake from all sources, and multiplying by the plant:animal transfer factor, the SFF, the sum of average alpha, beta, and gamma energies of the detected radionuclide (including energies for all members of decay chain), and a factor to convert dose to rad/year. See text for further details.

ESTIMATION OF EXTERNAL EXPOSURES FROM SEDIMENT (rad/year)

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR			
	Cotton mouse	Short-tailed shrew	Meadowlark	Great-horned owl
Lead-214	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Radium-228	5.2E-03	1.1E-03	2.1E-04	6.9E-05

[a] Calculated by multiplying the soil radionuclide activity by the SFF, the gamma energy of the detected radionuclide, and a factor to convert dose to rad/year. See text for further details.

HAZARD INDEX [a]

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR			
	Cotton mouse	Short-tailed shrew	Meadowlark	Great-horned owl
Lead-214	1.1E-03	5.6E-04	6.9E-05	1.3E-05
Radium-228	1.4E-04	3.0E-05	5.7E-06	1.9E-06
Hazard Index:	1.2E-03	5.9E-04	7.5E-05	1.5E-05

NOTES:
[a] Hazard Index calculated by summing the internal and external exposures and dividing by the internal dose benchmark of 3.65E+01 rad/year.

TABLE S-4.3
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO SEMI-TERRESTRIAL ORGANISMS
FORESTED STREAM
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

EXPOSURE CONCENTRATION DATA

RADIONUCLIDE	ACTIVITY Sediment (pCi/g)	ACTIVITY Surface Water (pCi/l)	BAF [a] Sediment:Plan	BAF [a] Plant:Animal	BCF [b] (l/g)	AQUATIC PREY TISSUE ACTIVITY pCi/g [c]	AVERAGE ENERGY OF DECAY (MeV) [d] alpha	beta	gamma	total [c]
Actinium-228	[e]	4.5	5.3E-04	1.3E-03	2.5E-02	1.1E-01	NA	4.6E-01	9.3E-01	1.4E+00
Cesium-137	0.699	[e]	1.2E-02	1.0E+00	4.0E-01	7.0E-01	NA	2.5E-01	6.0E-01	8.5E-01
Lead-212	0.9	[e]	6.8E-03	1.5E-02	3.0E-01	1.4E-02	NA	1.8E-01	1.5E-01	3.2E-01
Lead-214	0.9	2.2	6.8E-03	1.5E-02	3.0E-01	6.6E-01	6.8E+00	3.3E-01	2.5E-01	7.4E+00
Potassium-40	3.4	[e]	1.5E-01	1.0E+00	1.0E+00	3.4E+00	NA	5.2E-01	1.6E-01	6.8E-01
Radium-226	0.97	[e]	2.3E-03	1.3E-02	5.0E-02	1.2E-02	1.7E+01	3.6E-03	6.9E-03	1.7E+01
Radium-228	0.35	0.95	2.3E-03	1.3E-02	5.0E-02	4.8E-02	NA	1.7E-02	4.1E-09	1.7E-02
Thallium-208	0.54	2.1	6.0E-04	2.0E+00	1.0E+01	2.1E+01	NA	5.6E-01	3.4E+00	3.9E+00
Uranium-235	0.33	[e]	1.3E-03	1.0E-02	1.0E-02	3.3E-03	4.5E+00	2.1E-01	1.8E-01	4.9E+00

[a] Transfer factors are derived as described in text.
[b] Fish BCFs as presented in Appendix S, Table S-2.9.
[c] Estimated using the higher of the product of sediment activity and plant:animal transfer factor and the product of surface water activity and BCF.
[d] Average energies shown for each radionuclide include energies for all members of the decay chain (see Appendix S, Table S-2.10).
[e] Radionuclide not a CPC in this medium.

EXPOSURE PARAMETERS FOR SEMI-TERRESTRIAL RECEPTORS

INDICATOR SPECIES		Percent Prey in Diet: Inverts	Plants	Small Mammals	Fish	Birds	Sediment	Home Range (acres)	Site Foraging Frequency [a]	Ingestion Rate (kg/day)
Short-tailed shrew	(herbivorous mammal)	78%	12%	0%	0%	0%	5%	0.96	1.0E+00	0.0024
Raccoon	(omnivorous mammal)	0%	0%	0%	93%	0%	7%	385	8.8E-03	0.067
American woodcock	(omnivorous bird)	80%	10%	0%	0%	0%	5%	80.1	4.2E-02	0.02
Great-horned owl	(carnivorous bird)	0%	0%	80%	0%	19%	0.5%	15	2.3E-01	0.079
Great blue heron	(piscivorous bird)	0%	0%	0%	98%	0%	2%	1.5	1.0E+00	0.40

SITE AREA: 3.4

[a] Site Foraging Frequency (SFF). Calculated by dividing site area by receptor home range (cannot exceed 1.0)

TABLE S-4.3
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO SEMI-TERRESTRIAL ORGANISMS
FORESTED STREAM
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

ESTIMATION OF INTERNAL EXPOSURES VIA FOOD, SEDIMENT, AND SURFACE WATER INGESTION (rad/year) [a]

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR				
	Short-tailed shrew	Raccoon	American woodcock	Great-horned owl	Great blue heron
Actinium-228	6.5E-06	6.2E-08	2.8E-07	8.3E-07	7.2E-06
Cesium-137	9.1E-03	9.6E-05	3.9E-04	1.7E-03	1.1E-02
Lead-212	4.1E-06	4.8E-08	1.7E-07	8.0E-08	2.4E-06
Lead-214	2.5E-03	2.4E-05	1.1E-04	3.2E-04	2.7E-03
Potassium-40	3.6E-02	3.7E-04	1.6E-03	6.6E-03	4.3E-02
Radium-226	1.8E-04	2.1E-06	7.6E-06	3.6E-06	1.0E-04
Radium-228	3.9E-07	3.8E-09	1.7E-08	4.5E-08	3.9E-07
Thallium-208	5.5E+00	5.2E-02	2.3E-01	2.7E+00	6.1E+00
Uranium-235	1.4E-05	1.6E-07	5.8E-07	2.8E-07	7.4E-06

[a] Calculated by summing the intake from all sources, and multiplying by the plant:animal transfer factor, the SFF, the sum of average alpha, beta, and gamma energies of the detected radionuclide (including energies for all members of decay chain), and a factor to convert dose to rad/year. See text for further details.

ESTIMATION OF EXTERNAL EXPOSURES FROM SEDIMENT (rad/year)

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR				
	Short-tailed shrew	Raccoon	American woodcock	Great-horned owl	Great blue heron
Actinium-228	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cesium-137	7.8E-03	6.9E-05	3.3E-04	1.8E-03	7.8E-03
Lead-212	2.5E-03	2.2E-05	1.1E-04	5.6E-04	2.5E-03
Lead-214	4.3E-03	3.8E-05	1.8E-04	9.7E-04	4.3E-03
Potassium-40	9.9E-03	8.7E-05	4.2E-04	2.2E-03	9.9E-03
Radium-226	1.2E-04	1.1E-06	5.3E-06	2.8E-05	1.2E-04
Radium-228	2.7E-11	2.4E-13	1.1E-12	6.1E-12	2.7E-11
Thallium-208	3.4E-02	3.0E-04	1.4E-03	7.7E-03	3.4E-02

[a] Calculated by multiplying the soil radionuclide activity by the SFF, the gamma energy of the detected radionuclide, and a factor to convert dose to rad/year. See text for further details.

HAZARD INDEX [a]

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR				
	Short-tailed shrew	Raccoon	American woodcock	Great-horned owl	Great blue heron
Actinium-228	1.8E-07	1.7E-09	7.6E-09	2.3E-08	2.0E-07
Cesium-137	4.6E-04	4.5E-06	2.0E-05	9.4E-05	5.1E-04
Lead-212	6.8E-05	6.0E-07	2.9E-06	1.5E-05	6.8E-05
Lead-214	1.9E-04	1.7E-06	7.9E-06	3.5E-05	1.9E-04
Potassium-40	1.3E-03	1.3E-05	5.4E-05	2.4E-04	1.4E-03
Radium-226	8.3E-06	8.8E-08	3.5E-07	8.7E-07	6.2E-06
Radium-228	1.1E-08	1.1E-10	4.5E-10	1.2E-09	1.1E-08
Thallium-208	1.5E-01	1.4E-03	6.5E-03	7.4E-02	1.7E-01
Hazard Index:	1.5E-01	1.5E-03	6.5E-03	7.4E-02	1.7E-01

NOTES:
[a] Hazard Index calculated by summing the internal and external exposures and dividing by the internal dose benchmark of 3.65E+01 rad/year.

TABLE S-4.4
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO SEMI-TERRESTRIAL ORGANISMS
ST. JOHNS RIVER
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

EXPOSURE CONCENTRATION DATA

RADIONUCLIDE	ACTIVITY Sediment (pCi/g)	ACTIVITY Surface Water (pCi/l)	BAF [a] Sediment:Plan	BAF [a] Plant:Animal	BCF [b] (l/g)	AQUATIC PREY TISSUE ACTIVITY pCi/g [c]	AVERAGE ENERGY OF DECAY (MeV) [d] alpha	beta	gamma	total [e]
Actinium-228	0.55	[e]	5.3E-04	1.3E-03	2.5E-02	6.9E-04	NA	4.6E-01	9.3E-01	1.4E+00
Bismuth-212	0.49	[e]	5.3E-03	2.0E-02	1.5E-02	9.8E-03	1.1E+01	4.7E-01	1.9E-01	1.2E+01
Bismuth-214	0.49	[e]	5.3E-03	2.0E-02	1.5E-02	9.8E-03	7.8E+00	6.5E-01	1.5E+00	9.9E+00
Cesium-137	0.11	[e]	1.2E-02	1.0E+00	3.0E-02	1.1E-01	NA	2.5E-01	6.0E-01	8.5E-01
Lead-212	0.51	[e]	6.8E-03	1.5E-02	3.0E-01	7.7E-03	NA	1.8E-01	1.5E-01	3.2E-01
Lead-214	0.56	[e]	6.8E-03	1.5E-02	3.0E-01	8.4E-03	6.8E+00	3.3E-01	2.5E-01	7.4E+00
Potassium-40	1.6	[e]	1.5E-01	1.0E+00	1.1E-02	1.6E+00	NA	5.2E-01	1.6E-01	6.8E-01
Thallium-208	0.21	[e]	6.0E-04	2.0E+00	1.0E+01	4.2E-01	NA	5.6E-01	3.4E+00	3.9E+00

[a] Transfer factors are derived as described in text.
[b] Fish BCFs as presented in Appendix S, Table S-2.9.
[c] Estimated using the higher of the product of sediment activity and plant:animal transfer factor and the product of surface water activity and BCF.
[d] Average energies shown for each radionuclide include energies for all members of the decay chain (see Appendix S, Table S-2.10).
[e] Radionuclide not a CPC in this medium.

EXPOSURE PARAMETERS FOR SEMI-TERRESTRIAL RECEPTORS

INDICATOR SPECIES		Percent Prey in Diet: Inverts	Plants	Small Mammals	Fish	Birds	Sediment	Home Range (acres)	Site Foraging Frequency [a]	Ingestion Rate (kg/day)
Muskrat	(herbivorous mammal)	10%	80%	0%	0%	0%	10%	0.2	1.0E+00	0.084
Raccoon	(omnivorous mammal)	0%	0%	0%	93%	0%	7%	385	5.2E-04	0.067
Sandpiper	(omnivorous bird)	93%	10%	0%	0%	0%	7%	5	4.0E-02	0.0074
Osprey	(piscivorous bird)	0%	0%	0%	99%	0%	1%	10	2.0E-02	0.61
Great blue heron	(piscivorous bird)	0%	0%	0%	98%	0%	2%	1.5	1.3E-01	0.40

SITE AREA: 0.2

[a] Site Foraging Frequency (SFF). Calculated by dividing site area by receptor home range (cannot exceed 1.0)

TABLE S-4.4
ESTIMATION OF CHRONIC RADIOLOGICAL RISKS TO SEMI-TERRESTRIAL ORGANISMS
ST. JOHNS RIVER
BASELINE RISK ASSESSMENT FOR OPERABLE UNIT 1
NAVAL AIR STATION JACKSONVILLE

ESTIMATION OF INTERNAL EXPOSURES VIA FOOD, SEDIMENT, AND SURFACE WATER INGESTION (rad/year) [a]

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR				
	Muskrat	Raccoon	Sandpiper	Osprey	Great blue heron
Actinium-228	1.3E-06	5.0E-10	3.8E-08	3.1E-09	3.9E-08
Bismuth-212	1.8E-04	8.0E-08	6.2E-06	1.2E-06	1.0E-05
Bismuth-214	1.5E-04	6.7E-08	5.2E-06	9.9E-07	8.4E-06
Cesium-137	3.2E-04	8.9E-07	6.9E-05	3.5E-05	2.3E-04
Lead-212	3.8E-06	1.6E-09	1.2E-07	2.1E-08	1.8E-07
Lead-214	9.5E-05	4.0E-08	3.1E-06	5.2E-07	4.6E-06
Potassium-40	6.0E-03	1.0E-05	8.1E-04	4.0E-04	2.7E-03
Thallium-208	8.4E-03	3.0E-05	2.3E-03	1.2E-03	8.1E-03

[a] Calculated by summing the intake from all sources, and multiplying by the plant:animal transfer factor, the SFF, the sum of average alpha, beta, and gamma energies of the detected radionuclide (including energies for all members of decay chain), and a factor to convert dose to rad/year. See text for further details.

ESTIMATION OF EXTERNAL EXPOSURES FROM SEDIMENT (rad/year)

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR				
	Muskrat	Raccoon	Sandpiper	Osprey	Great blue heron
Actinium-228	9.5E-03	5.0E-06	3.8E-04	1.9E-04	1.3E-03
Bismuth-212	1.7E-03	8.8E-07	6.8E-05	3.4E-05	2.3E-04
Bismuth-214	1.3E-02	6.9E-06	5.3E-04	2.7E-04	1.8E-03
Cesium-137	1.2E-03	6.4E-07	4.9E-05	2.4E-05	1.6E-04
Lead-212	1.4E-03	7.3E-07	5.6E-05	2.8E-05	1.9E-04
Lead-214	2.7E-03	1.4E-06	1.1E-04	5.3E-05	3.6E-04
Potassium-40	4.7E-03	2.4E-06	1.9E-04	9.3E-05	6.2E-04
Thallium-208	1.3E-02	6.8E-06	5.3E-04	2.6E-04	1.8E-03

[a] Calculated by multiplying the soil radionuclide activity by the SFF, the gamma energy of the detected radionuclide, and a factor to convert dose to rad/year. See text for further details.

HAZARD INDEX [a]

RADIONUCLIDE	REPRESENTATIVE SEMI-TERRESTRIAL WILDLIFE RECEPTOR				
	Muskrat	Raccoon	Sandpiper	Osprey	Great blue heron
Actinium-228	2.6E-04	1.4E-07	1.0E-05	5.2E-06	3.5E-05
Bismuth-212	5.1E-05	2.6E-08	2.0E-06	9.6E-07	6.5E-06
Bismuth-214	3.7E-04	1.9E-07	1.5E-05	7.3E-06	4.9E-05
Cesium-137	4.2E-05	4.2E-08	3.2E-06	1.6E-06	1.1E-05
Lead-212	3.9E-05	2.0E-08	1.5E-06	7.7E-07	5.2E-06
Lead-214	7.6E-05	3.9E-08	3.0E-06	1.5E-06	9.9E-06
Potassium-40	2.9E-04	3.5E-07	2.7E-05	1.4E-05	9.1E-05
Thallium-208	5.9E-04	1.0E-06	7.9E-05	4.1E-05	2.7E-04
Hazard Index:	1.7E-03	1.8E-06	1.4E-04	7.2E-05	4.8E-04

NOTES:
[a] Hazard Index calculated by summing the internal and external exposures and dividing by the internal dose benchmark of 3.65E+01 rad/year.

Table S-4.

Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Grassy Drainage Ditch

Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Internal Dose Rate

Element	Conc. in SW (pCi/L)	Conc. in SW (Bq/L)	ALPHA En [a]	BETA En [a]	phi [b] (SI)	phi [b] (LI)	GAMMA En [a]	phi [b] (SI)	phi [b] (LI)	Small Insects BCF [c]	Small Insects Co (Bq/kg)	Large Insects and Molluscs BCF [c]	Large Insects and Molluscs Co (Bq/kg)
Lead-214	24.8	0.918	7.83E+00	9.39E-01	0.8	1	1.71E+00	0.002	0.01	100	9.18E+01	100	9.18E+01
Radium-228	0.7	0.026	NA	4.77E-01	0.9	1	9.30E-01	0.003	0.01	250	6.48E+00	250	6.48E+00

NOTES:

[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.

[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).

[c] BCFs provided in Appendix S, Table S-2.9.

Table S-4.5

Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Grassy Drainage Ditch

Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of External Dose Rate (data sheet)

Element	Conc. in SW (pCi/L)	Conc. in SW (Bq/L)	ALPHA En [a]	BETA En [a]	1-phi [b] (SI)	1-phi [b] (LI)	GAMMA En	1-phi [b] (SI)	1-phi [b] (LI)	Small Insect Cw (Bq/L) [c]	Large Insect Cw (Bq/L) [c]
Lead-214	24.8	0.918	7.83E+00	9.39E-01	0.2	0	1.71E+00	0.998	0.99	9.18E-01	9.18E-01
Radium-228	0.7	0.026	NA	4.77E-01	0.1	0	9.30E-01	0.997	0.99	2.59E-02	2.59E-02

NOTES:

[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.

[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).

[c] Concentration of the radionuclide in water.

Table S-4.5

Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Grassy Drainage Ditch

Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Radiation Dose Rates--SMALL INSECT

Element	GW Conc. (Bq/L)	ALPHA Internal	ALPHA External	ALPHA TOTAL (uGy/h)	ALPHA TOTAL (rads/d)	BETA Internal	BETA External	BETA TOTAL (uGy/h)	BETA TOTAL (rads/d)	GAMMA Internal	GAMMA External	GAMMA TOTAL (uGy/h)	GAMMA TOTAL (rads/d)	TOTAL DOSE (rads/d)
Lead-214	0.918	4.14E-01	NC	4.14E-01	9.92E-04	3.97E-02	9.93E-05	3.98E-02	9.55E-05	1.81E-04	9.01E-04	1.08E-03	2.59E-06	1.09E-03
Radium-228	0.026	NA	NC	NA	NA	1.60E-03	7.11E-07	1.60E-03	3.84E-06	1.04E-05	1.38E-05	2.42E-05	5.81E-08	3.90E-06
TOTAL DOSE RATE					9.92E-04				9.93E-05				2.65E-06	1.09E-03

Table S-4.5

Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Grassy Drainage Ditch

Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Radiation Dose Rates--LARGE INSECT AND MOLLUSC

Element	GW Conc. (Bq/L)	ALPHA Internal	ALPHA External	ALPHA TOTAL (uGy/h)	ALPHA TOTAL (rads/d)	BETA Internal	BETA External	BETA TOTAL (uGy/h)	BETA TOTAL (rads/d)	GAMMA Internal	GAMMA External	GAMMA TOTAL (uGy/h)	GAMMA TOTAL (rads/d)	TOTAL DOSE (rads/d)
Lead-214	0.918	4.14E-01	NC	4.14E-01	9.92E-04	4.96E-02	0.00E+00	4.96E-02	1.19E-04	9.03E-04	8.94E-04	1.80E-03	4.31E-06	1.12E-03
Radium-228	0.026	NA	NC	NA	NA	1.78E-03	0.00E+00	1.78E-03	4.27E-06	3.47E-05	1.37E-05	4.84E-05	1.16E-07	4.38E-06
TOTAL DOSE RATE					9.92E-04				1.23E-04				4.42E-06	1.12E-03

Table S-4.6
Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water - Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville
Estimation of Internal Dose Rate

Element	Conc in SW (pCi/L)	Conc in SW (Bq/L)	ALPHA En [a]	BETA En [a]	phi [b] (SI)	phi [b] (LI)	phi [b] (SF)	GAMMA En [a]	phi [b] (SI)	phi [b] (LI)	phi [b] (SF)	phi [b] (LF)	Small Insects BCF [c]	Small Insects Co (Bq/kg)	Large Insects and Molluscs BCF [c]	Large Insects and Molluscs Co (Bq/kg)	Small Fish BCF [c]	Small Fish Co (Bq/kg)	Large Fish BCF [c]	Large Fish Co (Bq/kg)
Actinium-228	4.5	0.167	NA	4.60E-01	1	1	1	9.30E-01	0.002	0.01	0.01	0.1	330	5.49E+01	330	5.49E+01	330	5.49E+01	330	5.49E+01
Lead-214	2.2	0.081	7.83E+00	9.39E-01	0.8	1	1	1.71E+00	0.002	0.01	0.01	0.1	100	8.14E+00	100	8.14E+00	300	2.44E+01	300	2.44E+01
Radium-228	0.95	0.035	NA	4.77E-01	0.9	1	1	9.30E-01	0.002	0.01	0.01	0.1	250	8.79E+00	250	8.79E+00	50	1.76E+00	50	1.76E+00
Thallium-208	2.1	0.078	NA	5.58E-01	0.9	1	1	3.35E+00	0.002	0.002	0.002	0.1	5000	3.89E+02	5000	3.89E+02	5000	3.89E+02	5000	3.89E+02

NOTES:
[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10
[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).
[c] BCFs provided in Appendix S, Table S-2.9.

Table S-4.6

Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Forested Stream

Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of External Dose Rate

Element	Conc. in SW (pCi/L)	Conc. in SW (Bq/L)	ALPHA En [a]	BETA En [a]	1 – phi [b] (SI)	(LI)	(SF)	GAMMA En [a]	1 – phi [b] (SI)	(LI)	(SF)	(LF)	Small Insect Cw (Bq/L) [c]	Large Insect Cw (Bq/L) [c]	Small Fish Cw (Bq/L) [c]	Large Fish Cw (Bq/L) [c]
Actinium-22	4.5	0.167	NA	4.60E-01	0	0	0	9.30E-01	0.998	0.99	0.99	0.9	1.67E-01	1.67E-01	1.67E-01	1.67E-01
Lead-214	2.2	0.081	7.83E+00	9.39E-01	0.2	0	0	1.71E+00	0.998	0.99	0.99	0.9	8.14E-02	8.14E-02	8.14E-02	8.14E-02
Radium-228	0.95	0.035	NA	4.77E-01	0.1	0	0	9.30E-01	0.998	0.99	0.99	0.9	3.52E-02	3.52E-02	3.52E-02	3.52E-02
Thallium-20	2.1	0.078	NA	5.58E-01	0.1	0	0	3.35E+00	0.998	0.998	0.998	0.9	7.77E-02	7.77E-02	7.77E-02	7.77E-02

NOTES:

[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.

[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).

[c] Concentration of the radionuclide in water.

Table S-4.6
Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville
Radiation Dose Rates--SMALL INSECT

Element	SW Conc. (Bq/L)	ALPHA Internal	ALPHA External	ALPHA TOTAL (uGy/h)	ALPHA TOTAL (rads/d)	BETA Internal	BETA External	BETA TOTAL (uGy/h)	BETA TOTAL (rads/d)	GAMMA Internal	GAMMA External	GAMMA TOTAL (uGy/h)	GAMMA TOTAL (rads/d)	TOTAL DOSE (rads/d)
Actinium-228	0.167	NA	NC	NC	NC	1.46E-02	0.00E+00	1.46E-02	3.49E-05	5.89E-05	8.90E-05	1.48E-04	3.55E-07	3.53E-05
Lead-214	0.081	3.67E-02	NC	3.67E-02	8.80E-05	3.52E-03	8.81E-06	3.53E-03	8.47E-06	1.60E-05	7.99E-05	9.59E-05	2.30E-07	9.67E-05
Radium-228	0.035	NA	NC	NC	NC	2.17E-03	9.66E-07	2.17E-03	5.21E-06	9.41E-06	1.88E-05	2.82E-05	6.76E-08	5.28E-06
Thallium-208	0.078	NA	NC	NC	NC	1.12E-01	2.50E-06	1.12E-01	2.70E-04	1.50E-03	1.50E-04	1.65E-03	3.95E-06	2.73E-04
TOTAL DOSE RATE					8.80E-05				3.18E-04				4.61E-06	4.11E-04

Table S-4.6
Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville
Radiation Dose Rates--LARGE INSECT AND MOLLUSC

Element	SW Conc. (Bq/L)	ALPHA Internal	ALPHA External	ALPHA TOTAL (uGy/h)	ALPHA TOTAL (rads/d)	BETA Internal	BETA External	BETA TOTAL (uGy/h)	BETA TOTAL (rads/d)	GAMMA Internal	GAMMA External	GAMMA TOTAL (uGy/h)	GAMMA TOTAL (rads/d)	TOTAL DOSE (rads/d)
Actinium-228	0.167	NA	NC	NC	NC	1.46E-02	0.00E+00	1.46E-02	3.49E-05	2.94E-04	8.83E-05	3.83E-04	9.18E-07	3.58E-05
Lead-214	0.081	3.67E-02	NC	3.67E-02	8.80E-05	4.40E-03	0.00E+00	4.40E-03	1.06E-05	8.01E-05	7.93E-05	1.59E-04	3.82E-07	9.90E-05
Radium-228	0.035	NA	NC	NC	NC	2.41E-03	0.00E+00	2.41E-03	5.79E-06	4.71E-05	1.86E-05	6.57E-05	1.58E-07	5.95E-06
Thallium-208	0.078	NA	NC	NC	NC	1.25E-01	0.00E+00	1.25E-01	2.99E-04	1.50E-03	1.50E-04	1.65E-03	3.95E-06	3.03E-04
TOTAL DOSE RATE					8.80E-05				3.51E-04				5.41E-06	4.44E-04

Table S-4.6
Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville
Radiation Dose Rates--SMALL FISH

Element	SW Conc. (Bq/L)	ALPHA Internal	ALPHA External	ALPHA TOTAL (uGy/h)	ALPHA TOTAL (rads/d)	BETA Internal	BETA External	BETA TOTAL (uGy/h)	BETA TOTAL (rads/d)	GAMMA Internal	GAMMA External	GAMMA TOTAL (uGy/h)	GAMMA TOTAL (rads/d)	TOTAL DOSE (rads/d)
Actinium-228	0.167	NA	NC	NC	NC	1.46E-02	0.00E+00	1.46E-02	3.49E-05	2.94E-04	8.83E-05	3.83E-04	9.18E-07	3.58E-05
Lead-214	0.081	1.10E-01	NC	1.10E-01	2.64E-04	1.32E-02	0.00E+00	1.32E-02	3.17E-05	2.40E-04	7.93E-05	3.20E-04	7.66E-07	2.97E-04
Radium-228	0.035	NA	NC	NC	NC	4.83E-04	0.00E+00	4.83E-04	1.16E-06	9.41E-06	1.86E-05	2.81E-05	6.73E-08	1.23E-06
Thallium-208	0.078	NA	NC	NC	NC	1.25E-01	0.00E+00	1.25E-01	2.99E-04	1.50E-03	1.50E-04	1.65E-03	3.95E-06	3.03E-04
TOTAL DOSE RATE					2.64E-04				3.67E-04				5.71E-06	6.37E-04

Table S-4.6
Estimation of Chronic Radiological Risks to Aquatic Organisms in Surface Water – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville
Radiation Dose Rates--LARGE FISH

Element	SW Conc. (Bq/L)	ALPHA Internal	ALPHA External	ALPHA TOTAL (uGy/h)	ALPHA TOTAL (rads/d)	BETA Internal	BETA External	BETA TOTAL (uGy/h)	BETA TOTAL (rads/d)	GAMMA Internal	GAMMA External	GAMMA TOTAL (uGy/h)	GAMMA TOTAL (rads/d)	TOTAL DOSE (rads/d)
Actinium-228	0.167	NA	NC	NC	NC	1.46E-02	NC	1.46E-02	3.49E-05	5.89E-05	8.03E-05	1.39E-04	3.34E-07	3.52E-05
Lead-214	0.081	1.10E-01	NC	1.10E-01	2.64E-04	1.32E-02	NC	1.32E-02	3.17E-05	4.81E-05	7.21E-05	1.20E-04	2.88E-07	2.96E-04
Radium-228	0.035	NA	NC	NC	NC	4.83E-04	NC	4.83E-04	1.16E-06	1.88E-06	1.69E-05	1.88E-05	4.52E-08	1.20E-06
Thallium-208	0.078	NA	NC	NC	NC	1.25E-01	NC	1.25E-01	2.99E-04	1.50E-03	1.35E-04	1.63E-03	3.92E-06	3.03E-04
TOTAL DOSE RATE					2.64E-04				3.67E-04				4.59E-06	6.36E-04

Table S-4.7
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – Grassy Drainage Ditch
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Internal Dose Rate

Radionuclide	SD Conc. (pCi/g)	SD Conc. (Bq/kg)	ALPHA En [a]	BETA En [a]	phi [b] (SI)	phi [b] (LI)	GAMMA En	phi [b] (SI)	phi [b] (LI)	Small Insects BTF [c]	Large Insects BTF [c]
Radium-228	0.3	8.33	NA	4.77E-01	0.9	1	9.30E-01	0.003	0.01	1.25E-02	1.25E-02

NOTES:
[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.
[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).
[c] BTF adapted from Baes et al., 1984. BTFs are equal to an ingestion-to-beef transfer coefficient (days/kg) multiplied by a beef ingestion rate of 50 kg wet feed/day.

Table S-4.

Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – Grassy Drainage Ditch
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of External Dose Rate (data sheet)

Isotope	SD Conc. (pCi/g)	SD Conc. (Bq/kg)	ALPHA En [a]	BETA En [a]	1-phi [b] (SI)	1-phi [b] (LI)	GAMMA En	1-phi [b] (SI)	1-phi [b] (LI)	R [c] SI	R [c] LI
Radium-228	0.3	8.33	NA	4.77E-01	0.1	0	9.30E-01	0.997	0.99	1	1

NOTES:

[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.

[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).

[c] Fraction of time that small and large insects spend at the sediment-water interface.

Table S-4.7
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – Grassy Drainage Ditch
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –LARGE INSECT (sediment)

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Radium-228	NA	NC	2.57E-05	1.14E-04	1.40E-04	3.36E-07	1.67E-07	2.22E-03	2.22E-03	5.33E-06	5.67E-06
TOTAL BODY DOSE		0.00E+00				3.36E-07				5.33E-06	5.67E-06

Table S-4.7
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – Grassy Drainage Ditch
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –SMALL INSECT (sediment)

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Radium-228	NA	NC	2.86E-05	0.00E+00	2.86E-05	6.86E-08	5.57E-07	2.21E-03	2.21E-03	5.30E-06	5.36E-06
TOTAL BODY DOSE		0.00E+00				6.86E-08				5.30E-06	5.36E-06

Table S-4.

Estimation of Chronic Radiolgical Risks to Aquatic Organisms in Sediment – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Internal Dose Rate

Radionuclide	SD Conc. (pCi/g)	SD Conc. (Bq/kg)	ALPHA En [a]	BETA En [a]	phi [b] (SI)	phi [b] (LI)	phi [b] (SF)	GAMMA En [a]	phi [b] (SI)	phi [b] (LI)	phi [b] (SF)	phi [b] (LF)	Small Insects BTF [c]	Large Insects BTF [c]	Small Fish BTF [c]	Large Fish BTF [c]
Cesium-137	0.699	1.94E+01	NA	2.52E-01	1	1	1	5.96E-01	0.003	0.01	0.02	0.1	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Lead-212	0.9	2.50E+01	1.12E+01	6.44E-01	0.9	1	1	3.33E-01	0.002	0.01	0.01	0.1	1.50E-02	1.50E-02	1.50E-02	1.50E-02
Lead-214	0.9	2.50E+01	7.83E+00	9.39E-01	0.8	1	1	1.71E+00	0.002	0.01	0.01	0.1	1.50E-02	1.50E-02	1.50E-02	1.50E-02
Potassium-40	3.4	9.44E+01	NA	5.23E-01	0.9	1	1	1.56E-02	0.002	0.01	0.01	0.8	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Radium-226	0.97	2.69E+01	1.07E+01	2.85E-01	1	1	1	5.19E-01	0.003	0.01	0.02	0.1	1.25E-02	1.25E-02	1.25E-02	1.25E-02
Radium-228	0.35	9.71E+00	NA	4.77E-01	0.9	1	1	9.30E-01	0.003	0.01	0.02	0.1	1.25E-02	1.25E-02	1.25E-02	1.25E-02
Thallium-208	0.54	1.50E+01	NA	5.58E-01	0.9	1	1	3.35E+00	0.002	0.002	0.002	0.1	2.00E+00	2.00E+00	2.00E+00	2.00E+00
Uranium-235	0.33	9.16E+00	4.47E+00	2.11E-01	1	1	1	1.80E-01	0.002	0.01	0.02	0.1	1.00E-02	1.00E-02	1.00E-02	1.00E-02

NOTES:

[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.

[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).

[c] BTF adapted from Baes et al., 1984. BTFs are equal to an ingestion-to-beef transfer coefficient (days/kg) multiplied by a beef ingestion rate of 50 kg wet feed/day.

Table S-4.8
Estimation of Chronic Radiolgical Risks to Aquatic Organisms in Sediment – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of External Dose Rate

Radionuclide	SD Conc. (pCi/g)	SD Conc. (Bq/kg)	ALPHA En [a]	BETA En [a]	t-phi [b] (SI)	t-phi [b] (LI)	t-phi [b] (SF)	GAMMA En [a]	t-phi [b] (SI)	t-phi [b] (LI)	t-phi [b] (SF)	t-phi [b] (LF)	R [c] SI	R [c] LI	R [c] SF	R [c] LF
Cesium-137	0.699	3.05E+00	NA	2.52E-01	0	0	0	5.96E-01	0.997	0.99	0.98	0.9	1	1	1	1
Lead-212	0.9	1.42E+01	1.12E+01	6.44E-01	0.1	0	0	3.33E-01	0.998	0.99	0.99	0.9	1	1	1	1
Lead-214	0.9	1.55E+01	7.83E+00	9.39E-01	0.2	0	0	1.71E+00	0.998	0.99	0.99	0.9	1	1	1	1
Potassium-40	3.4	4.44E+01	NA	5.23E-01	0.1	0	0	1.56E-02	0.998	0.99	0.99	0.2	1	1	1	1
Radium-226	0.97	2.69E+01	1.07E+01	2.85E-01	0	0	0	5.19E-01	0.997	0.99	0.98	0.9	1	1	1	1
Radium-228	0.35	8.33E+00	NA	4.77E-01	0.1	0	0	9.30E-01	0.997	0.99	0.98	0.9	1	1	1	1
Thallium-208	0.54	1.50E+01	NA	5.58E-01	0.1	0	0	3.35E+00	0.998	0.998	0.998	0.9	1	1	1	1
Uranium-235	0.33	9.16E+00	4.47E+00	2.11E-01	0	0	0	1.80E-01	0.998	0.99	0.98	0.9	1	1	1	1

NOTES:
[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.
[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).
[c] Fraction of time that small and large insects spend at the sediment-water interface.

Table S-4.7
Estimation of Chronic Radiolgical Risks to Aquatic Organisms in Sediment – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –SMALL FISH

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Cesium-137	NA	NC	2.82E-03	0.00E+00	2.82E-03	6.75E-06	1.33E-04	3.26E-03	3.40E-03	8.14E-06	1.49E-05
Lead-212	2.42E-03	5.80E-06	1.39E-04	0.00E+00	1.39E-04	3.33E-07	7.19E-07	2.37E-03	2.37E-03	5.69E-06	1.18E-05
Lead-214	1.69E-03	4.05E-06	2.03E-04	0.00E+00	2.03E-04	4.86E-07	3.69E-06	1.22E-02	1.22E-02	2.92E-05	3.37E-05
Potassium-40	NA	NC	2.84E-02	0.00E+00	2.84E-02	6.82E-05	8.48E-06	4.20E-04	4.28E-04	1.03E-06	6.92E-05
Radium-226	2.07E-03	4.97E-06	5.53E-05	0.00E+00	5.53E-05	1.33E-07	2.01E-06	3.94E-03	3.95E-03	9.46E-06	1.46E-05
Radium-228	NA	NC	3.34E-05	0.00E+00	3.34E-05	8.00E-08	1.30E-06	2.55E-03	2.55E-03	6.12E-06	6.20E-06
Thallium-208	NA	NC	9.63E-03	0.00E+00	9.63E-03	2.31E-05	1.16E-04	1.44E-02	1.45E-02	3.49E-05	5.80E-05
Uranium-235	2.36E-04	5.65E-07	1.11E-05	0.00E+00	1.11E-05	2.67E-08	1.90E-07	4.65E-04	4.65E-04	1.12E-06	1.71E-06
TOTAL BODY DOSE		1.54E-05				9.91E-05				9.56E-05	2.10E-04

Table S-4.8
Estimation of Chronic Radiolgical Risks to Aquatic Organisms in Sediment – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –LARGE FISH

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Cesium-137	NA	NC	2.82E-03	NS	2.82E-03	6.75E-06	6.66E-04	3.00E-03	3.66E-03	8.78E-06	1.55E-05
Lead-212	2.42E-03	5.80E-06	1.39E-04	NS	1.39E-04	3.33E-07	7.19E-06	2.16E-03	2.16E-03	5.19E-06	1.13E-05
Lead-214	1.69E-03	4.05E-06	2.03E-04	NS	2.03E-04	4.86E-07	3.69E-05	1.11E-02	1.11E-02	2.66E-05	3.12E-05
Potassium-40	NA	NC	2.84E-02	NS	2.84E-02	6.82E-05	6.78E-04	8.48E-05	7.63E-04	1.83E-06	7.00E-05
Radium-226	2.07E-03	4.97E-06	5.53E-05	NS	5.53E-05	1.33E-07	1.01E-05	3.62E-03	3.63E-03	8.71E-06	1.38E-05
Radium-228	NA	NC	3.34E-05	NS	3.34E-05	8.00E-08	6.50E-06	2.34E-03	2.35E-03	5.63E-06	5.71E-06
Thallium-208	NA	NC	9.63E-03	NS	9.63E-03	2.31E-05	5.78E-03	1.30E-02	1.88E-02	4.51E-05	6.82E-05
Uranium-235	2.36E-04	5.65E-07	1.11E-05	NS	1.11E-05	2.67E-08	9.49E-07	4.27E-04	4.28E-04	1.03E-06	1.62E-06
TOTAL BODY DOSE		1.54E-05				9.91E-05				1.03E-04	2.17E-04

Table S-4.8
Estimation of Chronic Radiolgical Risks to Aquatic Organisms in Sediment – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –SMALL INSECT

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Cesium-137	NA	NC	2.82E-03	0.00E+00	2.82E-03	6.75E-06	2.00E-05	3.32E-03	3.34E-03	8.01E-06	1.48E-05
Lead-212	2.42E-03	5.80E-06	1.25E-04	4.63E-04	5.88E-04	1.41E-06	1.44E-07	2.39E-03	2.39E-03	5.73E-06	1.29E-05
Lead-214	1.69E-03	4.05E-06	1.62E-04	1.35E-03	1.51E-03	3.63E-06	7.38E-07	1.23E-02	1.23E-02	2.94E-05	3.71E-05
Potassium-40	NA	NC	2.56E-02	1.42E-03	2.70E-02	6.48E-05	1.70E-06	4.23E-04	4.25E-04	1.02E-06	6.58E-05
Radium-226	2.07E-03	4.97E-06	5.53E-05	0.00E+00	5.53E-05	1.33E-07	3.02E-07	4.01E-03	4.01E-03	9.62E-06	1.47E-05
Radium-228	NA	NC	3.00E-05	1.33E-04	1.63E-04	3.92E-07	1.95E-07	2.59E-03	2.59E-03	6.22E-06	6.61E-06
Thallium-208	NA	NC	8.67E-03	2.41E-04	8.91E-03	2.14E-05	1.16E-04	1.44E-02	1.45E-02	3.49E-05	5.62E-05
Uranium-235	2.36E-04	5.65E-07	1.11E-05	0.00E+00	1.11E-05	2.67E-08	1.90E-08	4.74E-04	4.74E-04	1.14E-06	1.73E-06
TOTAL BODY DOSE		1.54E-05				9.85E-05				9.61E-05	2.10E-04

Table S-4.8
Estimation of Chronic Radiolgical Risks to Aquatic Organisms in Sediment – Forested Stream
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –LARGE INSECT

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Cesium-137	NA	NC	2.82E-03	0.00E+00	2.82E-03	6.75E-06	6.66E-05	3.30E-03	3.36E-03	8.06E-06	1.48E-05
Lead-212	2.42E-03	5.80E-06	1.39E-04	0.00E+00	1.39E-04	3.33E-07	7.19E-07	2.37E-03	2.37E-03	5.69E-06	1.18E-05
Lead-214	1.69E-03	4.05E-06	2.03E-04	0.00E+00	2.03E-04	4.86E-07	3.69E-06	1.22E-02	1.22E-02	2.92E-05	3.37E-05
Potassium-40	NA	NC	2.84E-02	0.00E+00	2.84E-02	6.82E-05	8.48E-06	4.20E-04	4.28E-04	1.03E-06	6.92E-05
Radium-226	2.07E-03	4.97E-06	5.53E-05	0.00E+00	5.53E-05	1.33E-07	1.01E-06	3.98E-03	3.98E-03	9.55E-06	1.47E-05
Radium-228	NA	NC	3.34E-05	0.00E+00	3.34E-05	8.00E-08	6.50E-07	2.58E-03	2.58E-03	6.18E-06	6.26E-06
Thallium-208	NA	NC	9.63E-03	0.00E+00	9.63E-03	2.31E-05	1.16E-04	1.44E-02	1.45E-02	3.49E-05	5.80E-05
Uranium-235	2.36E-04	5.65E-07	1.11E-05	0.00E+00	1.11E-05	2.67E-08	9.49E-08	4.70E-04	4.70E-04	1.13E-06	1.72E-06
TOTAL BODY DOSE		1.54E-05				9.91E-05				9.57E-05	2.10E-04

Table S-4.9
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – St. Johns River
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Internal Dose Rate

Radionuclide	SD Conc. (pCi/g)	SD Conc. (Bq/kg)	ALPHA En [a]	BETA En [a]	phi [b] (SI)	phi [b] (LI)	phi [b] (SF)	GAMMA En [a]	phi [b] (SI)	phi [b] (LI)	phi [b] (SF)	phi [b] (LF)	Small Insects BTF [c]	Large Insects BTF [c]	Small Fish BTF [c]	Large Fish BTF [c]
Actinium-228	0.55	15.26	NA	4.60E-01	1	1	1	9.30E-01	0.003	0.01	0.02	0.1	1.25E-03	1.25E-03	1.25E-03	1.25E-03
Bismuth-212	0.49	13.60	1.12E+01	4.69E+00	0	0.5	0.6	1.85E-01	0.002	0.01	0.01	0.1	2.00E-02	2.00E-02	2.00E-02	2.00E-02
Bismuth-214	0.49	13.60	NA	6.48E-01	0.9	1	1	1.46E+00	0.002	0.01	0.01	0.1	2.00E-02	2.00E-02	2.00E-02	2.00E-02
Cesium-137	0.11	3.05	NA	2.52E-01	1	1	1	5.96E-01	0.003	0.01	0.02	0.1	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Lead-212	0.51	14.15	1.12E+01	6.44E-01	0.9	1	1	3.33E-01	0.002	0.01	0.01	0.1	1.50E-02	1.50E-02	1.50E-02	1.50E-02
Lead-214	0.56	15.54	7.83E+00	9.39E-01	0.8	1	1	1.71E+00	0.002	0.01	0.01	0.1	1.50E-02	1.50E-02	1.50E-02	1.50E-02
Potassium-40	1.6	44.40	NA	5.23E-01	0.9	1	1	1.56E-02	0.002	0.01	0.01	0.8	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Thallium-208	0.21	5.83	NA	5.58E-01	0.9	1	1	3.35E+00	0.002	0.002	0.002	0.1	2.00E+00	2.00E+00	2.00E+00	2.00E+00

NOTES:
[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.
[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).
[c] BTF adapted from Baes et al., 1984. BTFs are equal to an ingestion-to-beef transfer coefficient (days/kg) multiplied by a beef ingestion rate of 50 kg wet feed/day.

Table S-4.9
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – St. Johns River
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of External Dose Rate

Radionuclide	SD Conc. (pCi/g)	SD Conc. (Bq/kg)	ALPHA En [a]	BETA En [a]	1-phi [b] (SI)	(LI)	(SF)	GAMMA En [a]	1-phi [b] (SI)	(LI)	(SF)	(LF)	R [c] SI	LI	SF	LF
Actinium-228	0.55	15.26	NA	4.60E-01	0	0	0	9.30E-01	0.997	0.99	0.98	0.9	1	1	1	1
Bismuth-212	0.49	13.60	1.12E+01	4.69E+00	1	0.5	0.4	1.85E-01	0.998	0.99	0.99	0.9	1	1	1	1
Bismuth-214	0.49	13.60	NA	6.48E-01	0.1	0	0	1.46E+00	0.998	0.99	0.99	0.9	1	1	1	1
Cesium-137	0.11	3.05	NA	2.52E-01	0	0	0	5.96E-01	0.997	0.99	0.98	0.9	1	1	1	1
Lead-212	0.51	14.15	1.12E+01	6.44E-01	0.1	0	0	3.33E-01	0.998	0.99	0.99	0.9	1	1	1	1
Lead-214	0.56	15.54	7.83E+00	9.39E-01	0.2	0	0	1.71E+00	0.998	0.99	0.99	0.9	1	1	1	1
Potassium-40	1.6	44.40	NA	5.23E-01	0.1	0	0	1.56E-02	0.998	0.99	0.99	0.2	1	1	1	1
Thallium-208	0.21	5.83	NA	5.58E-01	0.1	0	0	3.35E+00	0.998	0.998	0.998	0.9	1	1	1	1

NOTES:

[a] Average energy of decay including short-lived daughter products (MeV), as provided in Appendix S, Table S-2.10.

[b] Absorbed photon energy fraction for various receptor geometries as provided in Blaylock et al., 1993; small insect (SI), large insect (LI), small fish (SF), and large fish (LF).

[c] Fraction of time that small and large insects spend at the sediment-water interface.

Table S-4.9
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – St. Johns River
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –SMALL INSECT

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Actinium-228	NA	NC	5.05E-06	0.00E+00	5.05E-06	1.21E-08	3.07E-08	4.08E-03	4.08E-03	9.77E-06	9.79E-06
Bismuth-212	1.75E-03	4.20E-06	0.00E+00	1.84E-02	1.84E-02	4.40E-05	5.80E-08	7.23E-04	7.23E-04	1.73E-06	5.00E-05
Bismuth-214	NA	NC	9.14E-05	2.54E-04	3.45E-04	8.28E-07	4.57E-07	5.71E-03	5.71E-03	1.37E-05	1.45E-05
Cesium-137	NA	NC	4.43E-04	0.00E+00	4.43E-04	1.06E-06	3.14E-06	5.22E-04	5.26E-04	1.26E-06	2.32E-06
Lead-212	1.37E-03	3.28E-06	7.09E-05	2.62E-04	3.33E-04	7.99E-07	8.14E-08	1.35E-03	1.35E-03	3.25E-06	7.32E-06
Lead-214	1.05E-03	2.52E-06	1.01E-04	8.41E-04	9.41E-04	2.26E-06	4.59E-07	7.63E-03	7.63E-03	1.83E-05	2.31E-05
Potassium-40	NA	NC	1.20E-02	6.69E-04	1.27E-02	3.05E-05	7.98E-07	1.99E-04	2.00E-04	4.79E-07	3.10E-05
Thallium-208	NA	NC	3.37E-03	9.37E-05	3.47E-03	8.31E-06	4.50E-05	5.61E-03	5.66E-03	1.36E-05	2.19E-05
TOTAL BODY DOSE		9.99E-06				8.78E-05				6.20E-05	1.60E-04

Table S-4.9
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – St. Johns River
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –LARGE INSECT

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Actinium-228	NA	NC	5.05E-06	0.00E+00	5.05E-06	1.21E-08	1.02E-07	4.05E-03	4.05E-03	9.71E-06	9.72E-06
Bismuth-212	1.75E-03	4.20E-06	3.67E-04	9.18E-03	9.55E-03	2.29E-05	2.90E-07	7.17E-04	7.18E-04	1.72E-06	2.88E-05
Bismuth-214	NA	NC	1.02E-04	0.00E+00	1.02E-04	2.43E-07	2.29E-06	5.66E-03	5.66E-03	1.36E-05	1.38E-05
Cesium-137	NA	NC	4.43E-04	0.00E+00	4.43E-04	1.06E-06	1.05E-05	5.19E-04	5.29E-04	1.27E-06	2.33E-06
Lead-212	1.37E-03	3.28E-06	7.87E-05	0.00E+00	7.87E-05	1.89E-07	4.07E-07	1.34E-03	1.34E-03	3.22E-06	6.69E-06
Lead-214	1.05E-03	2.52E-06	1.26E-04	0.00E+00	1.26E-04	3.02E-07	2.29E-06	7.57E-03	7.57E-03	1.82E-05	2.10E-05
Potassium-40	NA	NC	1.34E-02	0.00E+00	1.34E-02	3.21E-05	3.99E-06	1.97E-04	2.01E-04	4.83E-07	3.26E-05
Thallium-208	NA	NC	3.75E-03	0.00E+00	3.75E-03	8.98E-06	4.50E-05	5.61E-03	5.66E-03	1.36E-05	2.25E-05
TOTAL BODY DOSE		9.99E-06				6.58E-05				6.17E-05	1.37E-04

Table S-4.9
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – St. Johns River
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –SMALL FISH

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Actinium-228	NA	NC	5.05E-06	0.00E+00	5.05E-06	1.21E-08	2.04E-07	4.01E-03	4.01E-03	9.61E-06	9.62E-06
Bismuth-212	1.75E-03	4.20E-06	4.41E-04	7.35E-03	7.79E-03	1.87E-05	2.90E-07	7.17E-04	7.18E-04	1.72E-06	2.46E-05
Bismuth-214	NA	NC	1.02E-04	0.00E+00	1.02E-04	2.43E-07	2.29E-06	5.66E-03	5.66E-03	1.36E-05	1.38E-05
Cesium-137	NA	NC	4.43E-04	0.00E+00	4.43E-04	1.06E-06	2.10E-05	5.13E-04	5.34E-04	1.28E-06	2.34E-06
Lead-212	1.37E-03	3.28E-06	7.87E-05	0.00E+00	7.87E-05	1.89E-07	4.07E-07	1.34E-03	1.34E-03	3.22E-06	6.69E-06
Lead-214	1.05E-03	2.52E-06	1.26E-04	0.00E+00	1.26E-04	3.02E-07	2.29E-06	7.57E-03	7.57E-03	1.82E-05	2.10E-05
Potassium-40	NA	NC	1.34E-02	0.00E+00	1.34E-02	3.21E-05	3.99E-06	1.97E-04	2.01E-04	4.83E-07	3.26E-05
Thallium-208	NA	NC	3.75E-03	0.00E+00	3.75E-03	8.98E-06	4.50E-05	5.61E-03	5.66E-03	1.36E-05	2.25E-05
TOTAL BODY DOSE		9.99E-06				6.15E-05				6.16E-05	1.33E-04

Table S-4.9
Estimation of Chronic Radiological Risks to Aquatic Organisms in Sediment – St. Johns River
Baseline Risk Assessment for Operable Unit 1, NAS Jacksonville

Estimation of Dose Rates – –LARGE FISH

Radionuclide	ALPHA		BETA				GAMMA				TOTAL DOSE
	Internal	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	Internal	External	Total (uGy/h)	Total (rads/d)	(rads/d)
Actinium-228	NA	NC	5.05E-06	NS	5.05E-06	1.21E-08	1.02E-06	3.68E-03	3.68E-03	8.83E-06	8.84E-06
Bismuth-212	1.75E-03	4.20E-06	7.35E-04	NS	7.35E-04	1.76E-06	2.90E-06	6.52E-04	6.55E-04	1.57E-06	7.53E-06
Bismuth-214	NA	NC	1.02E-04	NS	1.02E-04	2.43E-07	2.29E-05	5.15E-03	5.17E-03	1.24E-05	1.26E-05
Cesium-137	NA	NC	4.43E-04	NS	4.43E-04	1.06E-06	1.05E-04	4.72E-04	5.76E-04	1.38E-06	2.44E-06
Lead-212	1.37E-03	3.28E-06	7.87E-05	NS	7.87E-05	1.89E-07	4.07E-06	1.22E-03	1.23E-03	2.94E-06	6.40E-06
Lead-214	1.05E-03	2.52E-06	1.26E-04	NS	1.26E-04	3.02E-07	2.29E-05	6.88E-03	6.90E-03	1.66E-05	1.94E-05
Potassium-40	NA	NC	1.34E-02	NS	1.34E-02	3.21E-05	3.19E-04	3.99E-05	3.59E-04	8.61E-07	3.29E-05
Thallium-208	NA	NC	3.75E-03	NS	3.75E-03	8.98E-06	2.25E-03	5.06E-03	7.31E-03	1.75E-05	2.65E-05
TOTAL BODY DOSE		9.99E-06				4.46E-05				6.21E-05	1.17E-04

APPENDIX T

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Table T-1
Synopsis of Potential Federal and State Chemical-Specific ARARs

Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
Federal		
Atomic Energy Act Regulations, Discharge of Radionuclides to Unrestricted Areas (Air and Water) [10 CFR Part 20.106]	Establishes maximum concentration limits for radionuclide discharges to air and water.	**Relevant and Appropriate.** Would be considered where nuclear material has the potential to be discharged to air or water.
Clean Air Act Regulations, National Emission Standards for Hazardous Air Pollutants: Standards for Radionuclides [40 CFR Part 61, Subparts H and I].	Establishes emission levels for radionuclides.	**Relevant and Appropriate.** The requirements in Subparts H and I would be a requirement for airborne emissions of radionuclides during the cleanup of sites at non-DOE Federal facilities. However, they would not be a requirement for airborne emissions from residual contamination after cleanup.
Clean Water Act (CWA) Regulations, Ambient Water Quality Criteria [40 CFR Part 131]	Ecological and health-based Federal Ambient Water Quality Criteria (AWQC) are guidelines used by states to set their state-specific water standards for surface water.	**Relevant and Appropriate.** AWQC should be used in the determination of cleanup goals in the absence of state water quality standards at OU 1. If a groundwater treatment system is installed at OU 1 and the discharge from this system is sent to an onsite surface water body, AWQC would be considered in the National Pollutant Discharge Elimination System (NPDES) permitting process. However, although Florida is not currently recognized as a "delegated" state, the Federal government uses the State surface water standards as identified in Florida Administrative Code (FAC) 62-302, not the AWQC, for limiting the discharges of pollutants to the surface waters of the State because they are better suited for Florida waters.
Safe Drinking Water Act (SDWA) Regulations, Maximum Contaminant Level Goals (MCLGs) [40 CFR Part 141]	Establishes drinking water quality goals at levels of no known or anticipated adverse health effects with an adequate margin of safety. These criteria do not consider treatment feasibility or cost elements.	**Relevant and Appropriate.** If MCLGs are greater than zero, these standards should be met for groundwaters or surface waters that are current or potential sources of drinking water, assuming that the treatment technique chosen is capable of achieving this standard.
SDWA Regulations, National Primary Drinking Water Standards, Maximum Contaminant Levels (MCLs) [40 CFR Part 141]	Establishes enforceable standards for potable water distribution systems for specific contaminants that have been determined to adversely effect human health. These standards, MCLs, are protective of human health for individual chemicals and are developed using MCLGs, available treatment technologies, and cost data. Secondary Maximum Contaminant Levels (SMCLs) are located in 40 CFR Part 143.	**Relevant and Appropriate.** MCLs can be used for groundwater or surface waters that are current or potential drinking water sources (i.e., ground and surface waters at OU1). MCLs would be relevant and appropriate requirements for surface water at OU 1 where nonzero MCLGs have not been promulgated.

See notes at end of table.

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Table T-1 (Continued)
Synopsis of Potential Federal and State Chemical-Specific ARARs

Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
State		
Chapter 62-302, FAC Florida Surface Water Standards, August, 1994	Defines classifications of surface waters, and establishes water quality standards (WQS) for surface water within the classifications. The State's antidegradation policy is also established in this rule. Unnamed creek discharges to the St. Johns River, which is classified as a Class III marine surface water.	**Applicable.** State WQSs should be used in the determination of cleanup goals for surface waters. The minimum WQSs mandate that all surface waters of the State must be "free from" contaminants as described at FAC 62-302.500. Remedial alternatives that include an option for discharge of treated groundwater to surface water will consider Florida WQSs.
Chapter 62-520, FAC Groundwater Classes, Standards, and Exemptions, October, 1994	Establishes the groundwater classification system for the State and provides qualitative minimum criteria for groundwater based on the classification. Groundwater at OU 1 is classified as G-II, designated for potable water use. This rule adopts the Federal primary and secondary drinking water standards and establishes some State standards that are more stringent than Federal standards. Like Federal MCLs, these standards are considered ARARs for cleanup of groundwater that is a current or potential source of drinking water.	**Applicable.** Groundwater subject to this rule must be "free from" components of discharges in concentrations that are harmful to the organisms responsible for treatment or stabilization of the discharge; are carcinogenic, mutagenic, teratogenic, or toxic to human beings; are acutely toxic to indigenous species of significance to the aquatic community; pose a serious danger to public health, safety, or welfare; create or constitute a nuisance; or impair the reasonable and beneficial uses of the adjacent waters. "Free from" is further defined in the Florida Groundwater Guidance Concentrations.
Chapter 62-550, FAC Florida Drinking Water Standards, September, 1994	Established to implement the Federal Safe Drinking Water Act by adopting the national primary and secondary drinking water standards and by creating additional rules to fulfill State and Federal requirements for community water distribution systems.	**Relevant and Appropriate.** MCLs are commonly considered relevant and appropriate where surface water or groundwater is considered a potential potable water supply source.
Chapter 62-650, FAC Florida Water Quality Based Effluent Limitations, November, 1989	All activities and discharges, except dredge and fill, must meet effluent limitations based on technology or water quality. This rule states that in addition to any other technology-based groundwater effluent limitation requirements, all sources will also meet water quality based effluent limitations where necessary to meet groundwater quality standards.	**Applicable.** All activities and discharges, other than dredge and fill activities, are required to meet effluent limitations based on technology (technology-based effluent limit) and/or water quality (water quality based effluent limit), as defined by this rule. The substantive permitting requirement established in this rule is an applicable requirement for remedial actions where treated groundwater is discharge to a surface water body (e.g., Unnamed Creek).

Notes: ARAR = applicable or relevant and appropriate requirements.
CFR = Code of Federal Regulation.
DOE = Department of Energy.
OU = operable unit.

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Table T-3
Synopsis of Potential Federal and State Location-Specific ARARs

Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
Federal		
Endangered Species Act [40 CFR Part 302(h), Appendix A]	Requires remedial action to avoid jeopardizing the continued existence of Federally-listed endangered or threatened species. Requirements include notification to the USEPA and minimization of adverse effects to such endangered species.	**Applicable.** When choosing a remedial action, minimization of impact to endangered species existing in and around OU 1 will be considered.
Fish and Wildlife Coordination Act Regulations [40 CFR Part 302]	Requires that the USFWS, NMFS, and related State agencies be consulted prior to structural modification of any stream or other water body (i.e., wetlands). It also requires adequate protection of fish and wildlife resources.	**Applicable.** Should a remedial action involve the alteration of a stream or other body of water, the USFWS, NMFS, and other related agencies must be consulted before that body of water is altered.
National Environmental Policy Act (NEPA) Regulations; Protection of Wetlands [Executive Order (EO) 11990, 40 CFR Part 6, Appendix A, and 40 CFR Part 6.302(a)]	Requires that Federal agencies minimize the degradation, loss, or destruction of wetlands, and preserve and enhance natural and beneficial values of wetlands under EO 11990.	**Applicable.** When choosing a remedial action, any possible impact to a wetlands through discharge should be considered to ensure that degradation, loss, or destruction of wetlands is minimized.
NEPA Regulations; Protection of Floodplains [EO 11988, 40 CFR Part 6, Appendix A, and 40 CFR Part 6.302(b)]	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial values of floodplains.	**Applicable.** The potential effects of any action at OU 1 will be evaluated to ensure that planning and decision making reflect consideration of flood hazards and floodplains management, including restoration and preservation of natural, undeveloped floodplains.
Chapter 62-340, FAC Delineation of the Landward Extent of Wetlands and Surface Waters	Provides a unified state-wide methodology for delineation of wetlands and surface waters.	**Applicable.** The methodology defined in this rule is required for delineation of all wetlands and surface waters at OU 1.

Notes: ARARs = applicable or relevant and appropriate requirements.
CFR = Code of Federal Regulations.
USEPA = U.S. Environmental Protection Agency.
OU = operable unit.
USFWS = U.S. Fish and Wildlife Services.
NMFS = National Marine Fisheries Service.
FAC = Florida Administrative Code.

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Table T-4
Synopsis of Potential Federal and State Action-Specific ARARs

Remedial Investigation and Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
Federal		
Clean Air Act (CAA) Regulations, Emissions Standards [40 CFR Part 50]	This rule provides emissions standards, which are promulgated to attain the National Ambient Air Quality Standards (NAAQSs), for hazardous air pollutants likely to cause an increase in mortality or a serious illness to humans.	**Relevant and Appropriate.** Emissions standards and monitoring requirements promulgated in this rule are relevant and appropriate requirements for alternatives that involve the potential discharge to air (e.g., excavation, air stripping) of pollutants regulated under the CAA. The state of Florida has jurisdiction for the implementation of these regulations through the State Implementation Plan.
CAA Regulations, New Source Performance Standards (NSPS) [40 CFR Part 60]	Establishes NSPS for specified sources that are similar to a source that has established NSPSs (such as air stripping technologies). The NSPSs limit the emissions of a number of different pollutants, including the six criteria pollutants list (carbon monoxide, nitrogen dioxide, volatile organic compounds, sulfur dioxide, particulate matter, and lead), for which NAAQSs are established, as well as fluorides, sulfuric acid mist, and total reduced sulfur (including hydrogen sulfide [H_2S]).	**Relevant and Appropriate.** This rule may be a relevant and appropriate requirement for a new source that is similar to a source that has established NSPSs (such as air stripping technologies). If it is determined that the remedy would create potential air impact, the response action or the equipment for the response action may qualify as a new source; therefore, these requirements should be met.
Clean Water Act (CWA) Regulations, National Pollutant Discharge Elimination System (NPDES) [40 CFR Parts 122 and 125]	Requires permits specifying the permissible concentration or level of contaminants in the effluent for the discharge of pollutants from any point source into waters of the United States.	**Applicable.** Treated groundwater from Superfund remedial actions that is discharged to onsite surface water must meet the substantive requirements of an NPDES permit, but would not have to meet the Resource Conservation and Recovery Act (RCRA) land disposal restriction levels, because discharges to surface waters that meet the requirements of an NPDES permit are exempt from the RCRA land disposal restrictions. Because the state of Florida is not recognized as "delegated" by the U.S. Environmental Protection Agency (USEPA), a facility discharging wastewater to the surface waters of the state would require an NPDES permit as well as a State wastewater discharge permit. When Florida becomes classified as a "delegated" state, a single permit will meet both Federal and State discharge requirements. All Federal NPDES permits must be certified by the state of Florida to confirm that Florida surface water standards are met.

See notes at end of table.

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Table T-4 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Feasibility Study, Operable Unit 1
Naval Air Station (NAS) Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
Federal		
Hazardous Materials Transportation Act, Hazardous Materials Transportation Regulations [49 CFR Parts 171-179]	Provides requirements for the packaging, labeling, manifesting, and transporting of hazardous materials. Packaging and transportation requirements for radioactive materials are provided in Parts 171-179.	**Applicable.** If offsite disposal of a hazardous material is considered at OU 1, contaminated materials (e.g., sludge from treated groundwater), would need to be handled, manifested, and transported to a licensed offsite disposal facility in compliance with these regulations.
RCRA Regulations, General Facility Standards [40 CFR Subpart B, 264.-10-264.18]	Sets the general facility requirements, including general waste analysis, security measures, inspections, and training requirements. Section 264.18 establishes that a facility located in a 100-year floodplain must be designed, constructed, and maintained to prevent washout of any hazardous wastes by a 100-year flood.	**Relevant and Appropriate.** If the remedial action involves construction of an onsite treatment facility, such as a groundwater treatment facility, the substantive requirements of this rule would be relevant and appropriate.
RCRA Regulations, Hazardous Waste Permits Program [40 CFR Part 270]	Establishes requirements for obtaining permits to treat, store, or dispose of hazardous wastes.	**Relevant and Appropriate.** Though obtaining a permit for onsite actions is not required, remedial actions involving the treatment or containment of hazardous waste at OU 1 must meet the substantive requirements of the permit program.
RCRA Regulations, Land Disposal Restrictions (LDRs) [40 CFR Part 268]	Establishes restrictions on land disposal of untreated hazardous wastes and provides standards for treatment of hazardous wastes prior to land disposal. Universal Treatment Standards (UTSs) for organic hazardous substances that are subject to LDRs became effective on December 19, 1994.	**Relevant and Appropriate.** Groundwater treatment system residuals (e.g., sludge) that exhibit the RCRA-hazardous waste toxicity characteristic will have to be treated until concentrations are below the characteristic levels established under RCRA before disposal once the LDRs for characteristic wastes become effective. Treated groundwater that is discharged to surface water must meet the substantive requirements of an NPDES permit, but would not have to meet the RCRA LDRs, because discharges to surface waters that meet the requirements of an NPDES permit are exempt from the RCRA LDRs. Therefore, groundwater itself is exempt from LDRs; however, the treatment residuals from the groundwater would be subject to LDRs and would need to be disposed of appropriately. Consolidation of soil under a landfill cap at OU 1 would not trigger LDRs because disposal occurred before the effective date of RCRA and because wastes will not be "generated" (i.e., they will not be moved out of the area of contamination).

See notes at end of table.

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Table T-4 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Feasibility Study, Operable Unit 1
Naval Air Station (NAS) Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
RCRA Regulations, Manifest System, Recordkeeping, and Reporting [40 CFR Part 264, Subpart E]	Outlines procedures for manifesting hazardous waste for owners and operators of onsite and offsite facilities that treat, store, or dispose of hazardous waste.	**Applicable.** These regulations apply if a remedial action involves transportation of wastes (e.g., sludge generated during pumping and treatment of groundwater) to an offsite treatment, storage, or disposal facility. Manifests would need to be completed for the receiving facility.
RCRA Regulations, Miscellaneous Units [40 CFR Part 264, Subpart X]	These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, and wetlands that may have adverse effects on human health and the environment.	**Relevant and Appropriate.** The design of proposed treatment alternatives, not specifically regulated under other subparts of RCRA, must prevent the release of hazardous constituents and future impact on the environment. This subpart would apply to onsite construction of any treatment facility that is not previously defined under the RCRA regulation.
RCRA Regulations, Preparedness and Prevention [40 CFR Part 264, Subpart C]	Outlines requirements for safety equipment and spill control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	**Applicable.** Safety and communication equipment should be incorporated into all aspects of the remedial process, and local authorities should be familiarized with site operations.
RCRA Regulations, Standards Applicable to Transporters of Hazardous Waste [40 CFR Part 263, Subpart A]	Establishes procedures for transporters of hazardous waste within the United States if the transportation requires a manifest under 40 CFR Part 262.	**Applicable.** Transportation of RCRA wastes to an offsite Treatment, Storage, and Disposal Facility (TSDF) must meet the requirements of this rule.
RCRA Regulations, Landfills [40 CFR Part 264, Subpart N]	Provides requirements for closure of a Subtitle C landfill.	**Relevant and Appropriate.** Because the remedial action would not constitute disposal, these requirements would not be applicable. However, should hazardous materials be placed within the landfill cap, the substantive requirements of this rule may be relevant and appropriate.
Solid Waste Disposal Act Regulations, Criteria for Municipal Solid Waste Landfills, [40 CFR Part 258]	Establishes requirements for closure and post-closure care where landfills are closes as a presumptive remedy.	**Relevant and Appropriate.** Requirements of this rule are implemented by the State of Florida under Chapter 62-701, FAC.
State		
Chapter 62-2, FAC Florida Air Pollution Rules, October, 1992	Establishes permitting requirements for owners or operators of any source which emits any air pollutant. This rule also establishes ambient air quality standards for sulfur dioxide, PM_{10}, carbon monoxide, lead, and ozone.	**Relevant and Appropriate.** Although this rule is directly applicable to industrial polluters, these requirements are relevant and appropriate for a remedial action which could result in the release of regulated contaminants to the atmosphere (e.g., particulate emissions during excavation).

See notes at end of table.

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Table T-4 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Feasibility Study, Operable Unit 1
Naval Air Station (NAS) Jacksonville
Jacksonville, Florida

Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Chapter 62-4, FAC Florida Rules on Permits, November, 1994	Establishes procedures for obtaining permits for sources of pollution.	**Applicable.** These permit requirements are substantive in nature and must be met during a CERCLA remediation.
Chapter 62-25, FAC Florida Regulation of Stormwater Discharge - May, 1993	Establishes requirements for discharges of untreated stormwater to ensure protection of the surface water of the state.	**Applicable.** Remedial actions should consider the impact of construction of the discharge of untreated stormwater.
Chapter 62-272, FAC Ambient Air Quality Standards - December, 1994	Establishes ambient air quality standards necessary to protect human health and public welfare. It also establishes maximum allowable increases in ambient concentrations for subject pollutants to prevent significant deterioration of air quality in areas where ambient air quality standards are being met. Approved air quality monitoring methods are also specified.	**Applicable.** These standards should be met for remedial actions involving the possible release of contaminants to the atmosphere, such as may occur during excavation.
Chapter 62-273, FAC Air Pollution Episodes - September, 1994	In order to prevent episode conditions (defined as a "condition which exists when meteorological conditions and rates of discharge of air pollutants combine to produce pollutant levels in the atmosphere which, if sustained, can lead to a substantial threat to the health of the people") from continuing or from developing into more severe conditions, action must be taken. This rule classifies an air episode as an air alert, warning or emergency and establishes criteria for determining the level of the air episode. It also establishes response requirements for each level.	**Relevant and Appropriate.** Although this rule is directly applicable to industrial polluters, these requirements are relevant and appropriate for remedial actions that may result in the emission of sulfur dioxide, PM_{10}, carbon monoxide, ozone, or nitrogen dioxide to the atmosphere. Particulate emissions are typically a concern during excavation.
Chapter 62-302, FAC Florida Surface Water Standards - August, 1994	Defines classifications of surface waters, and establishes water quality standards (WQSs) for surface water within the classifications. The State's antidegradation policy is also established in this rule.	**Applicable.** Remedial actions at OU 1 that involve a discharge to a surface water of the State will consider surface WQSs.
Chapter 62-522, FAC Florida Groundwater Permitting and Monitoring Requirements - April, 1994	Establishes permitting and monitoring requirements for installations discharging to groundwater.	**Applicable.** The substantive requirements of this rule should be considered when injection of treated or amended water is a possible component of a remedial action. If these requirements are met under another permit, a separate discharge permit may not be required.
Chapter 62-532, FAC Florida Water Well Permitting and Construction Requirements - March, 1992	Establishes the minimum standards for the location, construction, repair, and abandonment of water wells. Permitting requirements and procedures are established.	**Applicable.** The substantive requirements for permitting should be met if remedial actions involve the construction, repair, or abandonment of monitoring, extraction, or injection wells.
Chapter 62-730, FAC Florida Hazardous Waste Rules - October, 1993	Adopts, by reference, appropriate sections of 40 CFR and establishes minor additions to these regulations concerning the generation, storage, treatment, transportation, and disposal of hazardous wastes.	**Relevant and Appropriate.** The substantive permitting requirements for hazardous waste must be met where applicable for CERCLA remedial actions.

See notes at end of table.

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Table T-4 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Feasibility Study, Operable Unit 1
Naval Air Station (NAS) Jacksonville
Jacksonville, Florida

Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Chapter 62-736, FAC Florida Rules on Hazardous Waste Warning Signs - July, 1991	Requires warning signs at National Priority List (NPL) and Florida Department of Environmental Protection (FDEP) identified hazardous waste sites to inform the public of the presence of potentially harmful conditions.	**Applicable.** This requirement should be met for sites which are on the NPL or which have been identified by the FDEP as potentially harmful. OU 1 is a CERCLA site; therefore, these requirements must be met.
Chapter 62-770, FAC Florida Petroleum-Contaminated Site Cleanup Criteria - February, 1990	Establishes a cleanup process to be followed at all petroleum-contaminated sites. Actions to be taken to remove LNAPL (i.e., free product) from sites are outlined, and cleanup levels for G-I and G-II groundwater are provided for both the gasoline and kerosene/mixed products analytical groups.	**Relevant and Appropriate.** Though UST petroleum products were not the source of the LNAPL at OU 1, the recovery actions outlined in this regulation are suitable for removal of LNAPL from OU 1, where G-II groundwater exists. LNAPL recovery is being undertaken as part of an IRA at OU 1.

Notes:
ARARs = applicable or relevant and appropriate requirements.
CAA = Clean Air Act.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
CFR = Code of Federal Regulations.
CWA = Clean Water Act.
DOT = Department of Transportation.
FAC = Florida Administrative Code.
FDEP = Florida Department of Environmental Protection.
H_2S = hydrogen sulfide.
IRA = Interim Remedial Action.
LDRs = Land Disposal Restrictions.
LNAPL = light nonaqueous-phase liquid.
NAAQSs = National Ambient Air Quality Standards.
NAS = Naval Air Station.
NCP = National Contingency Plan.
NPDES = National Pollutant Discharge Elimination System.
NPL = National Priority List.
NSPS = New Source Performance Standards.
OU = operable unit.
PM_{10} = particulate matter less than 10 micron in size.
RCRA = Resource Conservation and Recovery Act.
SDWA = Safe Drinking Water Act.
SWMUs = Solid Waste Management Unit.
TSDF = Transportation, Storage, and Disposal Facility.
UTSs = Universal Treatment Standards.

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Table T-5
Synopsis of Federal and State "To Be Considered" Documents

Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Advisories and Guidance	Synopsis	Consideration in the Remedial Response Process
Federal:		
Clean Air Act (CAA) Regulations, National Ambient Air Quality Standards (NAAQSs) [40 CFR Part 50]	Establishes primary (health-based) and secondary (welfare-based) air quality standards for carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides emitted from a major source of air emissions. The NAAQSs form the basis for all regulations promulgated under the CAA. However, the NAAQSs themselves are non-enforceable and are never ARARs.	Site remediation activities should comply with emission standards established to achieve NAAQs at OU 1. The principle application of these standards is during remedial activities resulting in exposures to humans through dust and vapors.
Safe Drinking Water Act (SDWA) Regulations, National Secondary Drinking Water Standards (SMCLs) [40 CFR Part 143]	Establishes welfare-based standards for public water systems for specific contaminants or water characteristics that may affect the aesthetic qualities of drinking water.	SMCLs are non-enforceable limits intended as guidelines for use by States in regulating water supplies.
USEPA Office of Drinking Water, Health Advisories	Health advisories are estimates of non-carcinogenic risk due to consumption of contaminated drinking water.	These advisories should be considered for contaminants in surface water and groundwater that is or could be used as a potable water source (i.e., OU 1's ground and surface water).
USEPA, Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities	Establishes a streamlined approach for determining protective levels for lead in soil. Recommends 400 ppm as a screening level for lead in soil under a residential land use scenario, and describes how to develop PRGs for lead at CERCLA sites.	This guidance document can be used to establish cleanup goals for lead in soil at OU 1 if risk-based or other standards are not available or not sufficiently protective.
State:		
Chapter 62-611, FAC Florida Wetlands Application Regulations - November, 1989	Sets requirements for discharges of domestic wastewater to wetlands.	This rule mainly addresses the discharge of domestic wastewater to wetlands. Discharge limits are established for CBOD, TSS, nitrogen, and phosphorus. This rule should be considered for remedial alternatives which result in discharges to wetlands where these limits may be approached.
Chapter 62-620, FAC Florida Wastewater Facility Permits	This rule establishes requirements for wastewater permits. It was published in November, 1994; however, it is not effective until Florida is recognized as a "delegated" state.	Upon delegation, facilities in Florida requiring a wastewater permit, will meet the permitting requirements under this rule. When Florida becomes a "delegated" state, facilities will be allowed to have a single permit to meet both Federal and State discharge requirements.

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Table T-5 (Continued)
Synopsis of Federal and State "To Be Considered" Documents

Feasibility Study, Operable Unit 1
Naval Air Station Jacksonville
Jacksonville, Florida

Advisories and Guidance	Synopsis	Consideration in the Remedial Response Process
State (continued):		
Groundwater Guidance Concentrations, Bureau of Groundwater Protection - June, 1994	This document establishes maximum concentration levels of contaminants for groundwater in the state of Florida Groundwater with concentrations less than the listed values are considered "free from" contamination.	The values provided in this document should be considered when determining cleanup levels for groundwater. These guidance values for groundwater are considered to be ARARs by the Florida Department of Environmental Protection (FDEP). However, by definition of ARARs in the National Contingency Plan (NCP), state requirements must be a state law or regulation; an environmental or facility siting law; promulgated; more stringent than the Federal requirement; identified in a timely manner; and consistently applied. All of these parameters must be met according to the NCP. The Groundwater Guidance Concentrations are not promulgated as law or regulation; however, it is recognized that the FDEP maintains the position that these guidance concentrations are considered as ARARs.
Soil Cleanup Standards for Military Sites, 1995	This document provides guidance for soil cleanup levels which can be developed on a site-by-site basis.	These guidelines aid in determining health and leachability-based cleanup goals for soils. The State of Florida considers these values to be ARARs. However, because they are not promulgated standards, a site-by-site assessment is recommended.

Notes:
ARARs = applicable or relevant and appropriate requirements.
CAA = Clean Air Act.
CBOD = Carbonaceous Biological Oxygen Demand.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
CFR = Code of Federal Regulation.
FAC = Florida Administrative Code.
FDEP = Florida Department of Environmental Protection.
N = nitrogen.
NAAQSs = National Ambient Air Quality Standards.
NAS = Naval Air Station.
NCP = National Contingency Plan.
OU = operable unit.
ppm = parts per million.
RCRA = Resource Conservation and Recovery Act.
SDWA = Safe Drinking Water Act.
SMCLs = Secondary Drinking Water Standards.
TSS = total suspended solids.
USEPA = U.S. Environmental Protection Agency.

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Florida Department of

Environmental Protection

Memorandum

TO: Tim Bahr, Technical Review Section
Bureau of Waste Cleanup

THROUGH: Jim Crane, Technical Review Section
Bureau of Waste Cleanup

FROM: Ligia Mora-Applegate, Technical Review Section
Bureau of Waste Cleanup

DATE: April 5th, 1995

SUBJECT: *Soil Cleanup Goals for the Military Sites*

Attached, for your information and use, please find the **updated** soil cleanup goals. The health-based cleanup goals (i.e., residential, industrial) are applicable to the upper two feet of soil. If the industrial scenario is warranted, the site must have a deed restriction for the more restrictive land use. If there is ground water contamination above Florida standards and minimum criteria or if there was a recent discharge, the leachability-based cleanup goals should be considered and compared with the health-based cleanup goals using the applicable scenario (i.e., residential, industrial). The lowest of the two should be the final cleanup goal for the upper two feet of soil. For soils below two feet, the leachability-based goal should be applied if the parameters of concern are detected above the Florida criteria. In addition, until further notice and where appropriate, the metals should pass TCLP as an indication not only that the soil is not a hazardous waste, but also that the soil will not act as a source of groundwater contamination.

If any of the levels is below site-specific background or the Method Detection Limit (MDL) any of the latter two will suffice.

If you have any questions, please see me.

Attachment

/lm-a

BUREAU OF WASTE CLEANUP

APR 06 1995

TECHNICAL REVIEW SECTION

Soil Cleanup Goals

Based on Direct Exposure and Migration to Groundwater

March 30, 1995

The appended Table 1 contains risk-based, soil cleanup goals for over 200 chemicals commonly found as contaminants at sites in Florida. Cleanup goal concentrations based on direct exposure have been calculated using exposure assumptions consistent with both residential and commercial/industrial land use. For situations in which there is evidence that soil may be serving as a source of contamination for groundwater, soil cleanup goal concentrations for organic chemicals based on leaching from soil to groundwater are also provided.

For evaluation of direct exposure to contaminants in soils, intake from incidental ingestion, dermal contact, and inhalation has been considered. Soil concentrations were calculated using the following equation:

$$Cs = \frac{TR \times BW \times AT}{EF \times ED \times FC \times [A + B + C]}$$

When calculating soil concentrations based on potential carcinogenicity:

- the ingestion component, A = $\left(SF_o \times IR_o \times 10^{-6} kg / mg\right)$
- the dermal component, B = $\left(SF_d \times SA \times AF \times DA \times 10^{-6} kg / mg\right)$
- and the inhalation component, C = $\left(SF_i \times IR_i \times \left(\frac{1}{VF} + \frac{1}{PEF}\right)\right)$

When calculating soil concentrations based on potential non-cancer health effects:

- the ingestion component, A = $\left(\frac{1}{RfD_o} \times IR_o \times 10^{-6} kg / mg\right)$
- the dermal component, B = $\left(\frac{1}{RfD_d} \times SA \times AF \times DA \times 10^{-6} kg / mg\right)$
- and the inhalation component, C = $\left(\frac{1}{RfD_i} \times IR_i \times \left(\frac{1}{VF} + \frac{1}{PEF}\right)\right)$

The equation variables and assumptions are summarized in Table 2. For most of the chemicals in Table 1, toxicity criteria (reference doses and slope factors) were taken from IRIS (Integrated Risk Information System, USEPA). When toxicity criteria were unavailable from IRIS, other sources (e.g. HEAST, ECAO, OPP, and the toxicological literature) were used. Intake from all routes was assumed to contribute to toxic endpoints that are systemic in nature. For toxic endpoints that are route-specific (e.g. carcinogenicity from inhalation of hexavalent chromium) only the relevant intake pathway was included in the calculation of the soil cleanup goal. Dermal toxicity criteria were derived using route-to-route extrapolation from available criteria for other routes; for some chemicals, inhalation toxicity criteria were also derived using this method. For carcinogens, soil cleanup goal concentrations were calculated for both carcinogenic and non-carcinogenic health effects. Only the lower of the two values is shown in Table 1. These values are intended to be applicable only to soil contamination within 2 feet of land surface.

For leaching of organic contaminants from soil to groundwater, the following equation was used to calculate a soil cleanup goal:

$$Cs = Cw\left[K_d + \frac{(\theta_w + \theta_a H')}{\rho_b}\right]$$

The variables and assumed values are summarized below:

Variable	Definition	Assumed Value
Cw	target soil leachage concentration (mg/L)	chemical-specific
K_d	soil-water partition coefficient (cm^3/g)	K_{oc} x f_{oc} (organics)
θ_w	water-filled soil porosity (L_{water}/L_{soil})	0.3
θ_a	air-filled soil porosity (L_{air}/L_{soil})	0.13
ρb	dry soil bulk density (kg/L)	1.5
Koc	organic carbon partition coefficient (cm^3/g)	chemical-specific
f_{oc}	organic carbon content of soil (g/g)	0.002 (0.2%)
H'	dimensionless Henry's Law constant	chemical-specific

Soil concentrations based on partitioning to groundwater were not calculated for inorganics, and for some organic chemicals for which the necessary physical-chemical characteristics were unavailable. Soil cleanup goals for this latter group of chemicals may become available in future updates.

Table 2. Variables and Assumptions for Calculating Soil Cleanup Goals Based on Direct Exposure to Soil

Variable	Child Resident[1] (age 1-6 years)	Aggregate Resident[2] (age 1 - 30 yrs)	On-Site Worker[3]
BW (body weight)	15 kg	59 kg	70 kg
IRo (ingestion rate, oral)	200 mg/kg	120 mg/day	50 mg/day
IRi (inhalation rate)	10 m^3/day	15 m^3/day	20 m^3/day
FC (fraction from contam. source)	1.0 (100%)	1.0 (100%)	1.0 (100%)
EF (exposure frequency)	350 days/yr	350 days/yr	250 days/yr
ED (exposure duration)	6 yrs	30 yrs	25 yrs
SA (surface area of skin exposed)	1,800 cm^2/day	4,855 cm^2/day	2,300 cm^2/day
AF (adherence factor)	0.2 mg/cm^2	0.2 mg/cm^2	0.6 mg/cm2
AT (averaging time)			
• non-carcinogens	2,190 days	10,950	9,125 days
• carcinogens	25,550 days	25,550 days	25,550 days

1 used in calculating soil cleanup goals based on non-cancer health effects for a residential scenario

2 used in calculating soil cleanup goals based on potential carcinogenicity for a residential scenario.

3 used in calculating soil cleanup goals based on both cancer and non-cancer health effects for commercial/industrial land use.

Variable	
TR (target risk)	1×10^{-6} for carcinogens; hazard quotient of 1.0 for non-carcinogens
DA (dermal absorption)	0.01 for organics; 0.001 for inorganics[4]
PEF (particulate emission factor)	6.32 E+08 m^3/kg
VF (volatilization factor)	compound specific[5]
SF (slope factor)	compound and route specific
RfD (reference dose)	compound and route specific

4 based upon Region IV guidance

5 refer to *Technical Background Document for Draft Soil Screening Level Guidance*, EPA 540/R-94/018, March 1994, for the method of calculation.

TABLE 1. SELECTED SOIL CLEAN-UP GOALS[7]

All values are presented in mg/kg (ppm)

Chemical Name	CAS	Residential	Industrial	Leaching
Acenaphthene	83-32-9	2000	19000	2.0
Acenaphthylene	208-96-8	320	2300	11
Acetone	67-64-1	130	890	1.4
Acrolein	107-02-8	0.2	1.3	0.3
Acrylonitrile	107-13-1	0.08	0.1	0.02
Alachlor	15972-60-8	14	56	NC
Aldrin	309-00-2	0.06	0.2	0.05
Aluminum	7429-90-5	75000	*	NC
Anthracene	120-12-7	16000	200000	890
Antimony	7440-36-0	26	210	NC
Arsenic	7440-38-2	0.7	3.0	NC
Atrazine	1912-24-9	5.0	20	0.2
Barium	7440-39-3	5000	74000	NC
Benzene	71-43-2	0.8	1.1	0.003
Benzo(a)anthracene	56-55-3	1.4	4.9	29
Benzo(a)pyrene	50-32-8	0.14	0.5	3.7
Benzo(b)fluoranthene	205-99-2	1.4	4.9	71
Benzo(g,h,i)perylene	191-24-2	14	50	320
Benzo(k)fluoranthene	207-08-9	14	47	44
Benzoic acid	65-85-0	83000	680000	56
Benzyl alcohol	100-51-6	23000	480000	4.6
Beryllium	7440-41-7	0.1	0.2	NC
Bis(2-chloroethoxy)methane	111-91-1	150	2100	0.03
Bis(2-chloroethyl)ether	111-44-4	0.3	0.5	0.005
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	45	100	11
Boron	7440-42-8	7000	180000	NC
Bromodichloromethane	75-27-4	0.4	0.5	0.002
Bromoform	75-25-2	43	75	0.02
Butanone, 2- (MEK)	78-93-3	2500	17000	8.8
Butylbenzylphthalate, N-	85-68-7	15000	300000	960
Cadmium	7440-43-9	37	600	NC
Carbaryl	63-25-2	7500	150000	4.6

Chemical Name	CAS	Residential	Industrial	Leaching
Carbazole	86-74-8	35	81	0.4
Carbofuran	1563-66-2	370	7400	0.1
Carbon disulfide	75-15-0	2.6	18	2.5
Carbon tetrachloride	56-23-5	0.3	0.4	0.02
Chlordane	57-74-9	0.8	2.8	2.1
Chloro-m-cresol, p-	59-50-7	1200	18000	42
Chloroaniline, 4-	106-47-8	190	2300	0.08
Chlorobenzene	108-90-7	19	130	0.6
Chloroethylvinylether, 2-	110-75-8	130	920	0.003
Chloroform	67-66-3	0.3	0.4	0.02
Chloromethane	74-87-3	0.1	0.2	0.01
Chloronaphthalene, beta-	91-58-7	1700	14000	55
Chlorophenol, 2-	95-57-8	220	2500	0.3
Chlorpyrifos	2921-88-2	170	2200	3.8
Chromium (hexavalent)	18540-29-9	150	220	NC
Chromium (trivalent)	16065-83-1	66000	540000	NC
Chrysene	218-01-9	140	490	31
Cobalt	7440-48-4	4700	110000	NC
Copper	7440-50-8	2900	72000	NC
Coumaphos	56-72-4	19	400	NC
Cyanide	57-12-5	1600	40000	NC
DDD, 4,4'-	72-54-8	4.4	17	0.2
DDE, 4,4'-	72-55-9	2.9	9.9	0.2
DDT, 4,4'-	50-29-3	3.1	12	0.5
Dalapon	75-99-0	2300	48000	NC
Demeton	8065-48-3	3.1	64	NC
Di-n-Butylphthalate	84-74-2	7500	150000	240
Di-n-Octylphthalate	117-84-0	1500	32000	**
Diazinon	333-41-5	64	1200	0.04
Dibenz(a,h)anthracene	53-70-3	0.14	0.5	270
Dibenzofuran	132-64-9	200	2400	NC
Dibromochloromethane	124-48-1	0.6	0.9	0.004
Dibromoethane, 1,2- (EDB)	106-93-4	0.01	0.04	.00006
Dicamba	1918-00-9	2.0	13	0.4
Dichlorobenzene, 1,2-	95-50-1	420	3000	5.8

Chemical Name	CAS	Residential	Industrial	Leaching
Dichlorobenzene, 1,3-	541-73-1	960	7100	0.4
Dichlorobenzene, 1,4-	106-46-7	4.2	6.0	0.9
Dichloroethane, 1,1-	75-34-3	160	1100	2.3
Dichloroethane, 1,2- (EDC)	107-06-2	0.4	0.5	0.008
Dichloroethene, cis-1,2-	156-59-2	13	90	0.2
Dichloroethene, trans-1,2-	156-60-5	33	220	0.3
Dichlorophenol, 2,4-	120-83-2	210	3500	0.02
Dichlorophenoxy acetic acid, 2,4-	94-75-7	59	420	0.2
Dichlorophenoxy)butyric acid, 4-(2,4-	94-82-6	610	12000	NC
Dichloropropane, 1,2-	78-87-5	0.4	0.6	0.02
Dichloropropene, 1,3-	542-75-6	0.1	0.2	0.003
Dichlorprop	120-36-5	3.8	15	NC
Dichlorvos	62-73-7	3.8	15	0.0003
Dicofol	115-32-2	92	1800	NC
Dieldrin	60-57-1	0.07	0.3	0.02
Diethylphthalate	84-66-2	51000	780000	20
Dimethylformamide, N,N-	68-12-2	1100	16000	1.5
Dimethylphenol, 2,4-	105-67-9	960	11000	1.8
Dimethylphthalate	131-11-3	540000	*	200
Dinitrotoluene, 2,4-	121-14-2	1.2	3.0	0.0006
Dinitrotoluene, 2,6-	606-20-2	1.4	4.4	0.0006
Dinoseb	88-85-7	31	290	0.5
Disulfoton	298-04-4	2.8	51	0.05
Diuron	330-54-1	120	1700	0.2
Endosulfan	115-29-7	340	4400	0.006
Endrin	72-20-8	23	450	0.4
Endrin aldehyde	7421-93-4	23	480	0.05
Ethoprop	13194-48-4	1.2	25	NC
Ethyl chloride	75-00-3	4100	27000	0.6
Ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5	0.7	15	0.008
Ethyl dipropylthiocarbamate, S- (EPTC)	759-94-4	1900	38000	NC
Ethylbenzene	100-41-4	770	5500	0.2
Fenamiphos	22224-92-6	19	420	NC
Fensulfothion	115-90-2	19	410	NC

Chemical Name	CAS	Residential	Industrial	Leaching
Fenthion	55-38-9	3.8	80	NC
Fluoranthene	206-44-0	2800	44000	280
Fluorene	86-73-7	1900	21000	45
Fluoride	16984-58-8	4700	120000	NC
Guthion	86-50-0	120	2500	0.1
Heptachlor	76-44-8	0.2	0.4	0.06
Heptachlor epoxide	1024-57-3	0.1	0.3	0.03
Hexachlorobenzene	118-74-1	0.5	1.2	0.8
Hexachlorobutadiene	87-68-3	1.7	2.6	2.1
Hexachlorocyclohexane, alpha-	319-84-6	0.2	0.5	0.002
Hexachlorocyclohexane, beta-	319-85-7	0.6	2.3	0.005
Hexachlorocyclohexane, delta-	319-86-8	23	460	0.007
Hexachlorocyclohexane, gamma-	58-89-9	0.8	2.6	0.006
Hexachlorocyclopentadiene	77-47-4	0.3	2.0	9.7
Hexachloroethane	67-72-1	17	73	0.4
Hexane, n-	110-54-3	37	250	1.0
Hexazinone	51235-04-2	2500	52000	NC
Indeno(1,2,3-cd)pyrene	193-39-5	1.4	5.0	650
Lead	7439-92-1	500	1000	NC
Linuron	330-55-2	150	3200	NC
Lithium	743-99-32	1600	40000	NC
Malathion	121-75-5	1500	23000	3.1
Manganese	7439-96-5	10000	170000	NC
Mercury	7439-97-6	23	480	NC
Merphos	150-50-5	2.3	48	NC
Mesurol (Methiocarb)	2032-65-7	260	3300	NC
Methomyl	16752-77-5	1900	41000	0.6
Methoxychlor	72-43-5	380	7500	62
Methyl parathion	298-00-0	18	330	0.1
Methyl tert-butyl ether	1634-04-4	1900	13000	0.1
Methyl-2-pentanone, 4- (MIBK)	108-10-1	310	2200	1.1
Methyl-4-chlorophenoxy)propionic acid, 2-	93-65-2	77	1600	NC
Methyl-4-chlorophenoxyacetic acid, 2-	94-74-6	39	1000	NC
Methylene chloride	75-09-2	9.3	13	0.01
Methylnaphthalene, 1-	90-12-0	210	1500	NC

Chemical Name	CAS	Residential	Industrial	Leaching
Methylnaphthalene, 2-	91-57-6	700	5800	NC
Methylphenol, 2- (o-cresol)	95-48-7	1900	19000	1.1
Methylphenol, 3- (m-cresol)	108-39-4	3000	42000	4.2
Methylphenol, 4- (p-cresol)	106-44-5	300	4200	0.4
Metribuzin	21087-64-9	1900	42000	NC
Mevinphos	7786-34-7	19	420	NC
Mirex	2385-85-5	0.3	0.5	0.01
Molybdenum	7439-98-7	390	9500	NC
Monuron	150-68-5	9.6	190	NC
Naled	300-76-5	150	3200	NC
Naphthalene	91-20-3	840	6800	0.1
Nickel	7440-02-0	1500	11000	NC
Nickel (refinery dust)	7440-02-0	7200	11000	NC
Nickel subsulfide	12035-72-2	3600	5300	NC
Nitrate	14797-55-8	120000	*	NC
Nitrite	14797-65-0	7800	200000	NC
Nitroaniline, o-	88-74-4	3.7	59	0.02
Nitroaniline, p-	100-01-6	230	4600	NC
Nitrobenzene	98-95-3	33	550	0.04
Nitroso-di-n-propylamine, N-	621-64-7	0.01	0.02	0.009
Nitrosodimethylamine, N-	62-75-9	0.001	0.002	0.02
Nitrosodiphenylamine, N-	86-30-6	44	69	0.06
Oxamyl	23135-22-0	1900	42000	NC
Parathion	56-38-2	450	8800	6.9
Pentachlorophenol	87-86-5	5.5	12	0.01
Phenanthrene	85-01-8	1200	11000	2.8
Phenol	108-95-2	27000	290000	0.02
Phorate	298-02-2	13	200	0.05
Polychlorinated biphenyls (PCBs)	1336-36-3	1	3.5	44
Propazine	139-40-2	1500	32000	2.3
Pyrene	129-00-0	2200	37000	290
Pyridine	110-86-1	0.2	1.6	0.02
Ronnel	299-84-3	3600	65000	NC
Selenium	7782-49-2	390	9900	NC
Silver	7440-22-4	380	8000	NC

Chemical Name	CAS	Residential	Industrial	Leaching
Sodium diethyldithiocarbamate	148-18-5	4.1	17	NC
Strontium	7440-24-6	47000	*	NC
Styrene	100-42-5	1700	12000	2.0
Tetrachloroethane, 1,1,1,2-	630-20-6	3.2	4.7	0.003
Tetrachloroethane, 1,1,2,2-	79-34-5	0.5	0.8	0.0007
Tetrachloroethene (PCE)	127-18-4	9.2	18	0.03
Tetrachlorvinphos (Stirophos)	961-11-5	45	180	NC
Tetraethyl dithiopyrophosphate	3689-24-5	31	470	0.06
Tetraethylpyrophosphate (TEPP)	107-49-3	2.5	51	NC
Tin	7440-31-5	44000	660000	NC
Tokuthion	34643-46-4	68	1400	NC
Toluene	108-88-3	270	1800	0.2
Toxaphene	8001-35-2	0.8	2.6	0.04
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1900	13000	13000
Trichlorobenzene, 1,2,4-	120-82-1	480	5600	2.3
Trichloroethane, 1,1,1-	71-55-6	320	2200	0.9
Trichloroethane, 1,1,2-	79-00-5	1.1	1.6	0.02
Trichloroethene (TCE)	79-01-6	3.4	4.8	0.01
Trichlorofluoromethane	75-69-4	3.4	23	400
Trichlorophenol, 2,4,5-	95-95-4	6700	110000	0.1
Trichlorophenol, 2,4,6-	88-06-2	77	210	0.08
Trichlorophenoxy acetic acid, 2,4,5-	93-76-5	750	15000	NC
Trichlorophenoxy propionic acid, 2(2,4,5-	93-72-1	610	12000	2.7
Trimethylbenzene, 1,2,3-	526-73-8	3.8	27	0.2
Trimethylbenzene, 1,2,4-	95-63-6	3.5	25	0.2
Trimethylbenzene, 1,3,5-	108-67-8	2.0	14	0.1
Uranium, natural	7440-61-1	120	410	NC
Vanadium	7440-62-2	480	4800	NC
Vinyl acetate	108-05-4	92	610	0.5
Vinyl chloride	75-01-4	0.003	0.004	0.005
Xylene, total	1330-20-7	6400	44000	0.1
Zinc	7440-66-6	23000	550000	NC

+ Soil cleanup goals in these tables are based on human toxicity using generalized exposure assumptions. Some tabulated soil cleanup goals may be less than the minimum detection limit (MDL) for that chemical in soils; in such cases the MDL would be the applicable cleanup goal.

NC = not calculated

* extremely limited toxicity in soil under assumed exposure conditions; no upper limit on concentration.

** extremely limited solubility ; no upper limit on concentration.

APPENDIX U

FEASIBILITY STUDY CALCULATIONS

MEMORANDUM

TO: Elizabeth Messer
Jesse Tremaine

FROM: Willard Murray

DATE: February 22, 1996

SUBJECT: Cleanup Duration and Residual Risk Calculations - JAX OU1 FS

The estimated durations for cleanup in each of the five alternatives and their method of calculation is presented below; also calculations of residual risk resulting from allowing some or all of the groundwater plume to discharge to the Unnamed Tributary are presented for the first three alternatives. Since several of the alternatives allow at least some degree of natural flushing of the groundwater plume, we first present modeling results for contaminant plume migration with and without natural environmental degradation, and our method for determining residual risk in the Unnamed Tributary. In the model calculations, natural environmental degradation is assumed to be a first order decay process.

Plume Migration and Residual Risk Calculations

To assess what the residual risk will be in the surface water of the Unnamed Tributary, the concentration of VOCs in the surface water must be determined for the period of time when the groundwater plume is being naturally flushed to the stream. To accomplish this, both the variation of concentration with time flowing into the stream, and the variation of concentration with distance along the stream up to Segment C must be calculated.

First, as the groundwater plumes approach the stream (see Fig. 1), their centerline concentrations are calculated as a function of time. The results for the case of no retardation are shown in the attached Figure 2 (data for this plot has been calculated using the analytical model described in Appendix Q, with time adjusted for retardation as discussed in Chapter 5). As can be seen, the time required for flushing the plume to a concentration of 3 μg/l is about 44 years. Also shown on this figure are calculations for the highest 30-yr average concentration; this will be used later when determining residual risk. Calculations for various assumed degradation half-lives will be presented after the basic procedure has been presented for the no-degradation case.

Second, when the maximum plume concentration reaches the stream, the transverse variation of concentration along the stream reach is calculated. This is presented in the following table for both the landfill and LNAPL area plumes. Due to the vertical variation in concentration over the aquifer thickness, as shown in Figures 5-2 and 5-3 of the RI, the average concentration of groundwater entering the stream is taken to be one-third of the maximum plume concentrations as simulated by the analytical model; these concentrations

are shown in the last two columns of the following table.

Concentration Distribution When Plume Maximums Reach Stream Bank

Distance Along Stream Reach - ft	Model Concentration in Landfill Plume at Stream - μg/l	Model Concentration in LNAPL Area Plume at Stream - μg/l	Depth Averaged Landfill Plume - μg/l	Depth Averaged LNAPL Area Plume - μg/l
-330	10	60	3	20
-248	120	250	40	83
-165	710	680	237	227
- 99	1770	1130	590	377
Centerline	2985	1510	995	503
99	1770	1130	590	377
165	710	680	237	227
248	120	250	40	83
330	10	60	3	20

The concentrations shown in the last two columns of the above table are then plotted adjacent to the stream reach as shown in Figure 3. Note that the LNAPL plume is stretched out and "wrapped around" the upper end of the stream at Child Street. This is the apparent future disposition of the LNAPL Area plume as inferred from Figure 1. It can be seen from the depiction in Figure 3 that the Unnamed Tributary receives contaminated water from both east and west sides in the reach from Child Street to Hurricane Drive, but for the remainder of the stream down to Segment C, only the west side of the stream receives contaminated water.

Third, the average concentration of VOCs in the entire reach is calculated by assuming that the groundwater inflow to the stream is the same per foot of stream reach and that an equal quantity of flow enters the stream from each side:

- Average for Child St. to Hurricane Dr.
  - West side of stream -

Sta.	c	c_{ave} x dist. / reach =
0	995	
		598 x 200 / 700 = 171
200	200	
		125 x 200 / 700 = 36
400	50	
		50 x 300 / 700 = 21
700	50	
		228 μg/l

- East side of stream -

Sta.	c	c_{ave} x dist. / reach =
0	995	
		995 x 200 / 700 = 284
200	995	
		598 x 200 / 700 = 171
400	200	
		100 x 300 / 700 = 43
700	0	
		498 μg/l

- Average for upper 700 ft. (228+498)/2 = 363 μg/l

- Average for Hurricane Dr. to Segment C

  - West side of stream -

Sta.	c	c_{ave} x dist. / reach =
700	50	
		50 x 400 / 1400 = 14.3
1100	50	
		75 x 200 / 1400 = 10.7
1300	100	
		150 x 100 / 1400 = 10.7
1400	200	
		290 x 100 / 1400 = 20.7
1500	380	
		440 x 100 / 1400 = 31.4
1600	500	
		440 x 100 / 1400 = 31.4
1700	380	
		290 x 100 / 1400 = 20.7
1800	200	
		150 x 100 / 1400 = 10.7
1900	100	
		75 x 200 / 1400 = 10.7
2100	50	
		161.3 μg/l

  - Average for lower 1400 ft. (161.3 + 0)/2 = 80.7 μg/l

- TOTAL REACH AVERAGE: (363x700 + 80.7x1400)/2100 = 175 μg/l

Fourth, since the residual risk for the existing VOC contamination in the surface water is 2×10^{-5}, is caused by a total VOC concentration of 21.2 μg/l (Benzene = 4.4, TCE = 6, DCE = 5.4, VC = 5.4), and is due to a 6-yr child exposure plus a 24-yr adult exposure for a total resident exposure of 30 years; we will estimate the residual risk due to exposure to the unmitigated plume discharging to the stream as follows. An average stream concentration for a 30-year period will be used as the exposure concentration for risk purposes. This concentration will be divided by 21.2 μg/l and multiplied by 2×10^{-5} to determine the new risk value.

The exposure concentration is determined by observing that the maximum 30-yr average concentration of the individual plume breakthrough curves shown in Figure 1 is approximately one-half of the peak concentration. It is therefore assumed that the average exposure concentration in the stream reach from Child St. to Segment C will be one-half of the total reach average calculated above (which is the average when the individual plume peaks reach the stream). This gives an average 30-yr exposure concentration of 175/2 = 88 μg/l. This is 4.15 times the existing 21.2 μg/l and therefore we estimate the residual risk for simple flushing (no natural degradation) of the plumes into the Unnamed Tributary to be $4.15 \times 2 \times 10^{-5}$ = $\underline{8.3 \times 10^{-5}}$.

To account for intrinsic bioremediation, a first order decay term has been added to the analytical contaminant transport model, and natural degradation half-lives from the Handbook of Environmental Degradation Rates (1991), by Howard et. al. have been used. Natural degradation half-lives for the chlorinated ethenes of concern (TCE, DCE and VC) range from less than one year to 8 years. To assess the effect of this natural degradation on the flushing of the plume and on risk values, we have calculated plume migration using various half-lives from 8 years to 2 years.

Output from the model for plume migration with an 8-yr half-life is presented on the attached sheets. Also, similar to Figure 2, plots of maximum plume concentration vs. time at the stream bank have been prepared and are shown as Figures 4 and 5. It can be seen that the maximum plume concentrations reaching the stream are 780 μg/l for the LNAPL area plume and 480 μg/l for the landfill plume. These values are 4 and 3 times smaller respectively than the peaks of Figure 2 with no degradation. We therefore estimate the maximum average concentration in the stream reach above Segment C to be (4 + 3)/2 = 3.5 times smaller than that of Alternative 1, or 88/3.5 = 25 μg/l which is equivalent to a residual risk of $(8.3 \times 10^{-5})/3.5$ = $\underline{2.4 \times 10^{-5}}$.

It can also be seen from the model output, that the time required for flushing the aquifer to a concentration of 3μg/l or less is about 35 years, a nine year reduction over the flushing time of Alternative 1 which assumes no environmental degradation.

Similar calculations have been performed for half-lives of 6, 4 and 2 years with the results as presented in the following table.

Model Results for Natural Biodegradation

Half-Life (yrs)	Max. Concentration at Stream (μg/l)		Flush-Out Time (yrs)		Residual Risk
	LNAPL	Landfill	LNAPL	Landfill	
infinite	2985	1510	44	38	8.3×10^{-5}
8	780	475	36	32	2.4×10^{-5}
6	515	340	19	17	1.6×10^{-5}
4	245	190	16	15	8.3×10^{-6}
2	35	50	11	10	1.4×10^{-6}

Alternative 1

No active groundwater treatment for this alternative, so only the natural biological degradation of contaminants will occur. Although measurements show that there is active biodegradation occurring, it can not be assumed that this process will completely degrade the organics in the plume any faster than it will naturally be flushed out of the groundwater system. Hence the cleanup time for the groundwater for this alternative may be assumed to be the same as that for no degradation. This time is estimated to be about 44 years, with a residual risk of 8.3×10^{-5}. The model predicts a cleanup time as short as 10 years for a half-life of 2 years, but the value for half-life is very site specific and although we have an indication that anaerobic biological activity is occurring at OU1, we don't have enough data to determine a value for the half-life. Therefore we have estimated that the fastest time for cleanup will be about 25 years, the time it would take to physically flush the plume if it contained a non-retarded contaminant. Hence we assign a range of cleanup times from 25 to 44 years for the natural flushing condition.

Alternative 2

For the partial plume capture scenario, low capacity recovery wells are placed in the "hot spots" of the plumes to capture the plume areas of highest concentration. Three wells each capturing 3 gpm have been modelled using the USGS MODFLOW numerical model, and the resulting capture zones are shown on the attached Figure 6. The total average groundwater flow discharging to the Unnamed Tributary above Segment C is 0.11 cfs (from USGS model) or about 50 gpm. Therefore the three partial capture wells will extract nearly 20% of this flow. For purposes of residual risk calculation, we have assumed that the average VOC concentration of the groundwater plume that eludes the capture wells and reaches the stream will be reduced by a factor of 5 from the Alternative 1 results. Therefore the residual risk due to VOCs in the surface water will also be reduced by a factor of 5, or to a value of 1.7×10^{-5}. Although the concentrations will have been reduced, the duration of cleanup for this alternative is assumed to be approximately the same as for Alternative 1 because those portions of the groundwater plume outside of the small capture zones of the three low capacity wells will migrate toward the Unnamed Tributary at about the same rate as the undisturbed groundwater plume of Alternative 1.

Alternative 3

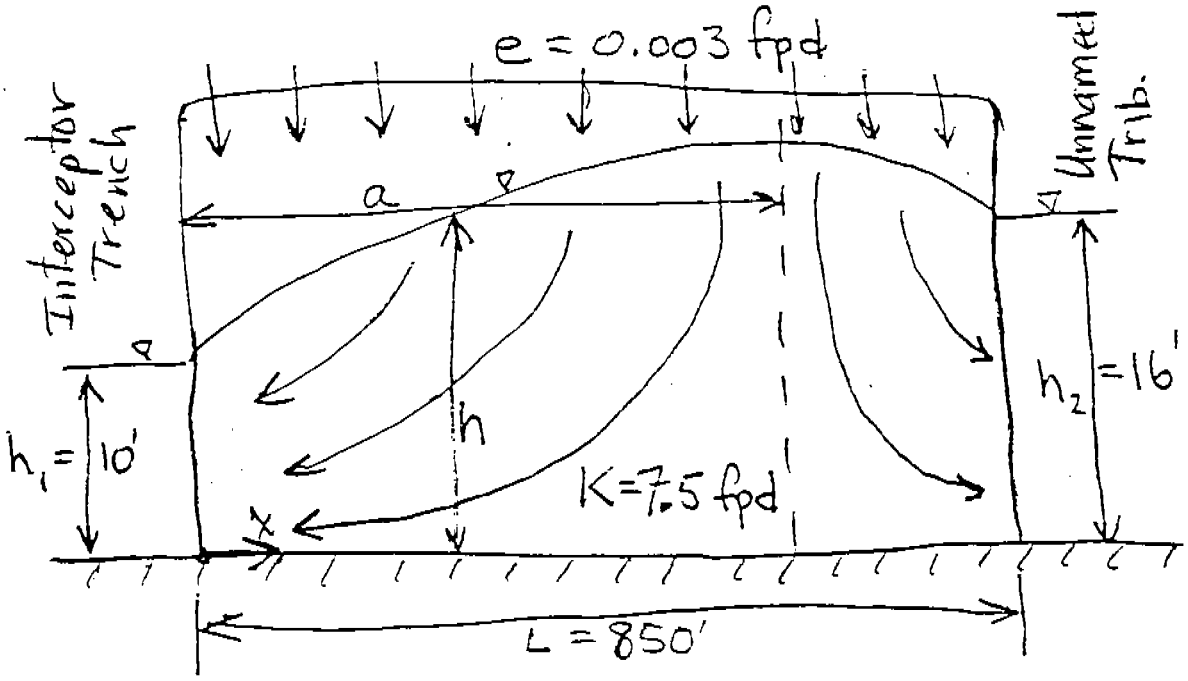
For this alternative, similar to Alternative 1, it is assumed that intrinsic biodegradation will reduce the contamination levels in the groundwater plume before discharging to the stream. However, since we have insufficient data to determine a half-life at OU1, it is assumed that, similar to Alternative 1, the cleanup time will be between 25 and 44 years with a residual risk no greater than 8.3×10^{-5}.

Alternative 4

For enhanced biodegradation using infiltration trenches to supply nutrients and carbon source to the plume area, we have selected a total of eight trenches as shown in the attached Figure 7. These trenches are spaced such that the groundwater travel time between them is about 4 to 5 years (based on travel times from pathline plot from numerical model of the groundwater flow under existing conditions). With this configuration, we estimate a total duration for cleanup of the VOC plume to be 10 to 12 years. This allows a time frame of up to 8 to 10 years for distributing the nutrients and carbon source over the plume area, and then up to 2 years for the bacteria to become acclimated to the new conditions and destroy the contaminants.

Alternative 5

For flushing of the plumes using the interceptor trench on the eastern boundary of the landfill, we have calculated the groundwater travel times for both the Landfill Area plume and the LNAPL Area plume. First, for the Landfill Area plume to be flushed from the groundwater divide formed between the Unnamed Tributary and the interceptor trench (see attached plan-view figure), we have used a simple model of groundwater flow between two water bodies as shown in the sketch below (see also representative geologic cross-sections, both along and perpendicular to the interceptor trench, which are attached).



The solution for this groundwater flow problem is given as follows (see Harr, M. E., GROUNDWATER AND SEEPAGE, McGraw Hill, 1962, pp. 43-44):

$$h = \sqrt{h_1^2 - \frac{(h_1^2 - h_2^2)x}{L} + \frac{e}{K}(L - x)x}$$

Now with q_x = discharge per unit width into the paper, we have

$$q_x = \frac{K(h_1^2 - h_2^2)}{2L} - e(\frac{L}{2} - x)$$

The seepage velocity, v_s, is then equal to $q_x/(nh)$ where n is the porosity (taken to be 0.25)

and h will be taken as the average aquifer thickness. The distance, a, to the groundwater divide is given by

$$a = \frac{L}{2} - \frac{K}{e}\frac{(h_1^2 - h_2^2)}{2L}$$

Now using the values given on the sketch, the following table has been prepared (the distance to the divide, a, has been calculated to be 655 ft).

x (ft)	h (ft)	q_x (ft^2/d)	v_s (ft/yr)
0	10	1.96	287
100			227
200	12	1.36	166
300			123
400	14	0.76	80
500			48
600	16	0.163	15

Now, for one pore volume of flushing, the groundwater time of travel, T, from the divide to the trench (a distance of about 500 ft) is given by the following approximation: T = (500 - 400)/48 + (400 - 300)/80 + (300 - 200)/123 + (200 - 100)/166 + (100 - 0)/227 = 2.08 + 1.25 + 0.81 + 0.60 + 0.44 = 5.3 years.

Based on results from the natural flushing model presented in Chapter 5 of the RI, which showed that it takes 2.5 pore volumes to flush out the Landfill Area plume, we calculate that it will take 2.5 x 5.3 = 13.25 years to flush the Landfill Area plume for Alternative 3.

The area near the groundwater divide is problematic due to the fact that the groundwater flushing velocities are very slow here, with a southerly direction (see attached plan-view figure).

Now for the LNAPL Area plume, the flushing time has been estimated as follows. First we realize that this plume will be affected by three different features of this alternative: 1) the NAPL recovery trenches, 2) the deepened drain beneath the Unnamed Tributary, and 3) the interceptor trench on the eastern boundary of the landfill. The groundwater flow pattern for this Alternative 3 can be seen in the attached figure showing groundwater pathlines from the numerical model (which is described in Appendix K). By comparing this figure with a similar one of pathlines for existing conditions at the site, we can deduce the following about the flushing times for Alternative 3.

The northeast portion of the LNAPL Area plume will migrate toward the Unnamed Tributary faster than for existing conditions (as were presented in Chapter 5 of the RI).

This is due to the facts that the average flow path length is reduced by about 30%, and that the discharge point at the Unnamed Tributary has been lowered about 2 feet with installation of the subsurface drain, which causes the overall gradient of the flow to be increased. Since the groundwater flow ,q, depends inversely on the flow path length, L, and directly on the difference in square of the saturated aquifer thicknesses at either end of the flow path, we can calculate the relative increase in flushing velocity using the following equation for steady state flow in a water table aquifer.

$$v_s = \frac{q}{nh_{ave}} = \frac{K}{2L}\frac{(h_o^2 - h_w^2)}{nh_{ave}}$$

where h_o is the upgradient aquifer thickness (30 ft), h_w is the aquifer thickness at the discharge point (27 ft with existing conditions, 25 ft for the drain system of Alternative 3), h_{ave} is the average aquifer thickness (28.5 ft and 27.5 ft respectively for existing conditions and for Alternative 3), v_s is the seepage velocity, n is porosity, and q is the discharge per unit width.

Now, the ratio of seepage velocity under conditions of Alternative 3 to that for existing conditions will determine the relative increase in flushing speed.

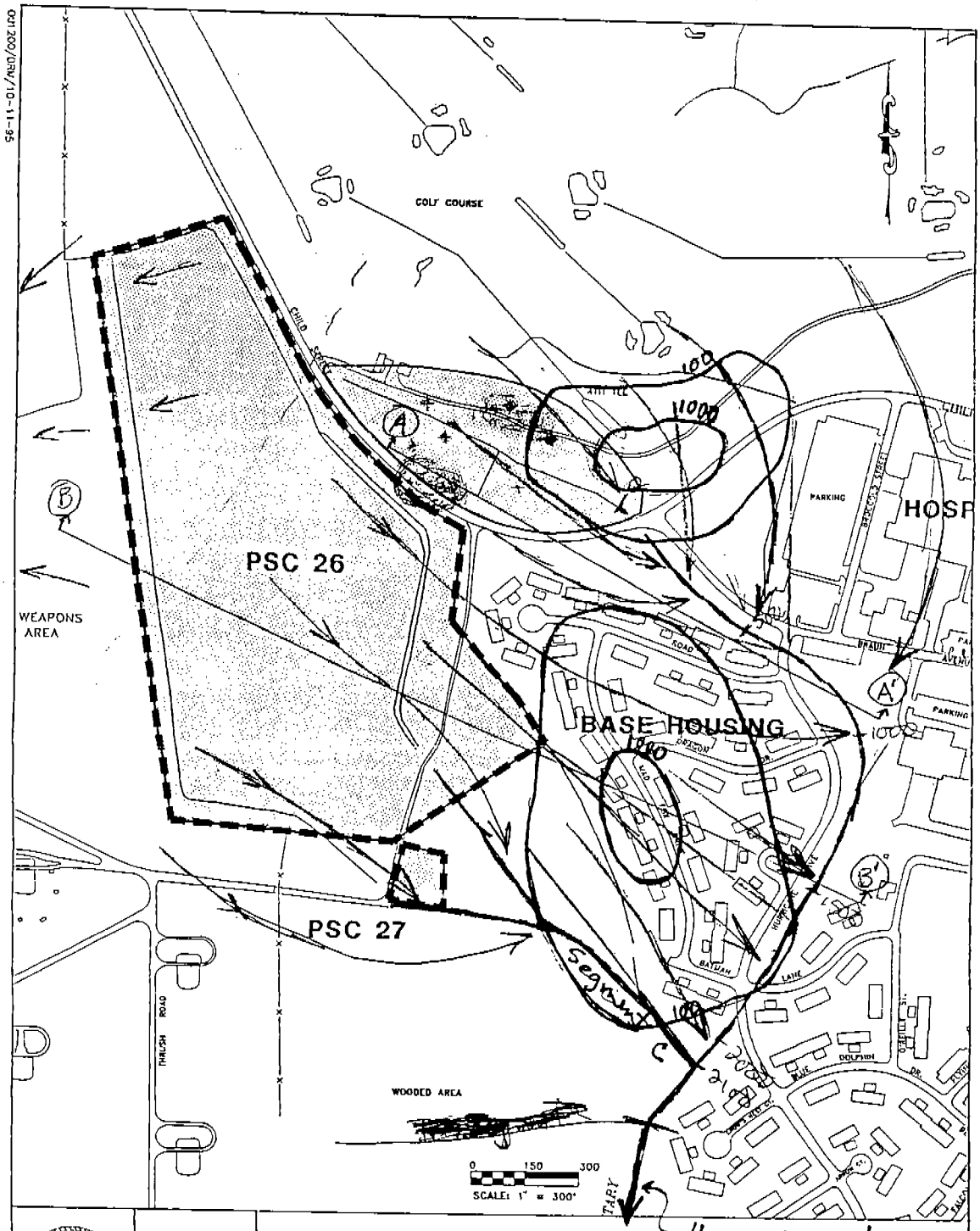
For Alternative 3: $v_s = \{K/[(2)(0.7Ln)]\}[(900 - 625)/27.5] = 7.14(K/Ln)$

For Exist. Cond.: $v_s = \{K/[(2)(Ln)]\}[(900 - 729)/28.5] = 3.0(K/Ln)$

Ratio = 7.14/3 = 2.38 times faster

Therefore the flushing time for Alternative 3 will be 44 years (the existing conditions flushing time from Chapter 5 of the RI) divided by 2.38, or <u>18.5 years</u>.

Now for the rest of the LNAPL Area plume, the western-most portion will be captured by the LNAPL recovery trenches, but the central portion of the plume will be pulled to the interceptor trench on the eastern boundary of the landfill (see attached figure of the groundwater pathlines for Alternative 3). Since the distance to the trench is about double the distance of the Landfill Area plume from the trench, we have assumed that the flushing time for this portion of the LNAPL Area plume will be twice that for the Landfill Area plume given above, that is 2 x 13.25 = 26.5 years. Hence the <u>overall cleanup time for Alternative 3 is 26.5 years</u>.



Plume contours are TVOCs, µg/l

LEGEND

PRESUMPTIVE REMEDY BOUNDARY

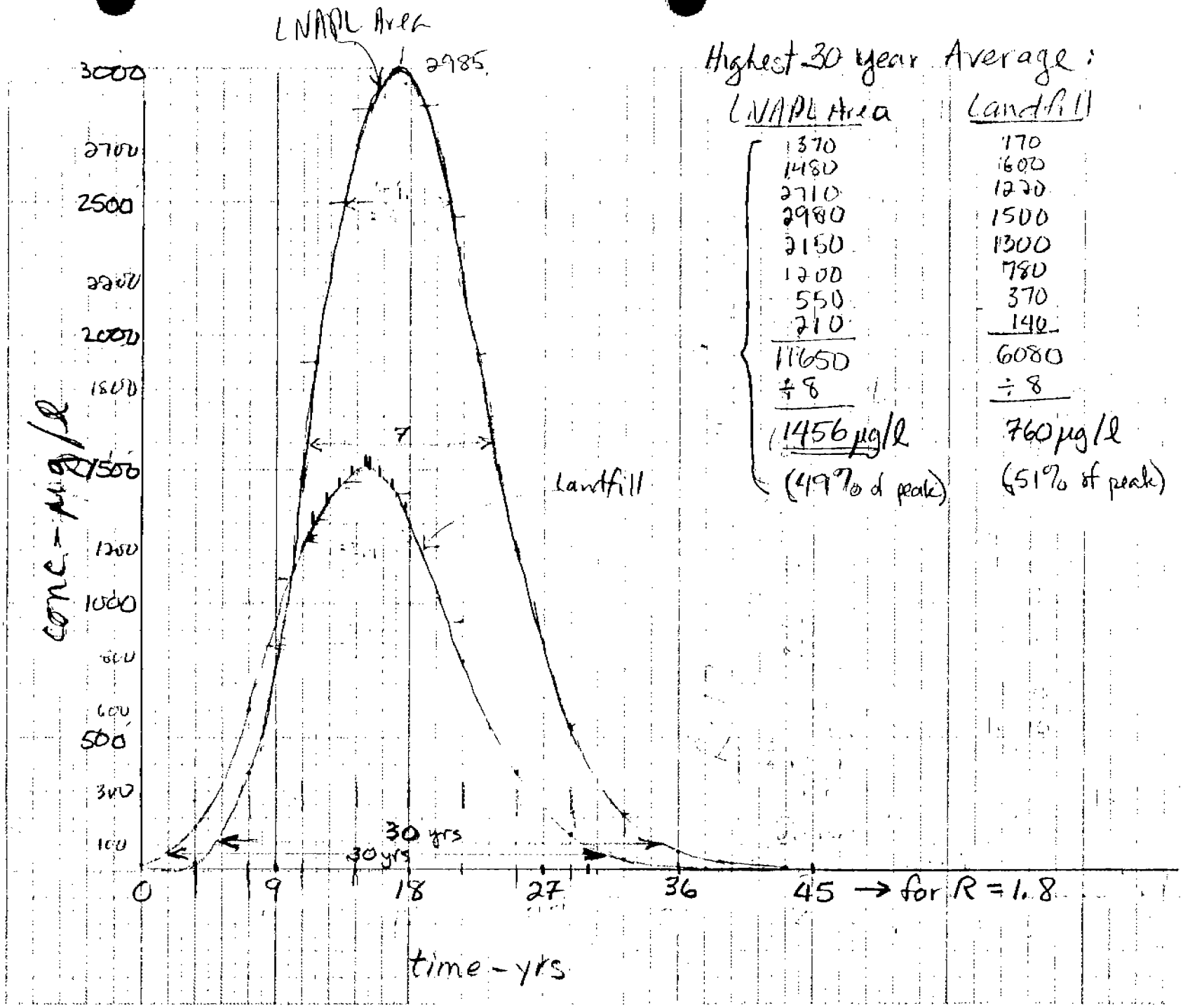
OU 1 BOUNDARY

REMEDIAL INVESTIGATION REPORT FOR OU 1

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

FIGURE 1

001200/GRN/10-11-95



Highest 30 year Average:

LNAPL Area	Landfill
370	170
1480	1600
2710	1270
2980	1500
2150	1300
1200	780
550	370
210	140
11650	6080
÷ 8	÷ 8
1456 µg/l	760 µg/l
(49% of peak)	(51% of peak)

PROJECT: Breakthrough at stream of maximum GW plume concentrations - not reduced for vertical variation in aquifer

No Navigation

COMP. BY

CHK. BY

JOB NO.

DATE

FIGURE 2

No Degradation

FIGURE 3

PROJECT	COMP. BY	JOB NO.
GW Conc. entering along length of Unnamed Tributary at time of peak concentration	CHK. BY	DATE

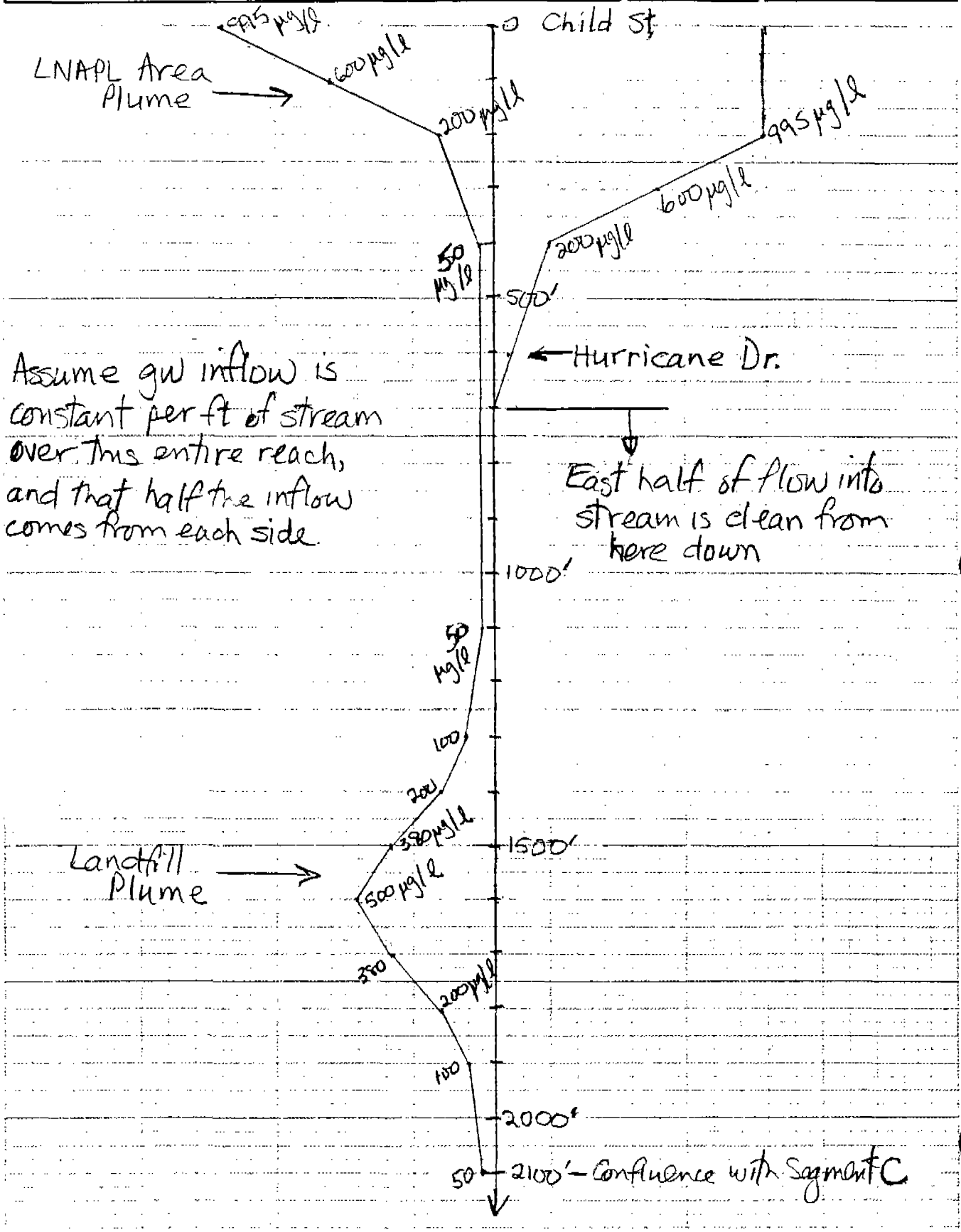
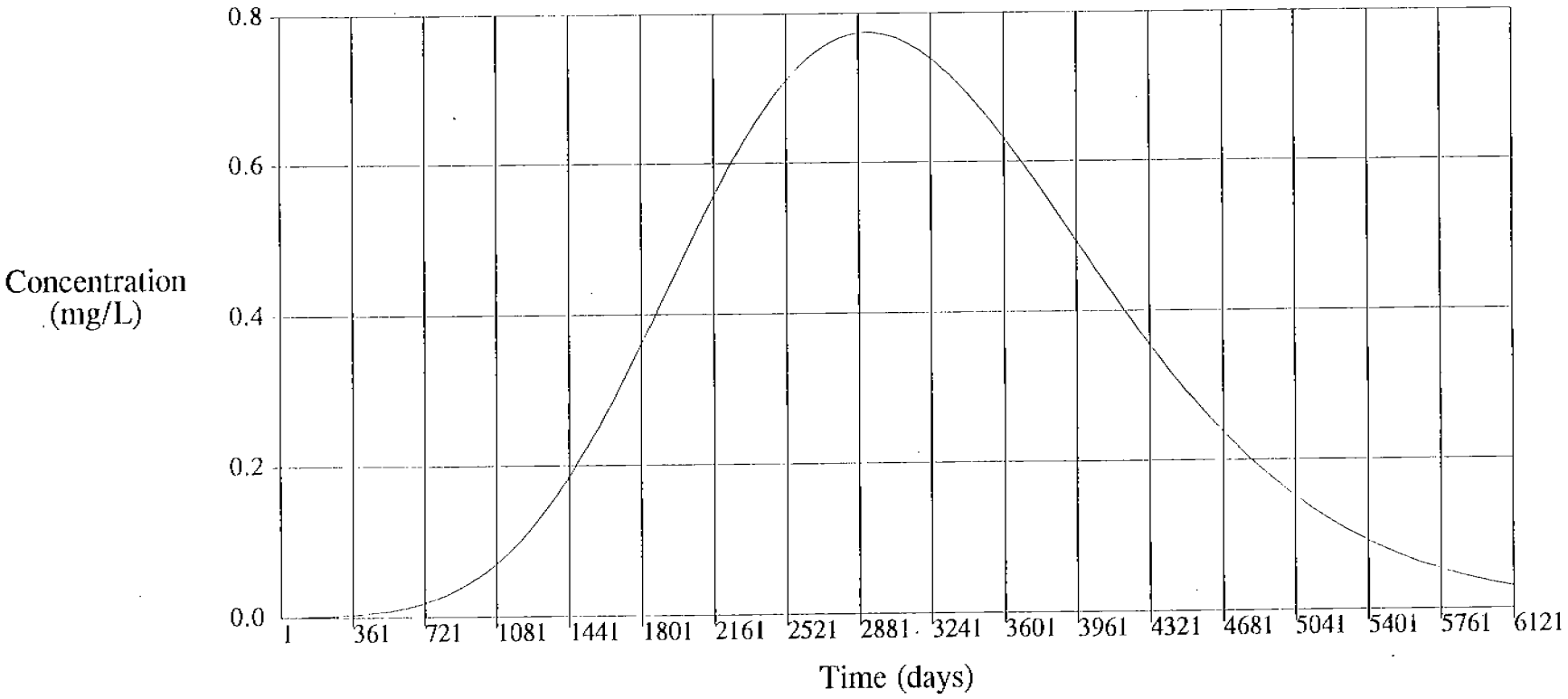


FIGURE 4

LNAPL Area Plume Breakthrough



MODELING NATURAL PLUME BIODEGRADATION

LNAPL Area Plume

M =	initial mass	=	8 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.0501 m/day	
T =	half-life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t)*exp-(((x-u*t)^2/(4*Dx*t))+(y^2/(4*Dy*t))+((0.693*R/T)*t))

time = 3193 days THIS TIME CORRESPONDS TO EXISTING PLUME, OR 1994

3193 (days "base" time) (time, t , in the equation is actually t/R)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
140	5.522	4.895	3.411	1.867	0.804	0.272	0.006	0.000	0.000	0.000	0.000
160	6.256	5.546	3.864	2.116	0.911	0.308	0.007	0.000	0.000	0.000	0.000
180	5.517	4.891	3.408	1.866	0.803	0.272	0.006	0.000	0.000	0.000	0.000
200	3.788	3.358	2.339	1.281	0.551	0.186	0.004	0.000	0.000	0.000	0.000
220	2.024	1.794	1.250	0.684	0.295	0.100	0.002	0.000	0.000	0.000	0.000
240	0.842	0.746	0.520	0.285	0.123	0.041	0.001	0.000	0.000	0.000	0.000
260	0.272	0.242	0.168	0.092	0.040	0.013	0.000	0.000	0.000	0.000	0.000
280	0.069	0.061	0.042	0.023	0.010	0.003	0.000	0.000	0.000	0.000	0.000
300	0.013	0.012	0.008	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000
320	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
340	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
360	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
380	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
420	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X = 160 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994
X = 340 METERS CORRESPONDS TO THE LOCATION OF THE NO-NAME CREEK

MODELING NATURAL PLUME BIODEGRADATION

LNAPL Area Plume

M =	initial mass	=	8 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.0501 m/day	
T =	half−life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t)*exp−(((x−u*t)^2/(4*Dx*t))+(y^2/(4*Dy*t))+((0.693*R/T)*t))

time = 6074 days THIS TIME CORRESPONDS TO t/R = 7.9 YEARS, OR 1994 + 14 = 2008

3193 (days "base" time)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
140	0.011	0.011	0.009	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000
160	0.031	0.029	0.024	0.018	0.011	0.006	0.001	0.000	0.000	0.000	0.000
180	0.075	0.071	0.059	0.043	0.027	0.015	0.002	0.000	0.000	0.000	0.000
200	0.160	0.150	0.124	0.091	0.058	0.033	0.005	0.000	0.000	0.000	0.000
220	0.298	0.280	0.231	0.169	0.108	0.061	0.008	0.001	0.000	0.000	0.000
240	0.486	0.456	0.377	0.275	0.177	0.100	0.014	0.001	0.000	0.000	0.000
260	0.695	0.653	0.540	0.393	0.252	0.143	0.020	0.001	0.000	0.000	0.000
280	0.872	0.818	0.677	0.493	0.316	0.179	0.025	0.002	0.000	0.000	0.000
300	0.958	0.899	0.743	0.542	0.348	0.197	0.027	0.002	0.000	0.000	0.000
320	0.922	0.866	0.716	0.522	0.335	0.189	0.026	0.002	0.000	0.000	0.000
340	0.779	0.731	0.605	0.440	0.283	0.160	0.022	0.001	0.000	0.000	0.000
360	0.576	0.541	0.447	0.326	0.209	0.118	0.016	0.001	0.000	0.000	0.000
380	0.374	0.351	0.290	0.212	0.136	0.077	0.011	0.001	0.000	0.000	0.000
400	0.213	0.200	0.165	0.120	0.077	0.044	0.006	0.000	0.000	0.000	0.000
420	0.106	0.100	0.082	0.060	0.039	0.022	0.003	0.000	0.000	0.000	0.000

X = 160 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994
X = 340 METERS CORRESPONDS TO THE LOCATION OF THE NO−NAME CREEK

MODELING NATURAL PLUME BIODEGRADATION

LNAPL Area Plume

M =	initial mass	=	8 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.0501 m/day	
T =	half-life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t)*exp-(((x-u*t)^2/(4*Dx*t))+(y^2/(4*Dy*t))+((0.693*R/T)*t))

time = 9314 days THIS TIME CORRESPONDS TO t/R = 16.8 YEARS, OR 1994 + 30 = 2024

3193 (days "base" time)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
180	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
220	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
240	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
260	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
280	0.004	0.004	0.003	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000
300	0.008	0.008	0.007	0.005	0.004	0.003	0.001	0.000	0.000	0.000	0.000
320	0.016	0.015	0.013	0.011	0.008	0.006	0.002	0.000	0.000	0.000	0.000
340	0.028	0.027	0.024	0.019	0.014	0.010	0.003	0.000	0.000	0.000	0.000
360	0.046	0.044	0.039	0.032	0.024	0.016	0.005	0.001	0.000	0.000	0.000
380	0.070	0.067	0.059	0.048	0.036	0.025	0.007	0.001	0.000	0.000	0.000
400	0.097	0.094	0.083	0.067	0.050	0.035	0.010	0.002	0.000	0.000	0.000
420	0.124	0.119	0.105	0.086	0.064	0.044	0.012	0.002	0.000	0.000	0.000

X = 160 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994
X = 340 METERS CORRESPONDS TO THE LOCATION OF THE NO-NAME CREEK

MODELING NATURAL PLUME BIODEGRADATION

M =	initial mass	=	8 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.0501 m/day	
T =	half -life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t)*exp−(((x−u*t)^2/(4*Dx*t))+(y^2/(4*Dy*t))+((0.693*R/T)*t))

time = 10394 days THIS TIME CORRESPONDS TO t/R = 19.7 YEARS, OR 1994 + 35 = 2029

3193 (days "base" time) (time, t , in the equation is actually t/R)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
180	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
220	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
260	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
280	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
300	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
320	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
340	0.004	0.004	0.003	0.003	0.002	0.002	0.000	0.000	0.000	0.000	0.000
360	0.007	0.007	0.006	0.005	0.004	0.003	0.001	0.000	0.000	0.000	0.000
380	0.013	0.013	0.011	0.009	0.007	0.005	0.002	0.000	0.000	0.000	0.000
400	0.022	0.021	0.019	0.016	0.012	0.009	0.003	0.001	0.000	0.000	0.000
420	0.033	0.032	0.029	0.024	0.018	0.013	0.004	0.001	0.000	0.000	0.000

X = 160 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994
X = 340 METERS CORRESPONDS TO THE LOCATION OF THE NO−NAME CREEK

MODELING NATURAL PLUME BIODEGRADATION

LNAPL Area Plume

M =	initial mass	=	8 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.0501 m/day	
T =	half-life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t)*exp-(((x-u*t)^2/(4*Dx*t))+(y^2/(4*Dy*t))+((0.693*R/T)*t))

time = 10754 days THIS TIME CORRESPONDS TO t/R = 20.7 YEARS, OR 1994 + 37 = 2031

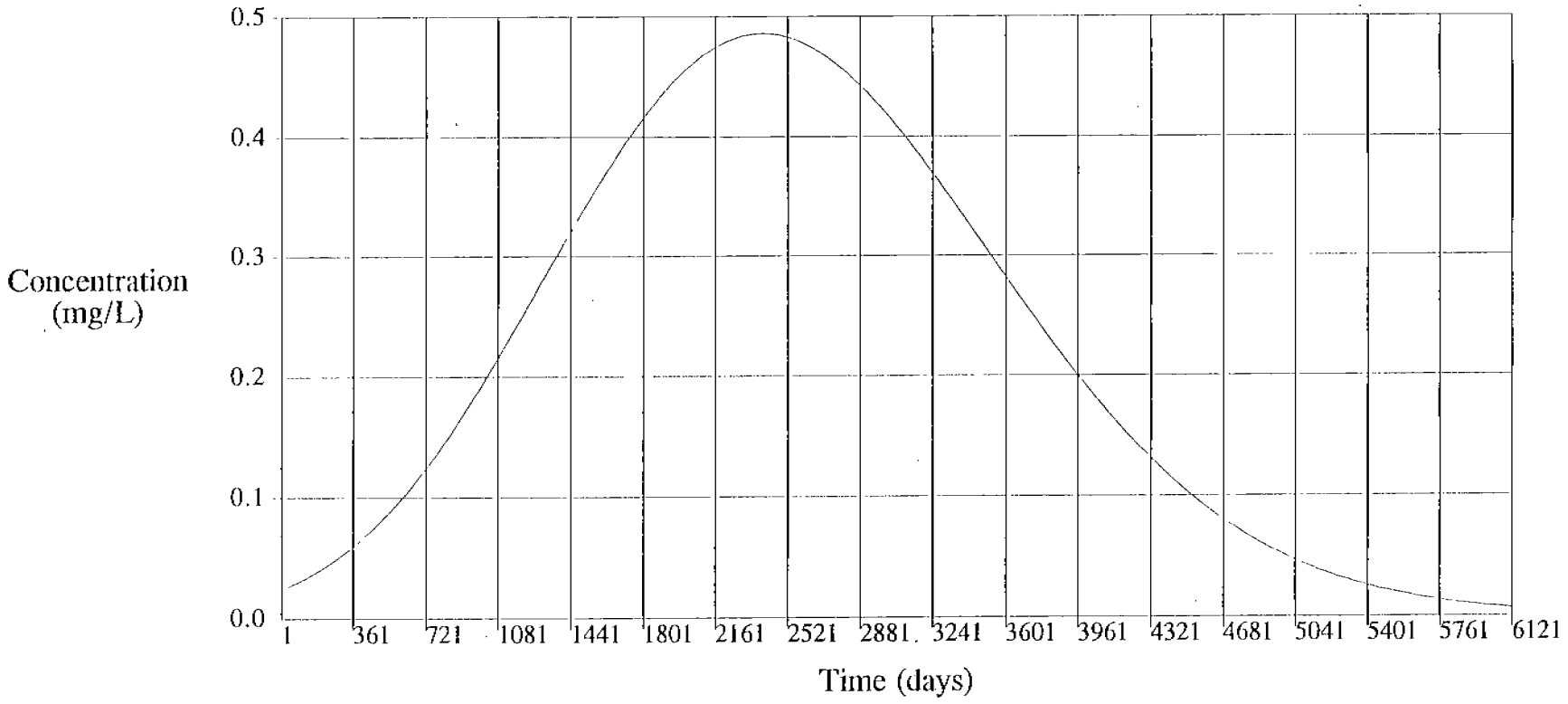
3193 (days "base" time)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
180	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
220	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
260	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
280	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
320	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
340	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
360	0.004	0.004	0.003	0.003	0.002	0.002	0.001	0.000	0.000	0.000	0.000
380	0.007	0.007	0.006	0.005	0.004	0.003	0.001	0.000	0.000	0.000	0.000
400	0.012	0.012	0.011	0.009	0.007	0.005	0.002	0.000	0.000	0.000	0.000
420	0.020	0.019	0.017	0.014	0.011	0.008	0.003	0.001	0.000	0.000	0.000

X = 160 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994
X = 340 METERS CORRESPONDS TO THE LOCATION OF THE NO-NAME CREEK

FIGURE 5

Landfill Plume Breakthrough



MODELING NATURAL PLUME BIODEGRADATION

Landfill Plume

M =	initial mass	=	7.3 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.065 m/day	
T =	half-life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	(R = 1.8)
Pi =		=	3.14159265	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t')*exp-(((x-ut)^2/(4*Dx*t))+(y^2/(4*Dy*t'))+((0.693*R/T)*t))

time = 9003 days THIS TIME CORRESPONDS TO EXISTING PLUME, OR 1994

9003 days ("base" time) (time, t, in this equation is actually t/R)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
567	1.952	1.870	1.645	1.329	0.985	0.671	0.177	0.027	0.000	0.000	0.000
587	2.024	1.939	1.706	1.378	1.022	0.696	0.183	0.028	0.000	0.000	0.000
607	1.921	1.840	1.619	1.308	0.970	0.660	0.174	0.027	0.000	0.000	0.000
627	1.667	1.598	1.406	1.135	0.842	0.573	0.151	0.023	0.000	0.000	0.000
647	1.325	1.269	1.117	0.902	0.669	0.455	0.120	0.018	0.000	0.000	0.000
667	0.963	0.923	0.812	0.655	0.486	0.331	0.087	0.013	0.000	0.000	0.000
687	0.640	0.614	0.540	0.436	0.323	0.220	0.058	0.009	0.000	0.000	0.000
707	0.390	0.373	0.328	0.265	0.197	0.134	0.035	0.005	0.000	0.000	0.000
727	0.217	0.208	0.183	0.148	0.110	0.075	0.020	0.003	0.000	0.000	0.000
747	0.111	0.106	0.093	0.075	0.056	0.038	0.010	0.002	0.000	0.000	0.000
767	0.052	0.049	0.043	0.035	0.026	0.018	0.005	0.001	0.000	0.000	0.000
787	0.022	0.021	0.019	0.015	0.011	0.008	0.002	0.000	0.000	0.000	0.000
807	0.009	0.008	0.007	0.006	0.004	0.003	0.001	0.000	0.000	0.000	0.000
827	0.003	0.003	0.003	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000
847	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000

X = 587 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994

X = 787 METERS CORRESPONDS TO THE LOCATION OF THE NO-NAME CREEK

MODELING NATURAL PLUME BIODEGRADATION

Landfill Plume

M =	initial mass	=	7.3 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.065 m/day	
T =	half-life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	(R = 1.8)
Pi =		=	3.14159265	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t')*exp-(((x-ut)^2/(4*Dx*t))+(y^2/(4*Dy*t'))+((0.693*R/T)*t))

time = 11353 days THIS TIME CORRESPONDS TO t/R = 6.4 YEARS, OR 1994 + 12 = 2006

9003 days ("base" time) (time, t, in this equation is actually t/R)

X; Y =	0	10	20	30	40	50	75	100	150	200	300	
567	0.045	0.043	0.039	0.033	0.026	0.019	0.007	0.002	0.000	0.000	0.000	
587	0.079	0.076	0.069	0.058	0.046	0.034	0.012	0.003	0.000	0.000	0.000	
607	0.130	0.126	0.113	0.096	0.076	0.056	0.019	0.004	0.000	0.000	0.000	
627	0.199	0.192	0.174	0.147	0.116	0.085	0.030	0.007	0.000	0.000	0.000	
647	0.284	0.274	0.248	0.209	0.165	0.122	0.042	0.010	0.000	0.000	0.000	
667	0.378	0.365	0.330	0.278	0.220	0.162	0.056	0.013	0.000	0.000	0.000	
687	0.468	0.453	0.409	0.345	0.272	0.201	0.070	0.016	0.000	0.000	0.000	
707	0.541	0.523	0.472	0.399	0.314	0.232	0.080	0.018	0.000	0.000	0.000	
727	0.582	0.563	0.508	0.429	0.339	0.250	0.087	0.020	0.000	0.000	0.000	
747	0.584	0.565	0.510	0.431	0.340	0.250	0.087	0.020	0.000	0.000	0.000	
767	0.546	0.528	0.477	0.403	0.318	0.234	0.081	0.018	0.000	0.000	0.000	
787	0.476	0.460	0.416	0.351	0.277	0.204	0.071	0.016	0.000	0.000	0.000	
807	0.387	0.374	0.338	0.285	0.225	0.166	0.057	0.013	0.000	0.000	0.000	
827	0.293	0.283	0.256	0.216	0.170	0.125	0.044	0.010	0.000	0.000	0.000	0.53
847	0.206	0.200	0.180	0.152	0.120	0.088	0.031	0.007	0.000	0.000	0.000	

X = 587 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994

X = 787 METERS CORRESPONDS TO THE LOCATION OF THE NO-NAME CREEK

MODELING NATURAL PLUME BIODEGRADATION

Landfill Plume

M =	initial mass	=	7.3 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.065 m/day	
T =	half-life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	(R = 1.8)
Pi =		=	3.14159265	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t')*exp-(((x-ut)^2/(4*Dx*t))+(y^2/(4*Dy*t'))+((0.693*R/T)*t))

time = 15124 days THIS TIME CORRESPONDS TO t/R = 16.8 YEARS, OR 1994 + 30 = 2024

9003 days ("base" time) (time, t, in this equation is actually t/R)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
567	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
587	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
607	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
627	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
647	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
667	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
687	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
707	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
727	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
747	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000
767	0.004	0.004	0.004	0.003	0.003	0.002	0.001	0.000	0.000	0.000	0.000
787	0.007	0.007	0.006	0.006	0.005	0.004	0.002	0.001	0.000	0.000	0.000
807	0.011	0.011	0.010	0.009	0.008	0.006	0.003	0.001	0.000	0.000	0.000
827	0.018	0.017	0.016	0.014	0.012	0.009	0.004	0.001	0.000	0.000	0.000
847	0.026	0.025	0.023	0.021	0.017	0.014	0.006	0.002	0.000	0.000	0.000

X = 587 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994

X = 787 METERS CORRESPONDS TO THE LOCATION OF THE NO-NAME CREEK

MODELING NATURAL PLUME BIODEGRADATION

Landfill Plume

M =	initial mass	=	7.3 kg/m thick	
n =	porosity	=	0.25	
Dx =	longitundinal dispersion	=	0.25 m^2/day	
Dy =	transverse dispersion	=	0.065 m^2/day	
u =	pore velocity	=	0.065 m/day	
T =	half-life	=	2920 days	(8 years)
R =	retardation coefficient	=	1.8	(R = 1.8)
Pi =		=	3.14159265	

PLUME DISTRIBUTION, USING:

C(x',y',t') = (M/n)/(4*PI*(Dx*Dy)^0.5*t')*exp-(((x-ut)^2/(4*Dx*t))+(y^2/(4*Dy*t'))+((0.693*R/T)*t))

time = 15484 days THIS TIME CORRESPONDS TO t/R = 17.8 YEARS, OR 1994 + 32 = 2026

9003 days ("base" time) (time, t, in this equation is actually t/R)

X; Y =	0	10	20	30	40	50	75	100	150	200	300
567	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
587	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
607	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
627	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
647	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
667	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
687	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
707	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
727	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
747	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
767	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
787	0.003	0.003	0.003	0.003	0.002	0.002	0.001	0.000	0.000	0.000	0.000
807	0.006	0.006	0.005	0.005	0.004	0.003	0.001	0.000	0.000	0.000	0.000
827	0.009	0.009	0.008	0.007	0.006	0.005	0.002	0.001	0.000	0.000	0.000
847	0.014	0.014	0.013	0.011	0.010	0.008	0.004	0.001	0.000	0.000	0.000

X = 587 METERS CORRESPONDS TO THE LOCATION OF THE PEAK CONCENTRATION IN 1994

X = 787 METERS CORRESPONDS TO THE LOCATION OF THE NO-NAME CREEK

Partial Capture - each well pumps 3 gpm

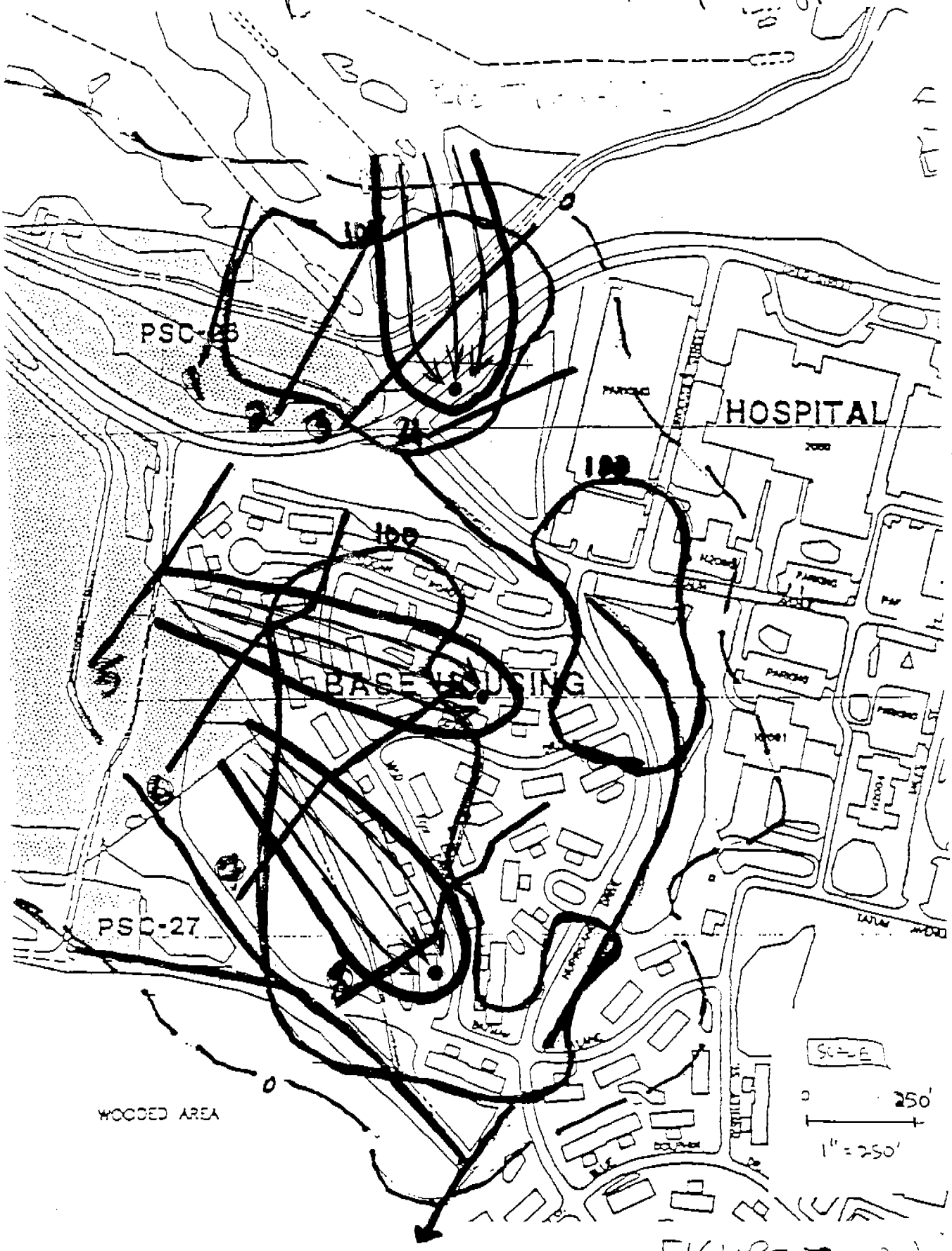
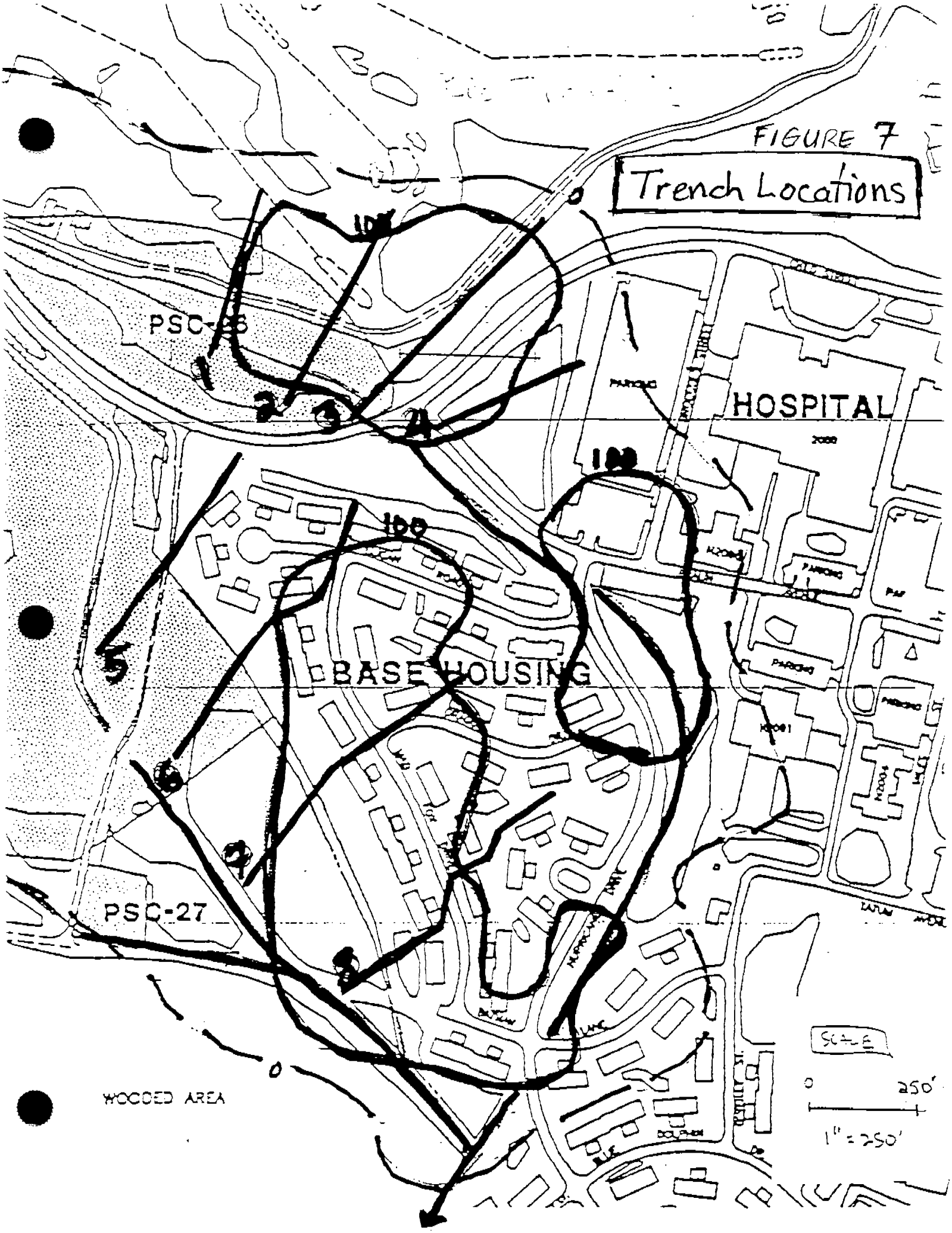


FIGURE 8 - Partial Capture

FIGURE 7

Trench Locations



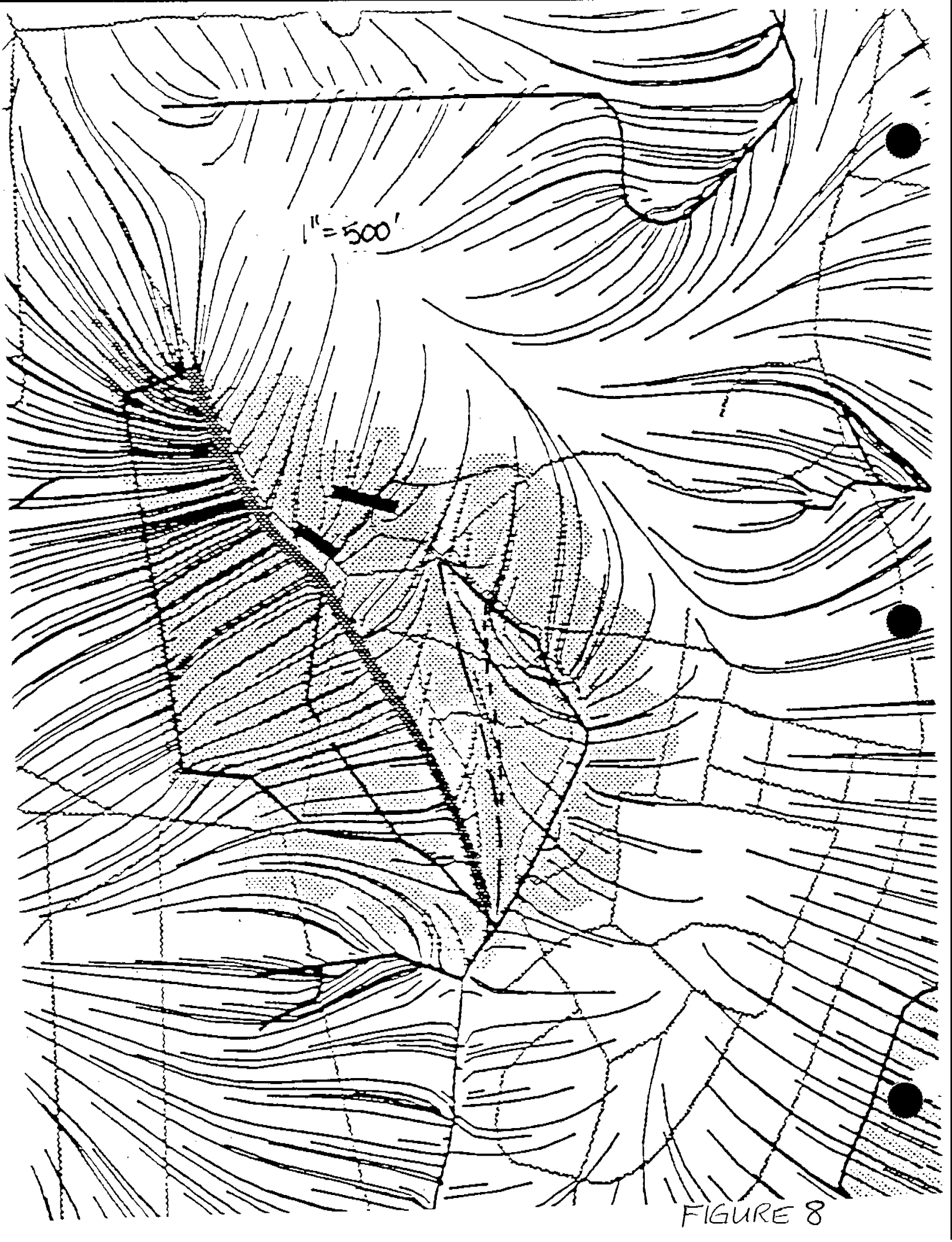


FIGURE 8

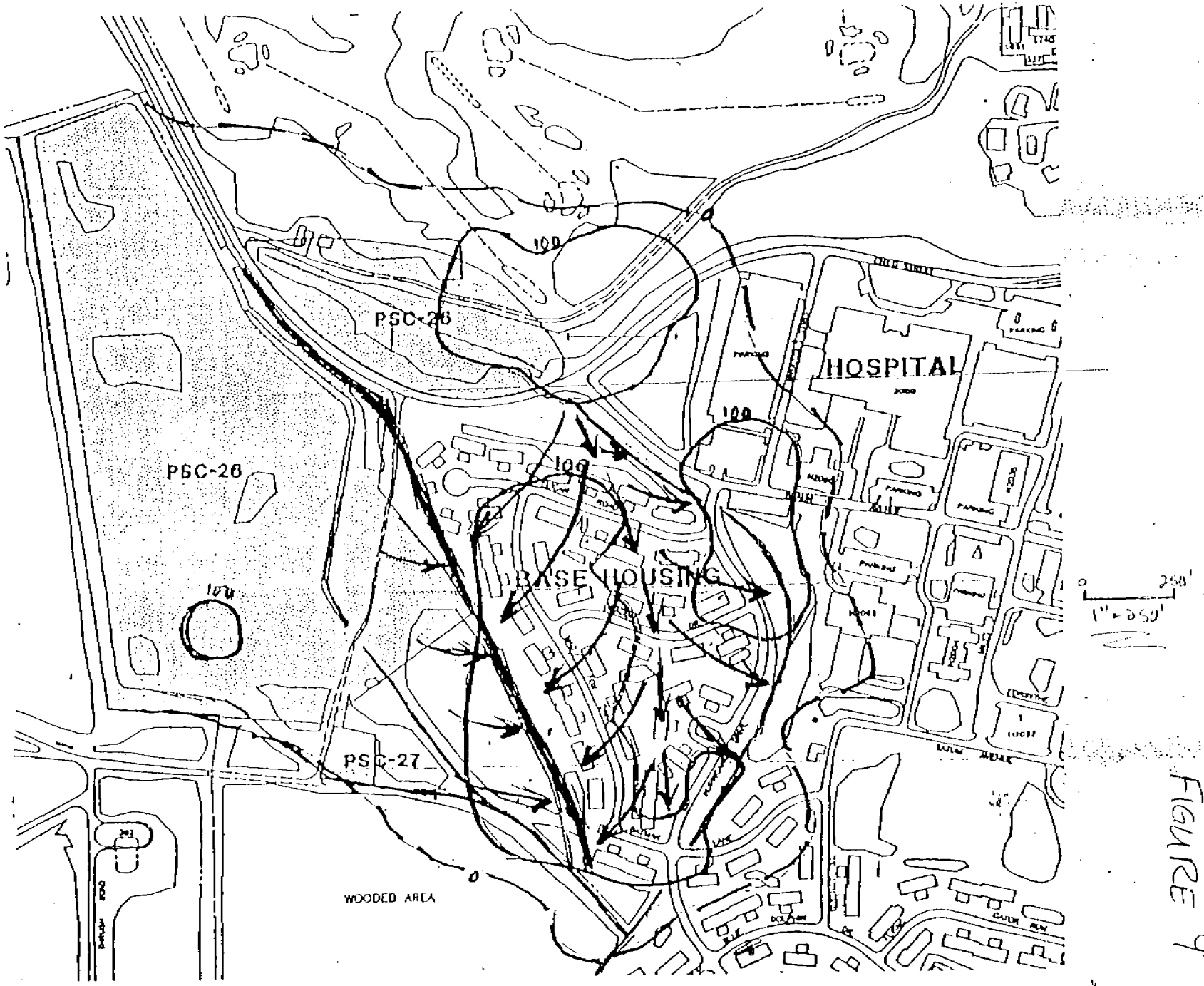
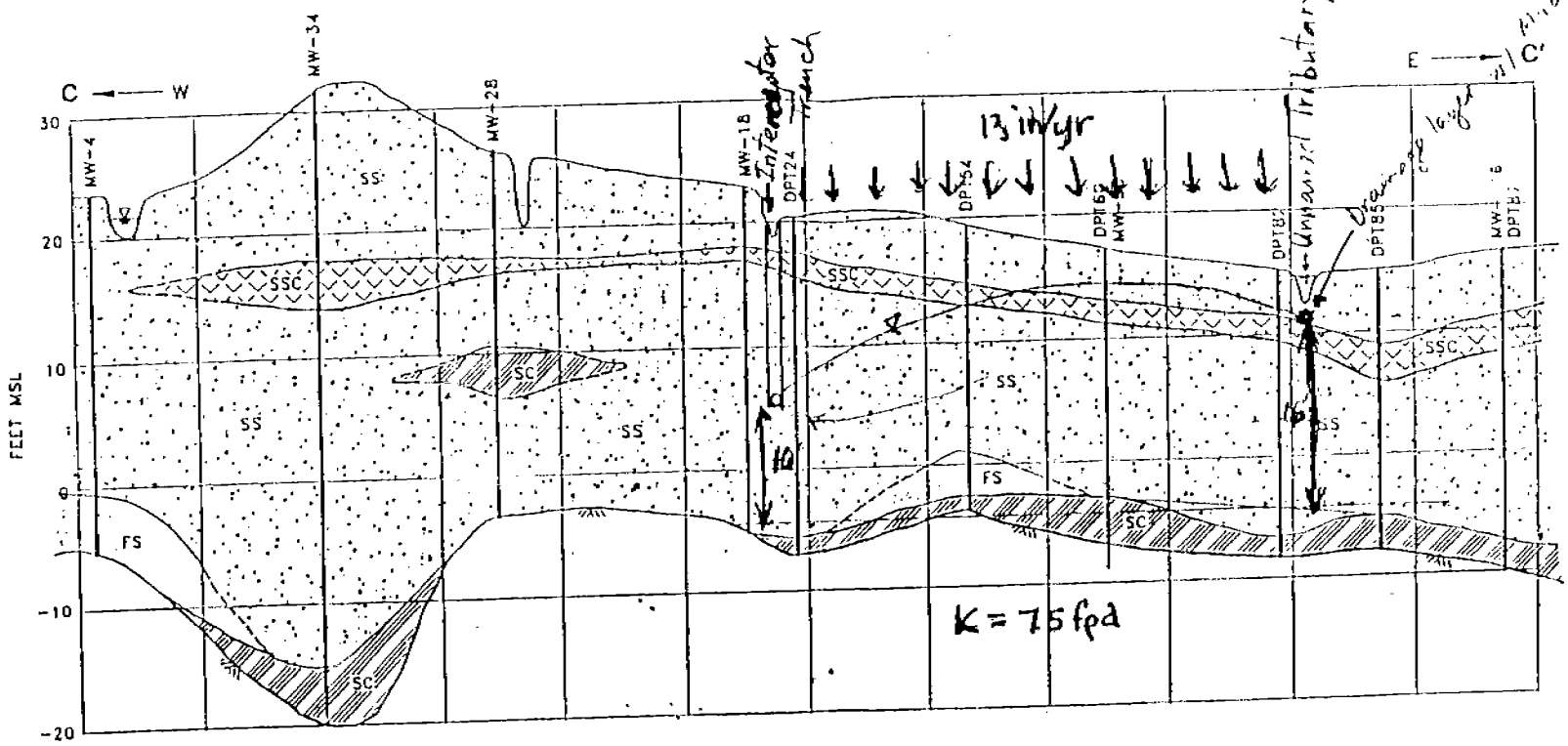

PSC-26
PSC-26
PSC-27
HOSPITAL
BASE HOUSING
WOODED AREA
100
100
100
100
0
0
250'
1" = 250'

FIGURE 9



SCALE: 1" = 200'
VERTICAL EXAGGERATION 10:1

NOTES:

1. SEE FIGURE A-1 FOR LOCATION AND ORIENTATION OF CROSS-SECTION.
2. CROSS-SECTION IS BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.

LEGEND

- SC: SILTY CLAY
- SS: SILTY SAND
- FS: FINE SAND
- SSC: SANDY SILTY CLAY
- INFERRED CONTACT

FIGURE
GEOLOGIC CROSS-SECTION C-C'

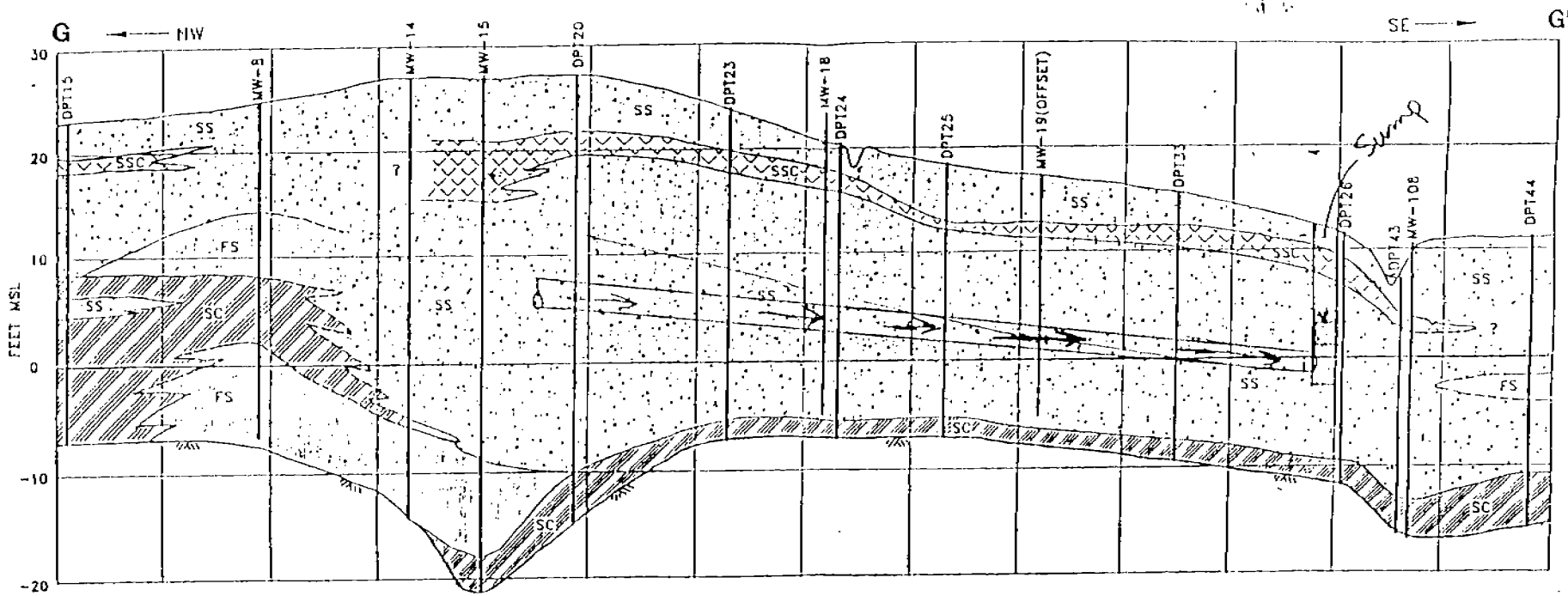
REMEDIAL INVESTIGATION REPORT FOR OU 1

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

/USR2/DWGS/OU1/CROSSEC/ORM/02-20-95

FIGURE 10

Interceptor Trench



0 100 200
SCALE: 1" = 200'
VERTICAL EXAGGERATION 10:1

NOTES:

1. SEE FIGURE A-1 FOR LOCATION AND ORIENTATION OF CROSS-SECTION.
2. CROSS-SECTION IS BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.

LEGEND

- SC: SILTY CLAY
- SS: SILTY SAND
- FS: FINE SAND
- SSC: SANDY SILTY CLAY
- INFERRED CONTACT

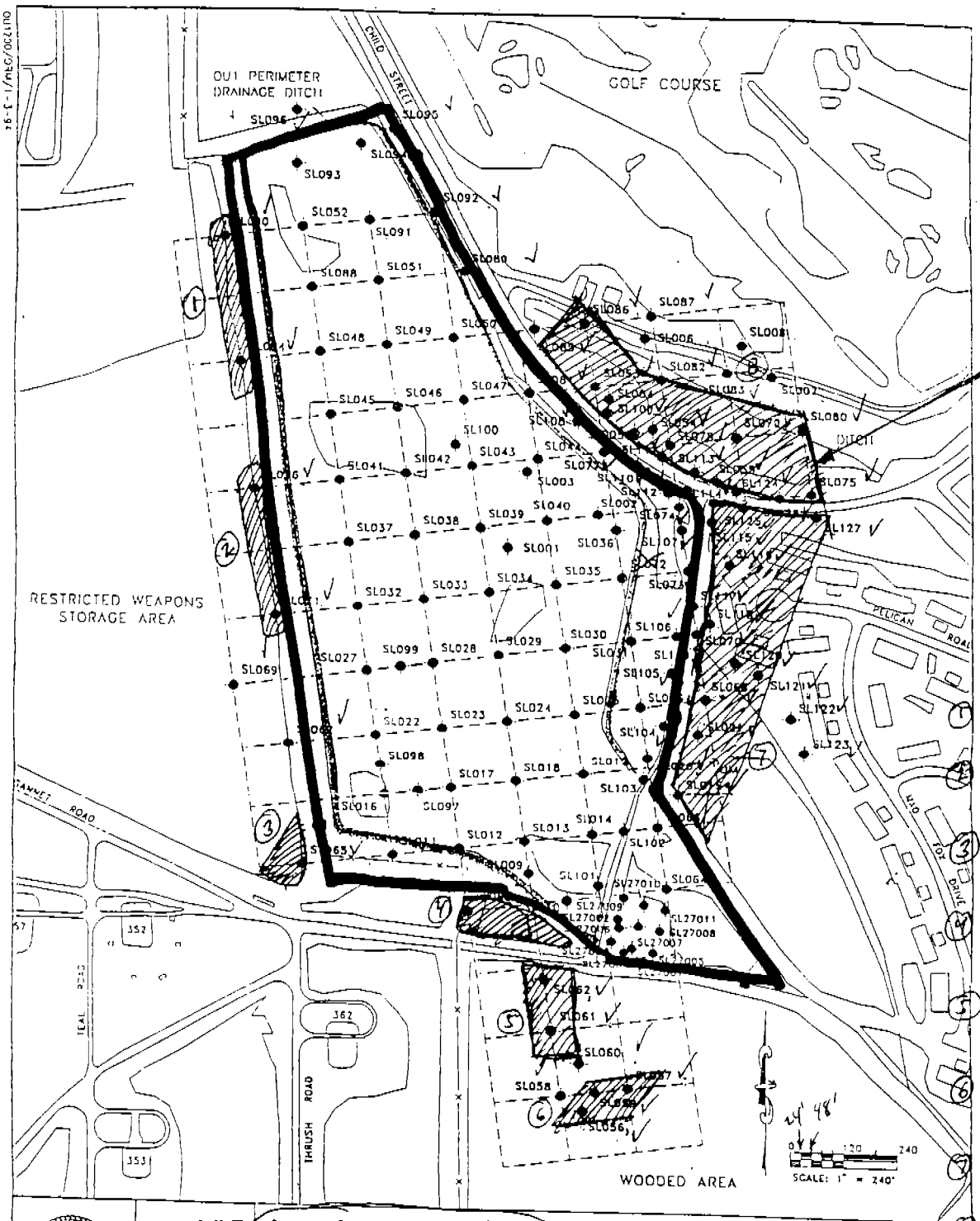
FIGURE
GEOLOGIC CROSS-SECTION G-G'

REMEDIAL INVESTIGATION REPORT FOR OU 1

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

/DWGS/OU1/CROSSEC/CG/DAW/03-23-95

FIGURE 11



CONTAMINATED SOIL IN EXCEEDANCE OF LOW-END ACTION LEVELS

VOLUME:

(50)(180)(1)
+
(50)(180)(1)
+
(75)(75)(1)
+
(240)(50)(1)
+
(120)(60)(1)
+
(120)(60)(1)
+
(600)(140)(1)
+
(580)(180)(1)

= 238,425 ft^3

= 9,000 yds^3

ALTS 3, 4, 5

FIGURE 1
SOIL SAMPLE LOCATIONS AT OU1

REMEDIAL INVESTIGATION REPORT FOR OU1
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

LEGEND
- SOIL SAMPLE LOCATION
- BENCHMARK

B(a)P concentration exceeds screening value
PCB concentration exceeds screening value
Landfill area evaluated for Presumptive Remedy

LOW-END SOIL EXCAVATION

31, 63, 66 are "outside landfill"

790.0000 U
260.0000 J

920.0000 U

930.0000 U

840.0000 U

760.0000 U
1200.0000 U
380.0000 J

840.0000 U
140.0000 J

890.0000 U

760.0000 U
380.0000 J

750.0000 U
730.0000 U

750.0000 U
340.0000 U

740.0000 U

150.0000 U
740.0000 U

870.0000 U

350.0000 U
730.0000 U

340.0000 U
130.0000 U
720.0000 U

880.0000 U

820.0000 U

24.0000 U
720.0000 U

370.0000 U

820.0000 U

62.0000 J

38.0000 J
740.0000 U

750.0000 U

720.0000 U

350.0000 U

59.0000 J

350.0000 U

360.0000 U
130.0000 J

370.0000 U

360.0000 U

Benzo(a)Pyrene

Benzo(a)Pyrene

790.0000 U
160.0000 U
920.0000 U
930.0000 U
840.0000 U
760.0000 U
1200.0000 U
94.0000 U
840.0000 U
890.0000 U
760.0000 U
61.0000 U
750.0000 U
730.0000 U
130.0000 U
740.0000 U
870.0000 U
740.0000 U
350.0000 U
730.0000 U
880.0000 U
1600.0000 U
340.0000 U
820.0000 U
350.0000 U
720.0000 U
820.0000 U
370.0000 U
340.0000 U
340.0000 U
740.0000 U
750.0000 U
720.0000 U
350.0000 U
380.0000 U
350.0000 U
360.0000 U
400.0000 U
370.0000 U
360.0000 U

Dibenzo(a,h)Anthracene

Dibenzo(a,h)Anthracene

39.0000 U
38.0000 U
450.
220.0000 U
66.
70.
1900.0000 U
59.0000 U
41.0000 U
48.
37.0000 U
39.0000 U
36.0000 U
36.0000 U
72.0000 U
41.0000 U
38.0000 U
39.0000 U
38.0000 U
72.0000 U
65.0000 U
35.0000 U
130.
42.
36.0000 U
35.0000 U
36.0000 U
40.0000 U
170.0000 U
70.0000 U
74.0000 U
51.
2000.0000 U
4000.0000 U
3600.0000 U
190.0000 U
42.0000 U
340.0000 U
70.0000 U
180.0000 U
39.0000 U
20000.0000 U
3600.
2100.0000 U
990.0000 U
36.0000 U
35.0000 U
17.0000 U
19.0000 U
17.0000 U
19.0000 U
18.0000 U
17.0000 U

Aroclor-1254

Aroclor-1254

39.0000 U
38.0000 U
480.
770.
45.0000 U
170.
1900.0000 U
39.0000 U
41.0000 U
130.
43.0000 U
37.0000 U
39.0000 U
36.0000 U
41.0000 U
38.0000 U
72.0000 U
130.
340.
39.0000 U
400.
170.
330.0000 U
99.
130.
86.
53.
42.0000 U
86.
78.
180.
170.
230.
40.0000 U
710.0000 U
310.
180.
43.0000 U
3800.
310.0000 U
36.0000 U
180.
3600.0000 U
4000.0000 U
2000.
40.0000 U
560.
220.
2500.0000 U
700.0000 U
20000.0000 U
2300.
150.
3400.
532.0000 U
2200.0000 U
360.
320.
190.
60.
17.0000 U
18.0000 U
150.
58.
17.0000 U

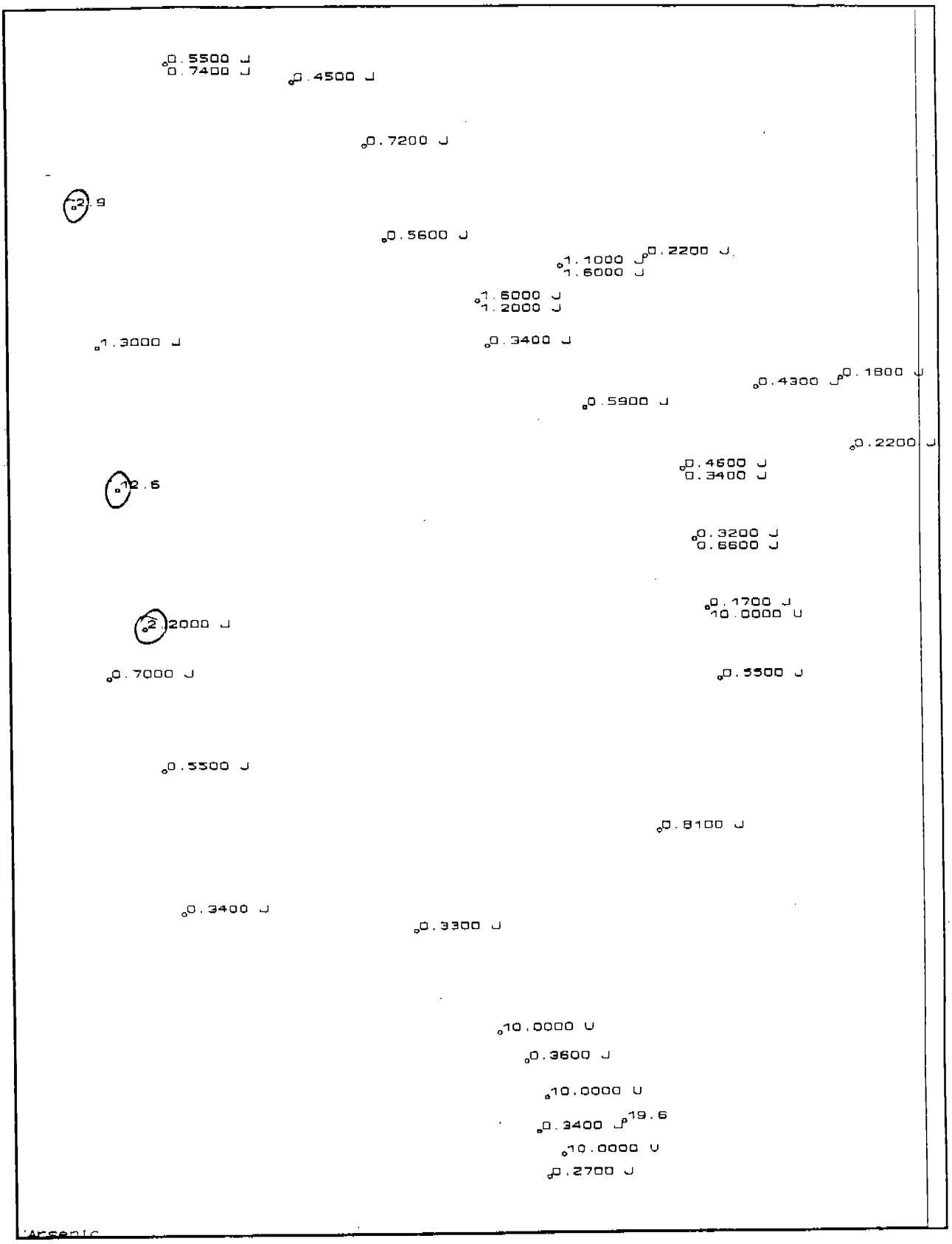
Aroclor-1260

Aroclor-1260

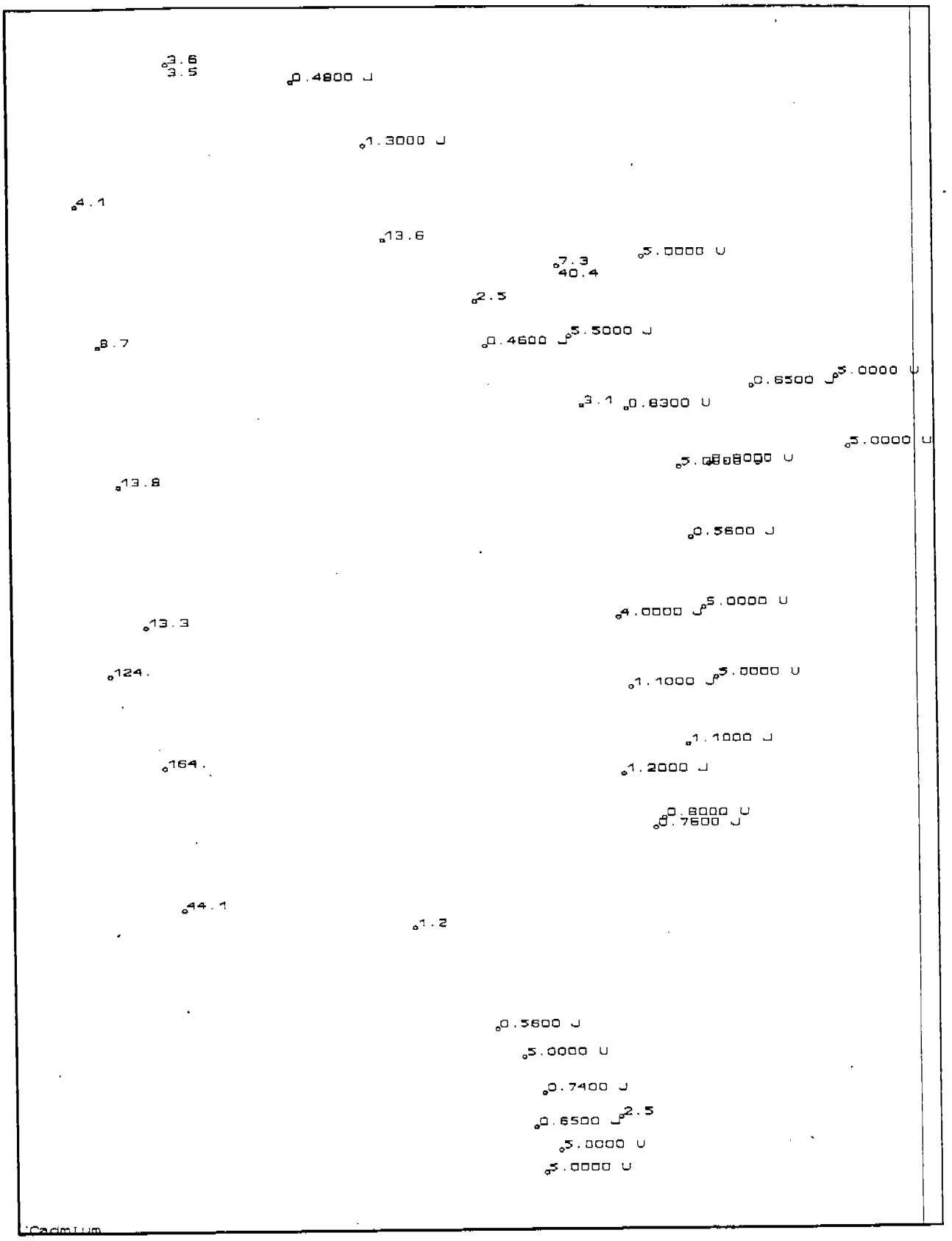
60.0000 U
60.0000 U
60.0000 U
60.0000 U
4.8000 J
60.0000 U
60.0000 U
60.0000 U
5.6000 J
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
8.4000 UJ
60.0000 U
60.0000 U
8.4000 UJ
60.0000 U
8.2000 UJ
60.0000 U
60.0000 U
4.3000 J
60.0000 U
7.0000 J
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U

Antimony

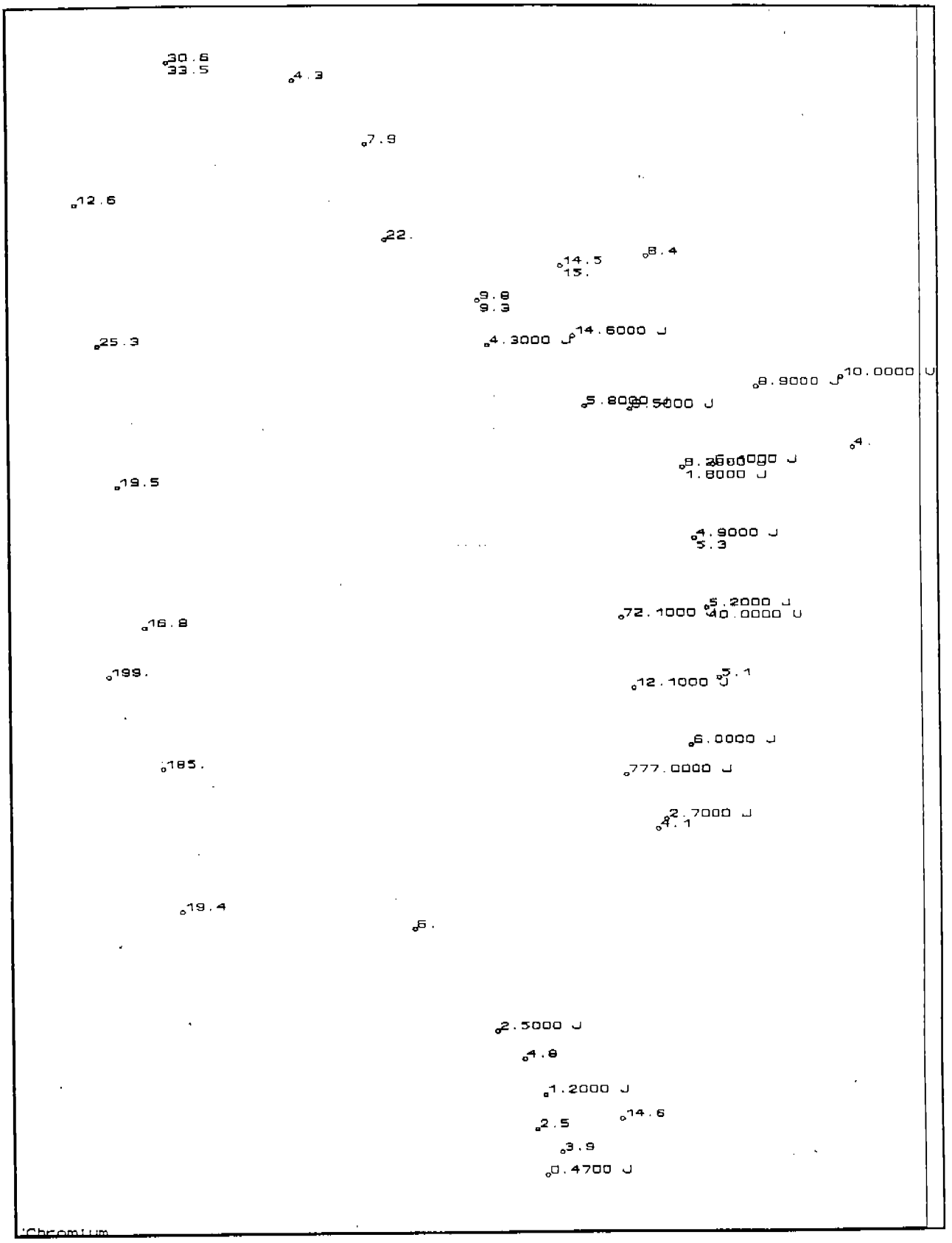
Antimony


0.5500 J
0.7400 J
0.4500 J
0.7200 J
2.5
0.5600 J
1.1000 J
1.6000 J
0.2200 J
1.6000 J
1.2000 J
1.3000 J
0.3400 J
0.4300 J
0.1800 J
0.5900 J
0.2200 J
0.4600 J
0.3400 J
12.6
0.3200 J
0.6600 J
0.1700 J
10.0000 U
2.2000 J
0.7000 J
0.5500 J
0.5500 J
0.8100 J
0.3400 J
0.3300 J
10.0000 U
0.3600 J
10.0000 U
0.3400 J
19.6
10.0000 U
0.2700 J
Arsenic

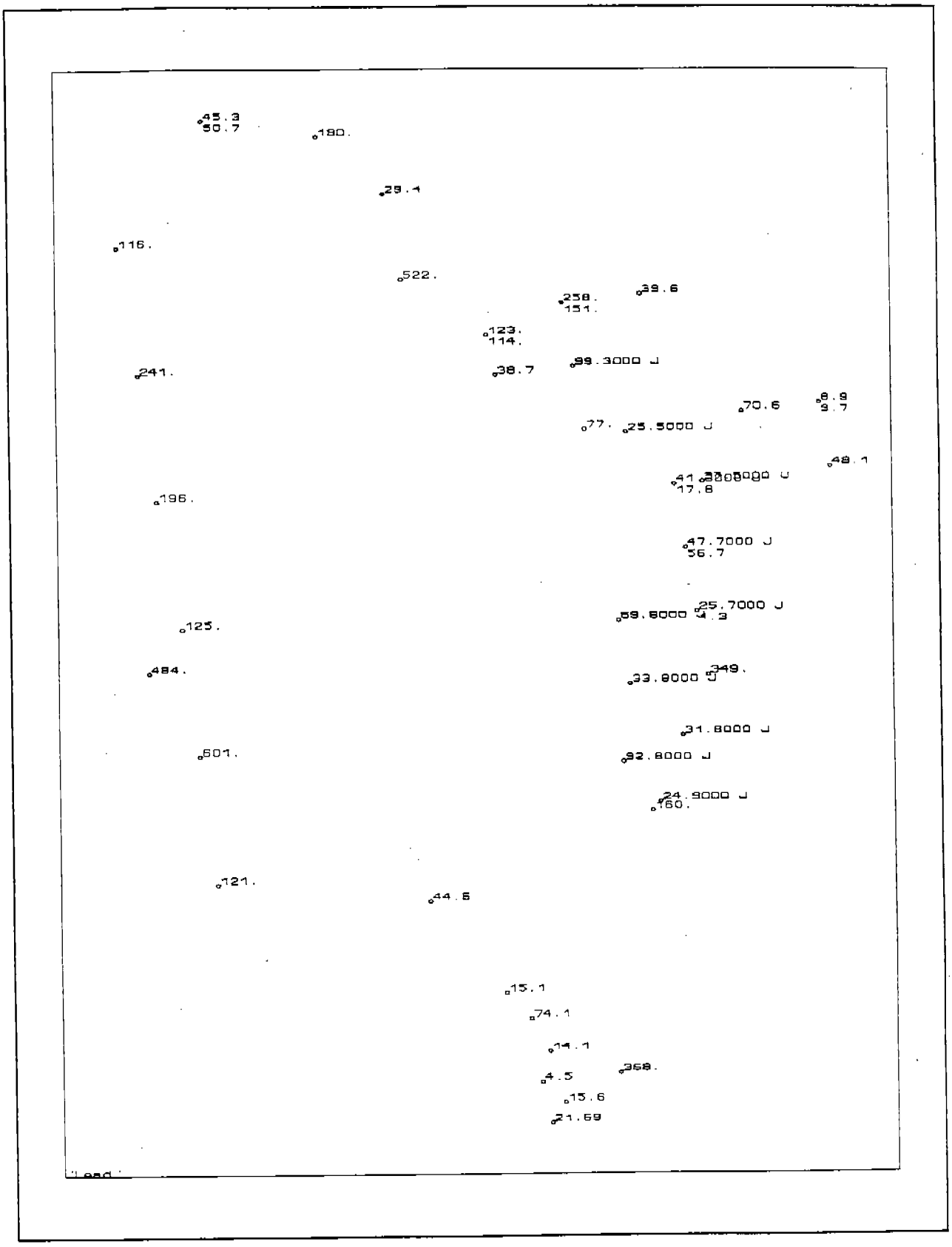
Arsenic


3.6
3.5
0.4800 J
1.3000 J
4.1
13.6
5.0000 U
7.3
40.4
2.5
0.4600 J
5.5000 J
8.7
0.6500 J
5.0000 U
3.1
0.8300 U
5.0000 U
13.8
0.5600 J
4.0000 J
5.0000 U
13.3
124.
1.1000 J
5.0000 U
1.1000 J
164.
1.2000 J
0.8000 U
0.7600 J
44.1
1.2
0.5600 J
5.0000 U
0.7400 J
0.6500 J
2.5
5.0000 U
5.0000 U
Cadmium

Cadmium

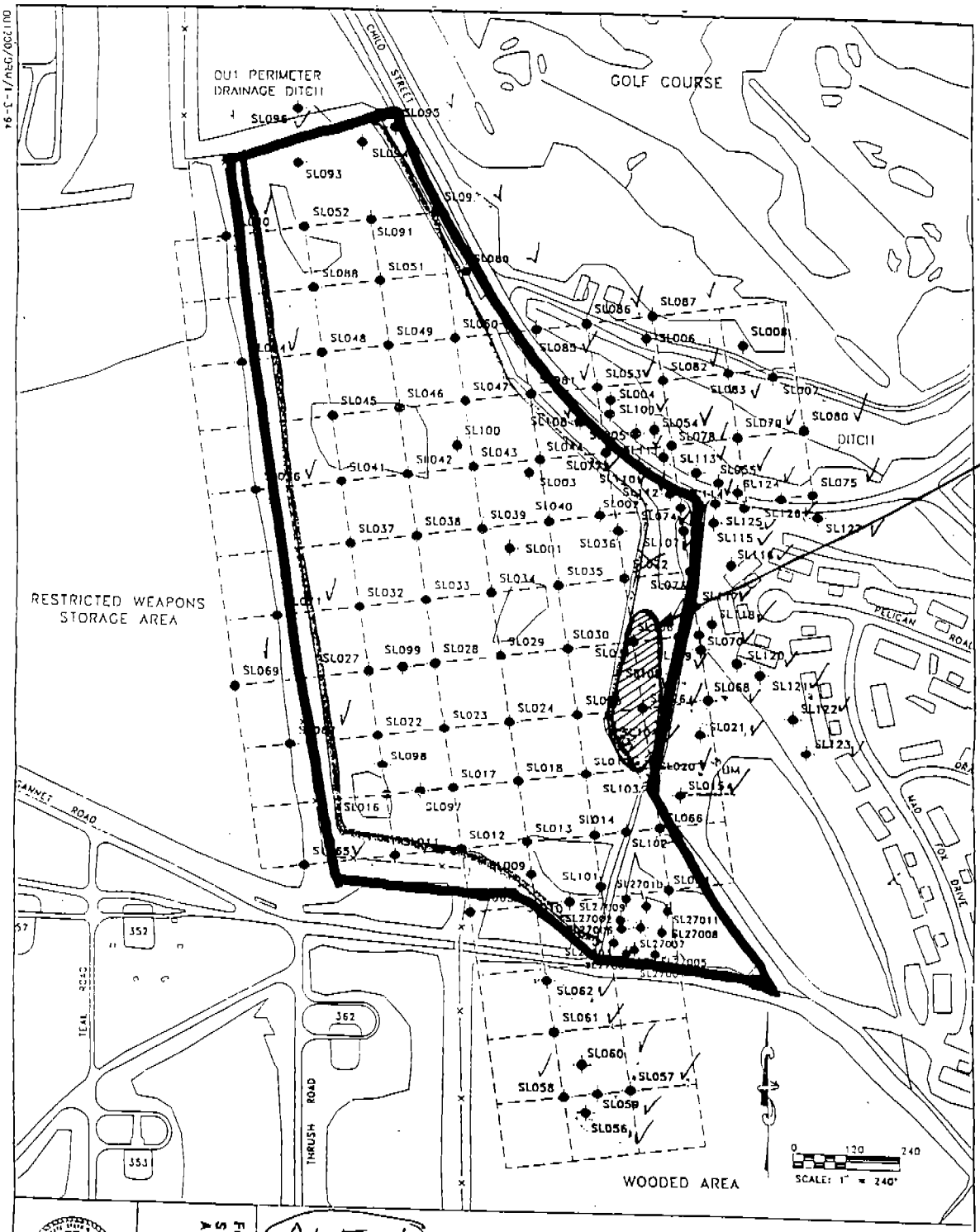

30.6
33.5
4.3
7.9
12.6
22.
14.5
15.
8.4
9.8
9.3
25.3
4.3000 J
14.6000 J
8.9000 J
10.0000 J
5.8000 J
4.
1.8000 J
19.5
4.9000 J
5.3
5.2000 J
72.1000
40.0000 J
16.8
199.
12.1000
5.1
6.0000 J
185.
777.0000 J
2.7000 J
4.1
19.4
6.
2.5000 J
4.8
1.2000 J
14.6
2.5
3.9
0.4700 J
Chromium

Chromium


45.3
50.7
180.
29.4
116.
522.
258.
151.
39.6
123.
114.
99.3000 J
241.
38.7
70.6
8.9
9.7
77.
25.5000 J
48.1
41.
17.8
196.
47.7000 J
56.7
25.7000 J
59.6000
4.3
125.
484.
33.8000 J
349.
31.8000 J
601.
92.8000 J
24.9000 J
160.
121.
44.6
15.1
74.1
14.1
368.
4.5
15.6
21.69

Lead

OU1200/GRV/1-3-94



ONLY AROCHLOR CONTAMINATED SOIL IN EXCEEDANCE OF HIGH-END ACTION LEVELS

VOLUME: "0"

ALT 1

FIGURE 1
SOIL SAMPLE LOCATIONS AT OU1

REMEDIAL INVESTIGATION REPORT FOR OU1
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

LEGEND
- SOIL SAMPLE LOCATION
- BENCHMARK

B(a)P concentration exceeds screening value
PCB concentration exceeds screening value
Landfill area evaluated for Presumptiver Remedy

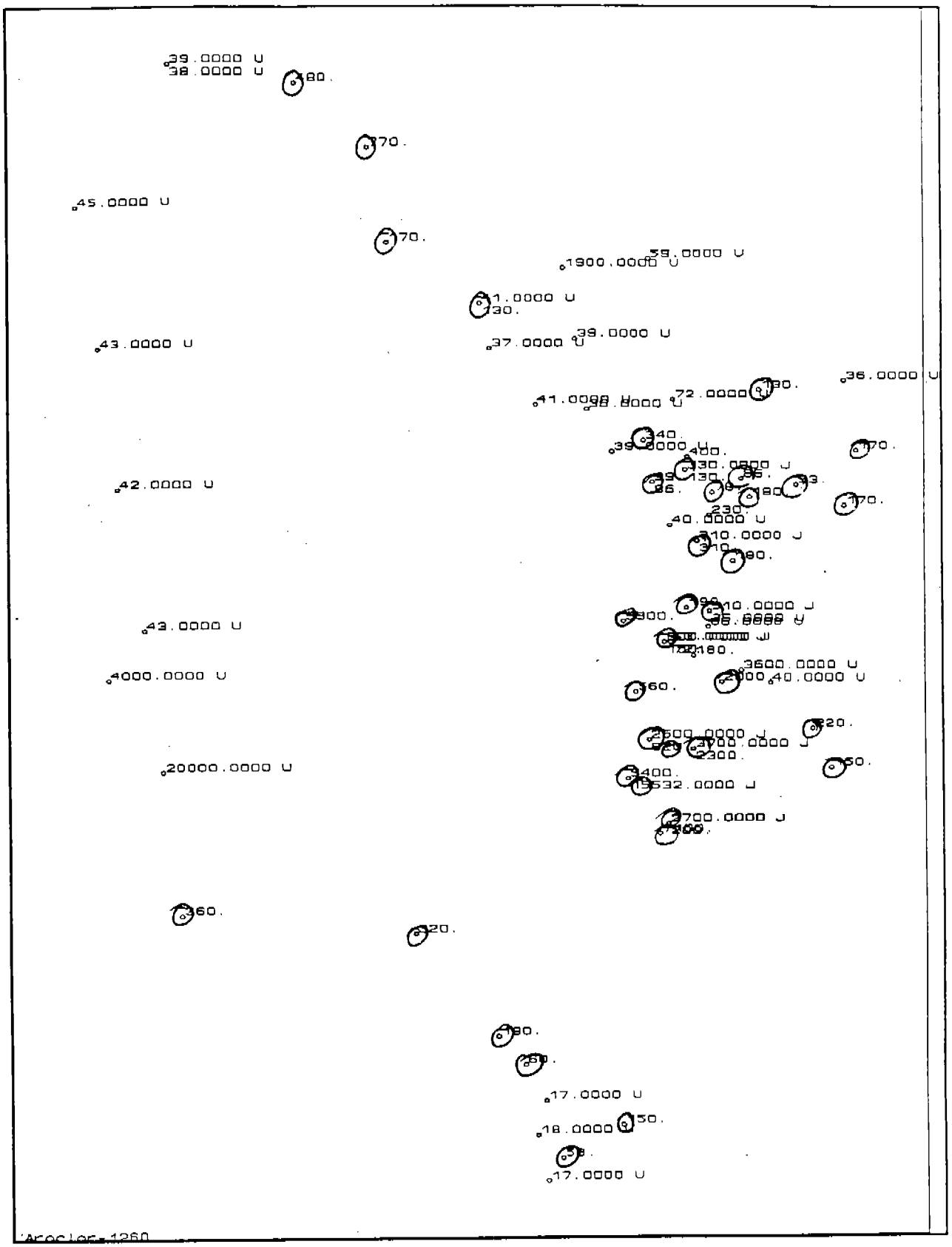
NO HIGH-END SOIL EXCAVATION REQUIRED; CAP WILL BE EXTENDED OVER CONTAMINATED SOIL IN EXCEEDANCE

31, 63, 66 are "outside landfill"

39.0000 U
38.0000 U
50.
220.0000 U
66.
70.
1900.0000 U
39.0000 U
41.0000 U
37.0000 U
39.0000 U
36.0000 U
36.0000 U
41.0000 U
72.0000 U
38.0000 U
39.0000 U
72.0000 U
35.0000 U
35.0000 U
36.0000 U
130.
35.0000 U
40.0000 U
170.0000 U
70.0000 U
74.0000 U
2000.0000 U
4000.0000 U
3600.0000 U
190.0000 U
42.0000 U
340.0000 U
180.0000 U
39.0000 U
20000.0000 U
2100.0000 U
850.0000 U
36.0000 U
35.0000 U
17.0000 U
19.0000 U
17.0000 U
19.0000 U
18.0000 U
18.0000 U
17.0000 U

Aroclor-1254

Aroclor-1254



Aroclor-1260

790.0000 U
160.0000 J

920.0000 U

930.0000 U

840.0000 U

760.0000 U 1200.0000 U
94.0000 J

840.0000 U

890.0000 U 760.0000 U 61.0000 J

750.0000 U 730.0000 U

130.0000 U 940.0000 U

740.0000 U

350.0000 U 740.0000 U

870.0000 U

350.0000 U
730.0000 U

340.0000 U
1600.0000 U 920.0000 U

880.0000 U

820.0000 U 350.0000 U 720.0000 U

370.0000 U

820.0000 U 340.0000 U

340.0000 U
740.0000 U

750.0000 U

720.0000 U

350.0000 U

380.0000 U

350.0000 U

360.0000 U 400.0000 U

370.0000 U

360.0000 U

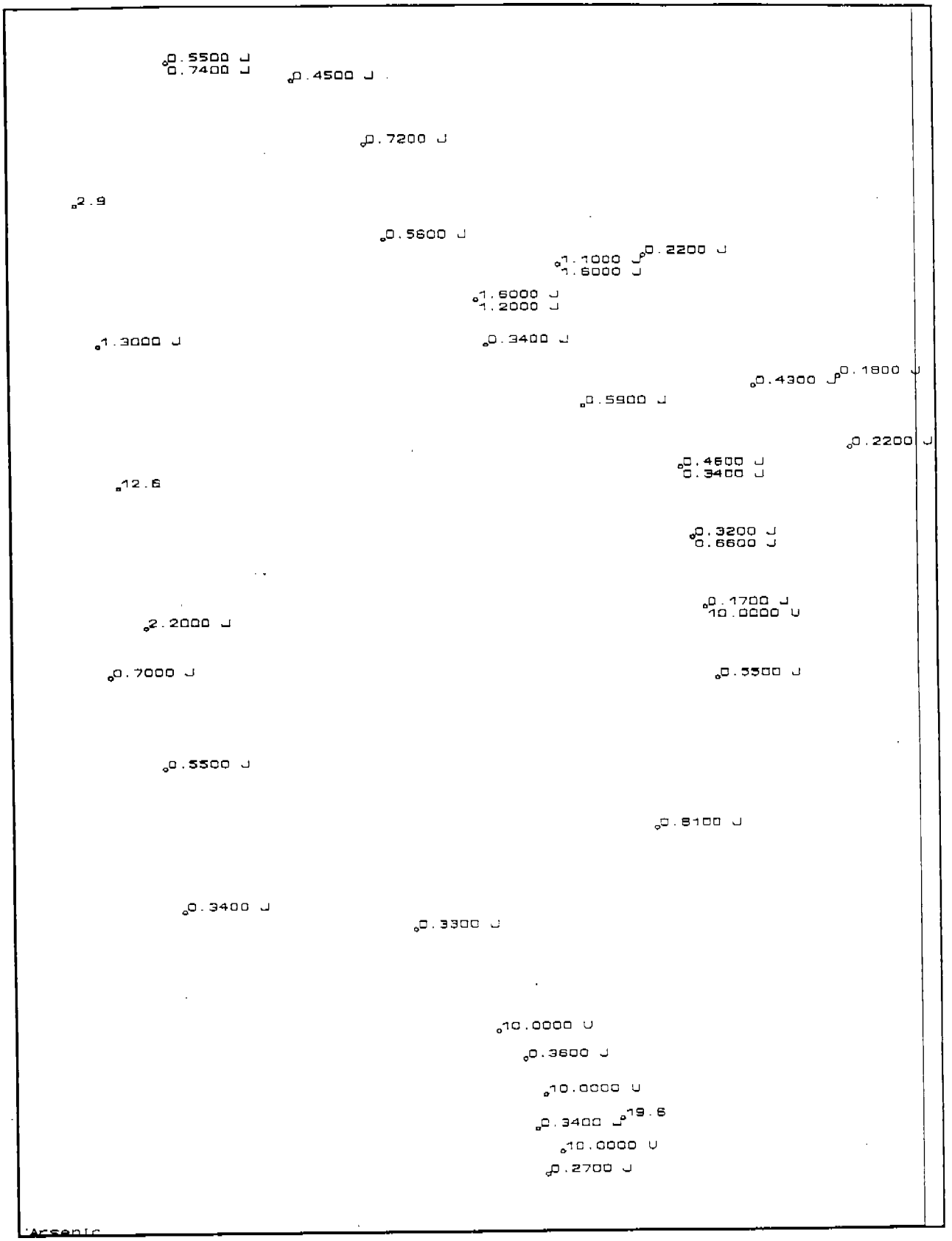
Dibenzo(a,h)Anthracene

Dibenzo(a,h)Anthracene

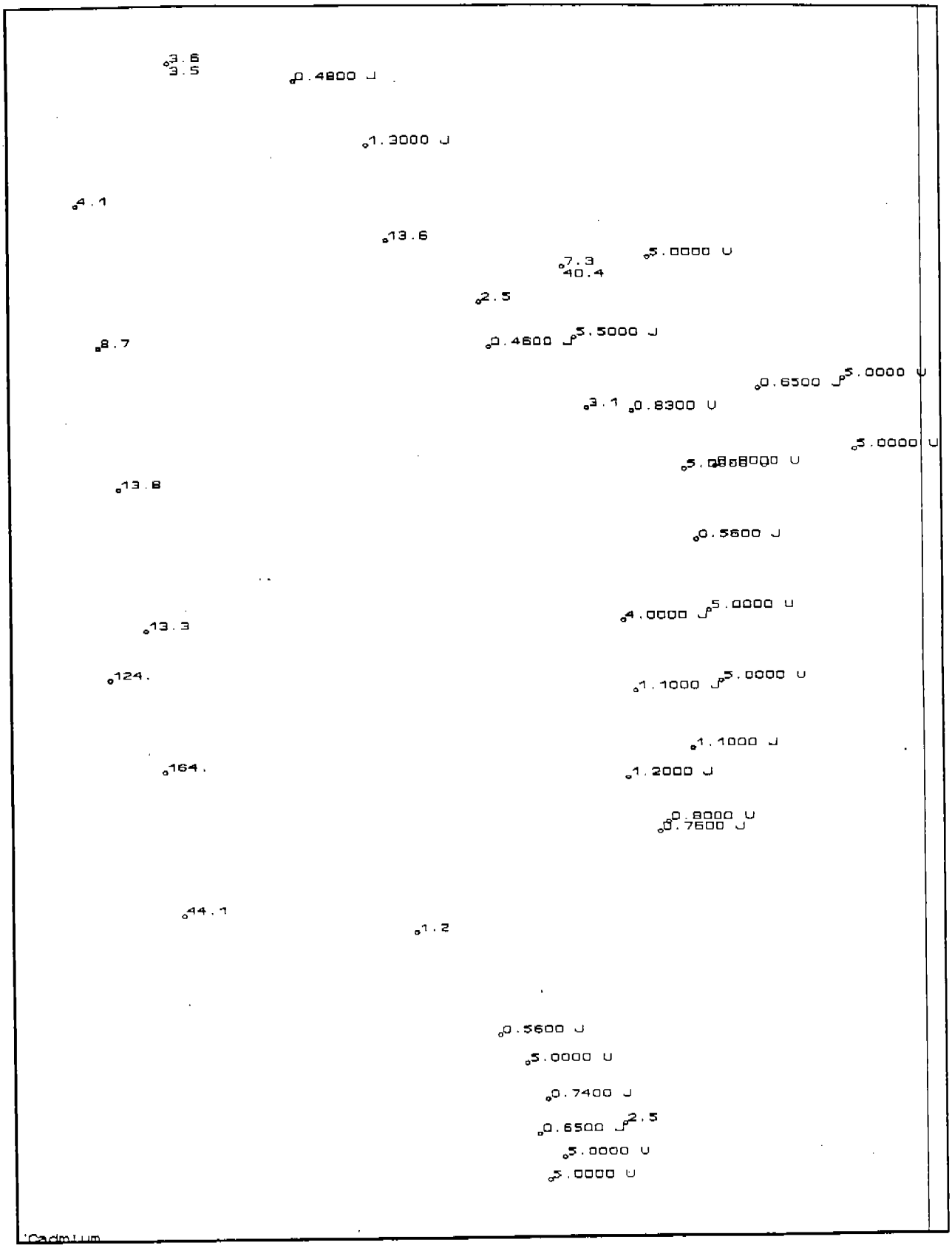
60.0000 U
60.0000 U
60.0000 U
60.0000 U
4.8000 J
60.0000 U
60.0000 U
60.0000 U
5.6000 J
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
8.4000 UJ
60.0000 U
60.0000 U
8.4000 UJ
60.0000 U
8.2000 UJ
60.0000 U
60.0000 U
4.3000 J
60.0000 U
7.0000 J
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U
60.0000 U

Antimony

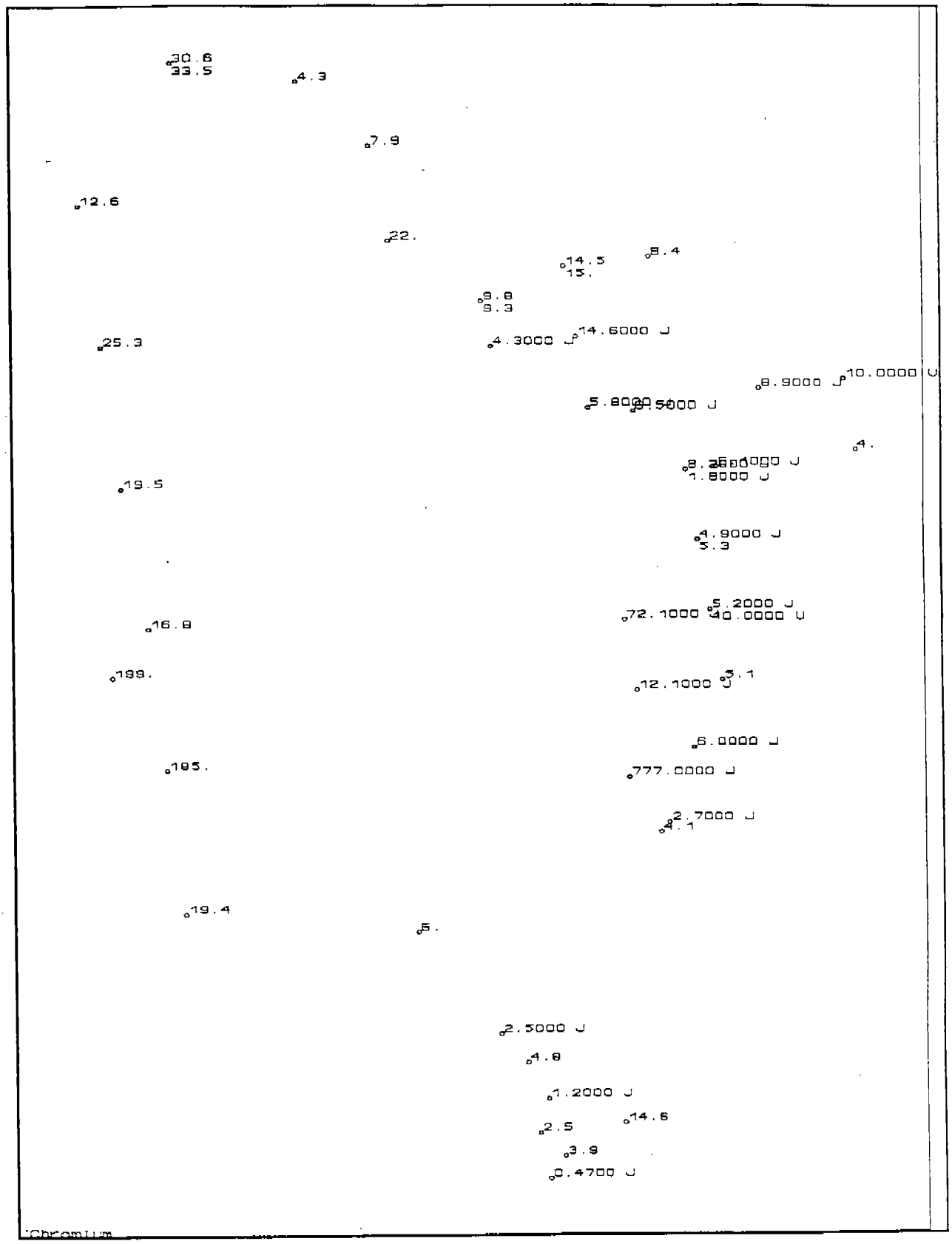
Antimony


0.5500 J
0.7400 J
0.4500 J
0.7200 J
2.9
0.5600 J
1.1000 J
1.6000 J
0.2200 J
1.6000 J
1.2000 J
1.3000 J
0.3400 J
0.4300 J
0.1800 J
0.5900 J
0.2200 J
0.4600 J
0.3400 J
12.6
0.3200 J
0.6600 J
0.1700 J
10.0000 U
2.2000 J
0.7000 J
0.5500 J
0.5500 J
0.8100 J
0.3400 J
0.3300 J
10.0000 U
0.3600 J
10.0000 U
0.3400 J
19.6
10.0000 U
0.2700 J
Arsenic

Arsenic


3.6
3.5
0.4800 J
1.3000 J
4.1
13.6
5.0000 U
7.3
40.4
2.5
8.7
0.4600 J
5.5000 J
0.6500 J
5.0000 U
3.1
0.8300 U
5.0000 U
5.0000 U
13.8
0.5600 J
4.0000 J
5.0000 U
13.3
124.
1.1000 J
5.0000 U
1.1000 J
164.
1.2000 J
0.8000 U
0.7600 J
44.1
1.2
0.5600 J
5.0000 U
0.7400 J
0.6500 J
2.5
5.0000 U
5.0000 U
Cadmium

Cadmium


30.6
33.5
4.3
7.9
12.6
22.
14.5
15.
8.4
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9.3
25.3
4.3000 J
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5.8000
3.5000 J
4.
8.2500 J
1.8000 J
19.5
4.9000 J
5.3
5.2000 J
72.1000
40.0000 J
16.8
199.
12.1000 J
3.1
6.0000 J
185.
777.0000 J
2.7000 J
4.1
19.4
5.
2.5000 J
4.8
1.2000 J
14.6
2.5
3.9
0.4700 J
Chromium

Chromium

Memorandum

To: Gopi Kanchibhatla, Tom Trainor, Willard Murray, Dave Belcher, Mark Kauffman, Jesse Tremaine
From: Maureen Dooley
Date: 4/13/95
RE: Preliminary Evaluation of Bioremediation Options at Jacksonville OU 1

A preliminary evaluation of bioremediation options that could be used to treat groundwater contamination found at PSC26 and PSC 27 located at Jacksonville OU1 were reviewed. I have presented recommendations for the individual PSC's because the extent of contamination and flow path is different. The following recommendations were made based on the data review.

1. Unaided Bioremdiation

As a preface to this section I think it is important to point out that the NAVY is very interested in unaided biodegradation. Our experience at King's Bay was that they wanted to collect more data on natural degradation of chlorinated VOC's to evaluate the need to expand the current remediation program. This approach obviously offers considerable cost savings. USGS is also looking for NAVY sites to gather data on the natural biodegradation of chlorinated solvents. This information will be used to develop a standardized set of procedures that would be used to that evaluate natural biodegradation in a manner that would be acceptable to state regulators. Therefore , I believe any recommendations made at a NAVY site tat involves chlorinated solvents in groundwater will be looked at very closely.

PCS 26 Plume: Based on risk assessment, is CL-VOC treatment required here?
Current VOC levels at PSC 26 levels are not very high. There is evidence biodegradation is occurring naturally based upon the detection of DCE and vinyl chloride and that the concentration of DCE/VC is higher than TCE at MW12. Since ethene measurements were not made, there is no evidence that the reaction is going to completion.

Preliminary review of the site data indicates conditions in the subsurface could support the anaerobic transformation of chlorinated VOCs. Conditions appear to be anoxic and there is a source of electron acceptor (sulfate). It is interesting to note that the sulfide levels were not very high, therefore it would be a good idea to confirm the redox conditions (ORP, DO, methane measurements) in the groundwater. There is some available nitrogen and phosphate and could be coming from runoff generated from the golf course. Results from TOC analysis indicate that there also is available carbon (electron donor).

Natural biodegradation rates can not be estimated because there is not enough data available. Additional data can be collected by placing piezometer type wells downgradient of MW12, or other location where there is evidence of contamination, to monitor the concentration of VOCs and other associated parameters in groundwater. 6 months should be a sufficient amount of time to collect data, but this should be looked at more closely

when well placement is being decided upon. These data shall be used to estimate natural biodegradation rates.

PSC 27 Plume: Are the VOC levels above risk-based clean-up standards? Higher levels of chlorinated VOC's have been observed and there is evidence that natural biodegradation is occurring. The ratio of biodegradation products to TCE increases in well locations downgradient from landfill. As with PSC 26, there does not appear be a major source of VOC's in the landfill.

The subsurface conditions are similar to those at PSC 26, but the nutrient levels may be slightly more limiting. Additional data (as described for PSC 26) should be collected at this location as well to measure the natural biodegradation rate. The contamination levels are higher and in closer proximity to the housing development, so a different set of criteria may be applied to this PSC. However, this approach should be considered at this site if current conditions do not pose an unacceptable risk.

2. Enhanced Bioremediation

PSC 26: It is hard to justify at this location with such low levels of VOC's.

PSC 27: Enhanced bioremediation is worth considering at this site if remediation is required using either a passive design or as part of a pump and treat system. Consider anaerobic only.

Pilot testing will be required to obtain site specific biodegradation rates under enhanced conditions. Some lab screening level laboratory would also be useful to screen potential electron donors.

3. Air Sparging

I am concerned with any sparging program because there are very high levels of iron in the groundwater. Need to consider carefully.

cc: Bill Weber, Steve Mitchell

ABB
ASEA BROWN BOVERI

ABB Environmental Services, Inc.
Northeast Region
Corporate Place 128
107 Audubon Road
Wakefield, MA 01880
FAX (617) 246-5060

DATE: 6/23/95 **FAX #:** ME/VA

TO: STU PEARSON / MARK KAUFMAN

FROM: D. Bilcher

NUMBER OF PAGES, INCLUDING COVER SHEET: 3

COMMENTS: Enclosed are some more bio notes — (preliminary — as Willard has not seen them) Please call if questions —

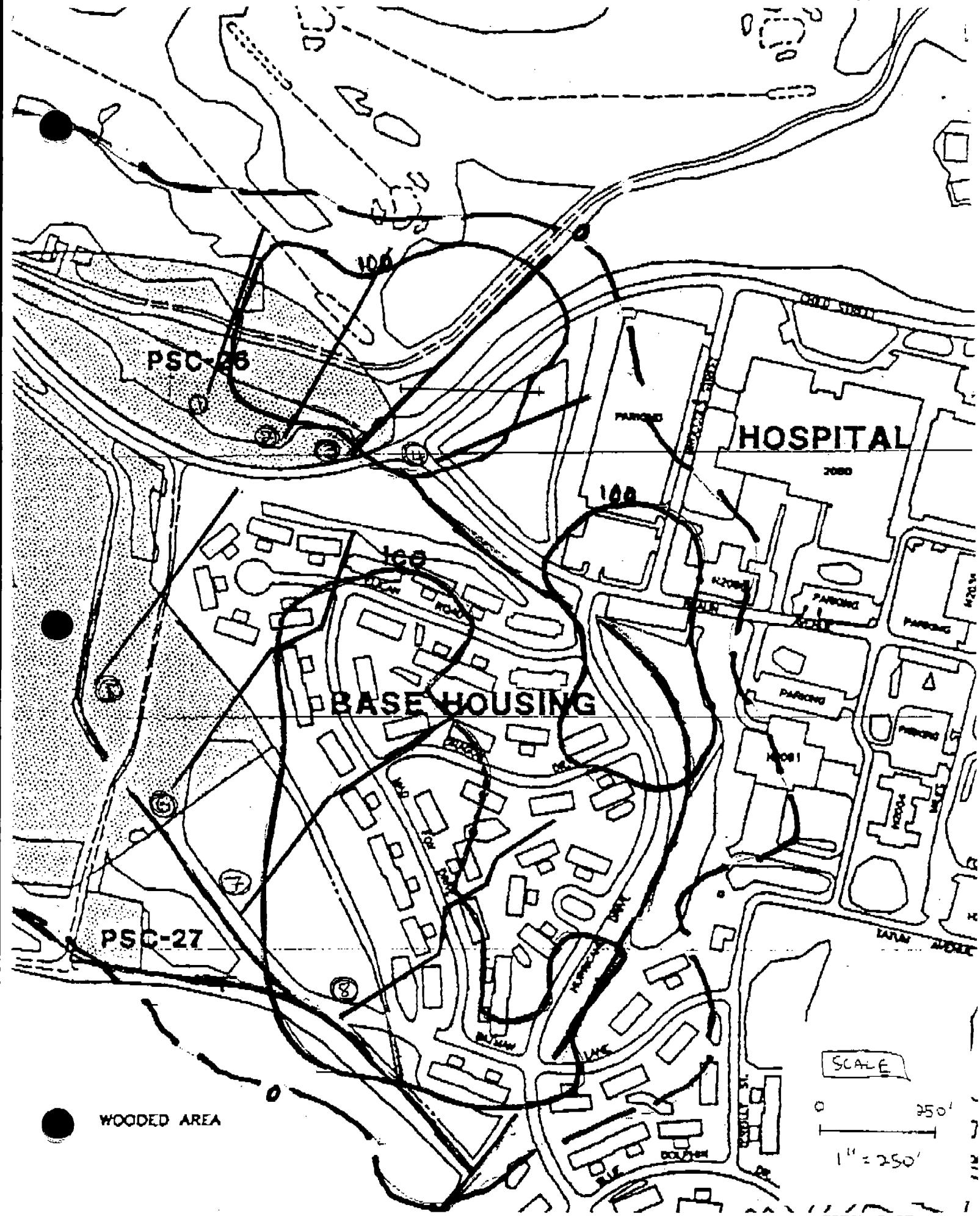
D Bilcher

ANY PROBLEMS WITH RECEIVING, PLEASE CALL RENEE AT (617) 245-6606

Jax OU1 - FS

In-situ Bioremediation

- although a pilot test would ultimately decide the most appropriate bioremediation method, based on the contaminants of concern at Jax OU1, aerobic (methanotrophic) bioremediation is the method of choice
- in-situ aerobic bioremediation would consist of adding oxygen, mineral nutrients and carbon (methane) to the groundwater through injection trenches
- approximately 8 trenches would be placed across the LNAPL and Landfill plumes, perpendicular to groundwater movement (approximately 4,500 linear feet of trench) (see attached figure)
- the bioremediation injection trenches would be spaced at groundwater travel time distances of approximately 4 to 5 years
- either deep (15 - 20' bgs) or shallow (5' bgs) trenches would be used for amendment injection, depending upon the mode of groundwater mixing (pump-induced mixing or fluid density gradient mixing)
- actual trench design would be developed from on pilot scale test results


PSC-26
HOSPITAL
BASE HOUSING
PSC-27
100
100
100
0
PARKING
SCALE
0
250'
1" = 250'
WOODED AREA

APPENDIX V

COST ESTIMATES

PROJECT: OU1 – ALTERNATIVE 1 (RA 1) JOB # 7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM (25% OF LANDFILL AREA)				$2,073,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				N/A
D2 – NUTRIENT INFILTRATION (BASE ITEMS)				N/A
D3 – GROUNDWATER COLLECTION TRENCH				N/A
D4 – CREEK COLLECTION SYSTEM				N/A
D5 – ON-SITE TREATMENT SYSTEM				N/A
D6 – SURFACE WATER DISCHARGE				N/A
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				N/A
TOTAL DIRECT COSTS				$2,093,000
INDIRECT COSTS				
HEALTH AND SAFETY		5.0%	$2,093,000	$105,000
LEGAL, ADMIN, PERMITTING		5.0%	$2,093,000	105,000
ENGINEERING		10.0%	$2,093,000	209,000
SERVICES DURING CONSTRUCTION		10.0%	$2,093,000	209,000
TOTAL INDIRECT COSTS				$628,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$2,721,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
TOTAL ANNUAL OPERATING AND MAINTENANCE COSTS (YRS 1 – 30)			$73,000	$1,122,000
TOTAL COSTS OF ALT 1				$3,843,000

PROJECT: OU1 – ALTERNATIVE 1 (RA 1) JOB # 7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
EQUIPMENT – DOZER	6	EA	500.00	$3,000
(IN or FRONT END LOADER	2	EA	500.00	1,000
OUT) DUMP TRUCKS	4	EA	250.00	1,000
BACKHOE	2	EA	500.00	1,000
WATER TRUCK	4	EA	250.00	1,000
SHEEPSFOOT ROLLER	4	EA	500.00	2,000
OFFICE TRAILER	5	MON	150.00	750
STORAGE TRAILER	5	MON	150.00	750
TRAILER SET–UP & DELIVERY, REMOVAL	2	EA	300.00	600
TOILET (2 EA* 5 MON/EA*4.2 WK/MON)	42	WK	25.00	1,050
WATER CLR (2EA*5MON/EA*4.2WK/MON)	42	WK	25.00	1,050
WATER (42 WK * 5 DAY/WK)	210	DAY	15.00	3,150
TELEPHONE SERVICE	5	MON	500.00	2,500
ELECTRICAL HOOK–UP	1	LS	5000.00	5,000
ELECTRICAL POWER	5	MON	100.00	500
PICK–UP (2 EA * 5 MON/EA)	10	MON	1000.00	10,000
OFFICE EQUIPMENT	5	MON	1000.00	5,000
WATER TRUCK & DRIVER (2 EA)	10	MON	13500.00	135,000
PUMPS, TOOLS MINOR EQUIPMENT	1	LS	5000.00	5,000
GRADE CONTRACTOR'S AREA	1	AC	3000.00	3,000
PAVE CONTRACTOR'S AREA				
6" GRAVEL BASE	4840	SY	3.00	14,520
6" 3/4" STONE	4840	SY	5.50	26,620
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	29.50	4,720
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	37.50	6,000
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	41.00	6,560
SITE SUPERINTENDANT (5 MON*210 HR/MON)	1050	MNHR	60.00	63,000
FOREMAN (5 MON * 210 HR/MON)	1050	MNHR	50.00	52,500
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	21,000
UNDEVELOPED DESIGN DETAILS ~20%				75,730
TOTAL MOB/DEMOB				$453,000

PROJECT: OU1 – ALTERNATIVE 1 (RA 1) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
SUBGRADE FILL (135,000 CY – CONTAMINATED SOIL PLACED IN LANDFILL)				
SUPPLY & DELIVER FROM OFF-SITE SOURCE	135000	CY	4.25	$573,750
SPREAD & COMPACT (INCL CONT SOIL)	135000	CY	0.80	108,000
GAS RELIEF RISERS	23	EA	500.00	11,500
UNDEVELOPED DESIGN DETAILS ~20%				138,750
TOTAL SUBGRADE FILL				$832,000
30 MIL PVC GEOMEMBRANE LINER				
FURNISH AND INSTALL 30 MIL PVC GEOMEMBRANE LINER	250470	SF	0.30	$75,141
UNDEVELOPED DESIGN DETAILS ~20%				14,859
TOTAL 30 MIL PVC GEOMEMBRANE LINER				$90,000
COMMON FILL LAYER				
COMMON FILL – 18" THICK	55800	CY	4.25	$237,150
SPREAD & COMPACT	55800	CY	0.80	44,640
UNDEVELOPED DESIGN DETAILS ~20%				56,210
TOTAL COMMON BORROW LAYER				$338,000
VEGETATIVE LAYER				
VEGETATIVE LAYER	18600	CY	7.00	$130,200
SPREAD & COMPACT	18600	CY	0.80	14,880
SEED, FERTILIZE, MULCH	23	AC	2500.00	57,500
UNDEVELOPED DESIGN DETAILS ~20%				40,420
TOTAL VEGETATIVE LAYER				$243,000

PROJECT: OU1 – ALTERNATIVE 1 (RA 1) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DETENTION BASIN				
CLEAR AND GRUB	1.15	AC	6000.00	$6,900
BASIN EXCAVATION	4650	CY	2.00	9,300
LOAD & HAUL 2 MILE	3845	CY	4.50	17,303
SPREAD & COMPACT FOR BERM	805	CY	3.50	2,818
6" SAND BUFFER LAYER	850	SY	4.25	3,613
40 MIL HDPE LINER	5050	SY	5.00	25,250
4" LOAM	2130	SY	7.00	14,910
SEED, FERTILIZE, MULCH	2130	SY	0.50	1,065
OUTLET STRUCTURE				
EXCAVATION	27	CY	5.00	135
BACKFILL OR SPOIL	27	CY	5.00	135
CONCRETE BASE SLAB	5	CY	300.00	1,500
WALLS	5	CY	400.00	2,000
ELEVATED SLAB	2	CY	600.00	1,200
1.5" GRATING	4	SF	50.00	200
24" DIA RCP	8	LF	35.00	280
3'x5' BOX CULVERT	50	LF	150.00	7,500
RIPRAP EROSION CONTROL	70	CY	50.00	3,500
UNDEVELOPED DESIGN DETAILS ~20%				19,393
TOTAL DETENTION BASIN				$117,000

PROJECT: OU1 – ALTERNATIVE 1 (RA 1) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL MOB/DEMOB				$453,000
TOTAL SUBGRADE FILL				832,000
TOTAL 30 MIL PVC GEOMEMBRANE LINER				90,000
TOTAL COMMON BORROW LAYER				338,000
TOTAL VEGETATIVE LAYER				243,000
TOTAL DETENTION BASIN				117,000
TOTAL A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)				$2,073,000

PROJECT: OU1 – ALTERNATIVE 1 (RA 1) JOB #7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USAGE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
INSTITUTIONAL CONTROLS	1	LS	20000.00	$20,000

PROJECT: OU1 – ALTERNATIVE 1 (RA 1) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

ANNUAL OPERATION & MAINTENANCE COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
MOWING	1	EVENT	2000.00	$2,000
PERODIC INSPECTION & MAINTENANCE	4	EVENT	750.00	3,000
5–YEAR SITE REVIEW	0.1810	YR	20000.00	3,619
QUARTERLY MONITORING FOR GROUNDWATER AND SURFACE WATER	4	QTR	13000.00	52,000
UNDEVELOPED DESIGN DETAILS ~20%				12,381
TOTAL ANNUAL O&M COSTS				$73,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM (25% OF LANDFILL AREA)				$2,073,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				N/A
D1 – INTRINSIC BIOREMEDIATION				N/A
D2 – NUTRIENT INFILTRATION				N/A
D3 – GROUNDWATER COLLECTION				60,000
D4 – CREEK COLLECTION SYSTEM (CONTINGENCY IN YEAR 3)				N/A
D5 – ON–SITE TREATMENT SYSTEM				186,000
D6 – SURFACE WATER DISCHARGE				14,000
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				N/A
				$2,353,000
INDIRECT COSTS				
HEALTH AND SAFETY		5.0%	$2,353,000	$118,000
LEGAL, ADMIN, PERMITTING		5.0%	$2,353,000	118,000
ENGINEERING		10.0%	$2,742,000	274,000
SERVICES DURING CONSTRUCTION		10.0%	$2,353,000	235,000
TOTAL INDIRECT COSTS				$745,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$3,098,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
TOTAL LANDFILL: 30 YEARS @ 5%			$73,000	$1,122,000
TOTAL GROUNDWATER: 30 YEARS @ 5%			$55,000	$845,000
TOTAL OPERATING & MAINTENANCE COSTS				$1,967,000
TOTAL COSTS OF ALT 2				$5,065,000
CONTIGENCY ITEM D4 IN YEAR 3 INCL INDIRECT COSTS LESS ENGINEERING				$423,000
TOTAL COSTS OF ALT 2 INCLUDING CONTINGENCY ITEMS				$5,488,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB # 7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
EQUIPMENT – DOZER	6	EA	500.00	$3,000
(IN or FRONT END LOADER	2	EA	500.00	1,000
OUT) DUMP TRUCKS	4	EA	250.00	1,000
BACKHOE	2	EA	500.00	1,000
WATER TRUCK	4	EA	250.00	1,000
SHEEPSFOOT ROLLER	4	EA	500.00	2,000
OFFICE TRAILER	5	MON	150.00	750
STORAGE TRAILER	5	MON	150.00	750
TRAILER SET–UP & DELIVERY, REMOVAL	2	EA	300.00	600
TOILET (2 EA* 5 MON/EA*4.2 WK/MON)	42	WK	25.00	1,050
WATER CLR (2EA*5MON/EA*4.2WK/MON)	42	WK	25.00	1,050
WATER (42 WK * 5 DAY/WK)	210	DAY	15.00	3,150
TELEPHONE SERVICE	5	MON	500.00	2,500
ELECTRICAL HOOK–UP	1	LS	5000.00	5,000
ELECTRICAL POWER	5	MON	100.00	500
PICK–UP (2 EA * 5 MON/EA)	10	MON	1000.00	10,000
OFFICE EQUIPMENT	5	MON	1000.00	5,000
WATER TRUCK & DRIVER (2 EA)	10	MON	13500.00	135,000
PUMPS, TOOLS MINOR EQUIPMENT	1	LS	5000.00	5,000
GRADE CONTRACTOR'S AREA	1	AC	3000.00	3,000
PAVE CONTRACTOR'S AREA				
6" GRAVEL BASE	4840	SY	3.00	14,520
6" 3/4" STONE	4840	SY	5.50	26,620
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	29.50	4,720
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	37.50	6,000
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	41.00	6,560
SITE SUPERINTENDANT (5 MON*210 HR/MON)	1050	MNHR	60.00	63,000
FOREMAN (5 MON * 210 HR/MON)	1050	MNHR	50.00	52,500
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	21,000
UNDEVELOPED DESIGN DETAILS ~20%				75,730
TOTAL MOB/DEMOB				$453,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

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SPREAD & COMPACT (INCL CONT SOIL)	135000	CY	0.80	108,000
GAS RELIEF RISERS	23	EA	500.00	11,500
UNDEVELOPED DESIGN DETAILS ~20%				138,750
TOTAL SUBGRADE FILL				$832,000
30 MIL PVC GEOMEMBRANE LINER				
FURNISH AND INSTALL 30 MIL PVC GEOMEMBRANE LINER	250470	SF	0.30	$75,141
UNDEVELOPED DESIGN DETAILS ~20%				14,85[illegible]
TOTAL 30 MIL PVC GEOMEMBRANE LINER				$90,000
COMMON FILL LAYER				
COMMON FILL – 18" THICK	55800	CY	4.25	$237,150
SPREAD & COMPACT	55800	CY	0.80	44,640
UNDEVELOPED DESIGN DETAILS ~20%				56,210
TOTAL COMMON BORROW LAYER				$338,000
VEGETATIVE LAYER				
VEGETATIVE LAYER	18600	CY	7.00	$130,200
SPREAD & COMPACT	18600	CY	0.80	14,880
SEED, FERTILIZE, MULCH	23	AC	2500.00	57,500
UNDEVELOPED DESIGN DETAILS ~20%				40,420
TOTAL VEGETATIVE LAYER				$243,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DETENTION BASIN				
CLEAR AND GRUB	1.15	AC	6000.00	$6,900
BASIN EXCAVATION	4650	CY	2.00	9,300
LOAD & HAUL 2 MILE	3845	CY	4.50	17,303
SPREAD & COMPACT FOR BERM	805	CY	3.50	2,818
6" SAND BUFFER LAYER	850	SY	4.25	3,613
40 MIL HDPE LINER	5050	SY	5.00	25,250
4" LOAM	2130	SY	7.00	14,910
SEED, FERTILIZE, MULCH	2130	SY	0.50	1,065
OUTLET STRUCTURE				
EXCAVATION	27	CY	5.00	135
BACKFILL OR SPOIL	27	CY	5.00	135
CONCRETE BASE SLAB	5	CY	300.00	1,500
WALLS	5	CY	400.00	2,000
ELEVATED SLAB	2	CY	600.00	1,200
1.5" GRATING	4	SF	50.00	200
24" DIA RCP	8	LF	35.00	280
3'x5' BOX CULVERT	50	LF	150.00	7,500
RIPRAP EROSION CONTROL	70	CY	50.00	3,500
UNDEVELOPED DESIGN DETAILS ~20%				19,393
TOTAL DETENTION BASIN				$117,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL MOB/DEMOB				$453,000
TOTAL SUBGRADE FILL				832,000
TOTAL 30 MIL PVC GEOMEMBRANE LINER				90,000
TOTAL COMMON BORROW LAYER				338,000
TOTAL VEGETATIVE LAYER				243,000
TOTAL DETENTION BASIN				117,000
TOTAL A1 – 30 MIL PVC GEOMEMBRANE LINER				$2,073,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB # 7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D3 – GROUNDWATER COLLECTION

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
INSTALL 3 WELLS	300	LF	100.00	$30,000
MOBILIZATION	1	LS	10000.00	10,000
FORCE MAIN TO TREATMENT PLANT	200	LF	25.00	5,000
POWER & INSTRUMENTATION CIRCUITS	500	LF	10.00	5,000
UNDEVELOPED DESIGN DETAILS ~20%				10,000
TOTAL D3 – GROUNDWATER COLLECTION TRENCH				$60,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D4 – CREEK COLLECTION SYSTEM

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB CREEK	2800	LF	2.00	$5,600
EXCAVATION OF CONTAMINATED SEDIMENT & OFF–SITE DISPOSAL (2800'x8'=800 CY)				
DOZER & OPERATOR	5	DAY	1600.00	8,000
FRONT END LOADER & OPERATOR	5	DAY	1500.00	7,500
LABORER (2 EA)	10	DAY	250.00	2,500
22 CY DUMP TRUCK & DRIVER (2 EA)	10	DAY	1300.00	13,000
OFF–SITE DISPOSAL	800	CY	200.00	160,000
NON WOVEN GEOTEXTILE (2800'x4')	22400	SF	0.20	4,480
MIRADRAIN	11200	SF	2.00	22,400
3/4" CRUSHED STONE ~6" THICK	200	CY	50.00	10,000
GCL (2800'x8')	22400	SF	2.00	44,800
6" LOAM	22400	SF	0.50	11,200
COLLECTION SUMP & PUMP STATION	1	LS	25000.00	25,000
FORCE MAIN	200	LF	25.00	5,000
POWER & INSTRUMENTATION CIRCUITS	500	LF	10.00	5,000
UNDEVELOPED DESIGN DETAILS ~20%				64,520
TOTAL D4 – CREEK COLLECTION SYSTEM				$389,000

(CONTINGENCY COST ADDED IN YEAR 3 IF REQUIRED)

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB #7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D5 – ON-SITE LEACHATE TREATMENT SYSTEM

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TREATMENT BUILDING – COMPLETE	1000	SF	75.00	$75,000
POWER SUPPLY	500	LF	10.00	5,000
WATER SERVICE	500	LF	25.00	12,500
TREATMENT EQUIPMENT				
WELL PUMPS	3	EA	5000.00	15,000
EQUALIZATION TANK	1	LS	600.00	600
EQUALIZATION TANK MIXER	1	EA	300.00	300
PACKAGE FLOCULATOR/CLARIFIER	1	EA	14000.00	14,000
GAC FILTER	1	EA	1200.00	1,200
GAC FILTER FEED TANK	1	EA	600.00	600
GAC FILTER FEED PUMP	2	EA	1000.00	2,000
SLUDGE PUMP	1	EA	400.00	400
CHEMICAL MAKE-UP TANK, MIXER, PUMP	2	LS	1000.00	2,000
AIR COMPRESSOR	1	LS	600.00	600
ELECTRICAL DISTRIBUTION EQUIPMENT	1	LS	5000.00	5,000
POWER CIRCUITS	400	LF	10.00	4,000
CONTROL PANEL	1	LS	5000.00	5,000
CONTROL CIRCUITS	400	LF	7.50	3,000
PROCESS PIPING, FITTINGS, VALVES	1	LS	7000.00	7,000
UTILITY PIPING, FITTINGS, VALVES	1	LS	2000.00	2,000
UNDEVELOPED DESIGN DETAILS ~20%				30,800
TOTAL D5 – ON-SITE LEACHATE TREATMENT SYSTEM				$186,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB # 7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D6 – SURFACE WATER DISCHARGE TO UNNAMED CREEK

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
12" DIA GRAVITY DISCHARGE PIPE	200	LF	30.00	$6,000
MANHOLE	1	LS	3000.00	3,000
HEADWALL	1	LS	2500.00	2,500
UNDEVELOPED DESIGN DETAILS ~20%				2,500
TOTAL D6 – SURFACE WATER DISCHARGE TO UNNAMED CREEK				$14,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USAGE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
INSTITUTIONAL CONTROLS	1	LS	20000.00	$20,000

PROJECT: OU1 – ALTERNATIVE 2 (RA 2) JOB # 7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

ANNUAL OPERATION & MAINTENANCE COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
ANNUAL LANDFILL POST CLOSURE CARE & MONITORING				
MOWING	1	EVENT	2000.00	$2,000
PERODIC INSPECTION & MAINTENANCE	4	EVENT	750.00	3,000
5–YEAR SITE REVIEW	0.1810	YR	20000.0000	3,619
SURFACE WATER & GROUNDWATER MONITORING	4	QTR	13000.00	52,000
UNDEVELOPED DESIGN DETAILS ~20%				12,381
TOTAL ANNUAL LANDFILL POST CLOSURE CARE & MONITORING				$73,000
ANNUAL GROUNDWATER OPERATION & MAINTENANCE				
GROUNDWATER TREATMENT O&M				
POLYMER	1	LS	600.00	$600
SLUDGE DISPOSAL	1	LS	25200.00	25,200
CARBON REPLACEMENT	1	LS	360.00	360
KMnO4	1	LS	100.00	100
ELECTRICITY	35040	KWHR	0.0750	2,628
SAMPLING & ANALYSIS	1	LS	2000.00	2,000
LABOR	416	HR	35.00	14,560
UNDEVELOPED DESIGN DETAILS ~20%				9,552
TOTAL ANNUAL GROUNDWATER OPERATION & MAINTENANCE				$55,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB # 7565-26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM (25% OF LANDFILL AREA)				$2,017,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				228,000
D1 – INTRINSIC BIOREMEDIATION				N/A
D2 – NUTRIENT INFILTRATION				N/A
D3 – GROUNDWATER COLLECTION				N/A
D4 – CREEK COLLECTION SYSTEM				N/A
D5 – ON-SITE TREATMENT SYSTEM				N/A
D6 – SURFACE WATER DISCHARGE				N/A
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				59,000
				$2,324,000
INDIRECT COSTS				
HEALTH AND SAFETY		5.0%	$2,324,000	$116,000
LEGAL, ADMIN, PERMITTING		5.0%	$2,324,000	116,000
ENGINEERING		10.0%	$2,996,000	300,000
SERVICES DURING CONSTRUCTION		10.0%	$2,324,000	232,000
TOTAL INDIRECT COSTS				$764,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$3,088,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
TOTAL LANDFILL: 30 YEARS @ 5%			$73,000	$1,122,000
TOTAL COSTS OF ALT 3				$4,210,000

PROJECT: OU1 – ALTERNATIVE 3A (RA 3) JOB #7565–26
BASELINE ALTERNATIVE 3 + CONTINGENCY ITEMS D4, D5, & D6 IN YEAR 3
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM (25% OF LANDFILL AREA)				$2,017,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				228,000
D1 – INTRINSIC BIOREMEDIATION				N/A
D2 – NUTRIENT INFILTRATION				N/A
D3 – GROUNDWATER COLLECTION				N/A
D4 – CREEK COLLECTION SYSTEM (CONTINGENCY IN YEAR 3)				N/A
D5 – ON–SITE TREATMENT SYSTEM (CONTINGENCY IN YEAR 3)				N/A
D6 – SURFACE WATER DISCHARGE (CONTINGENCY IN YEAR 3)				N/A
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				59,000
				$2,324,000
INDIRECT COSTS				
HEALTH AND SAFETY		5.0%	$2,324,000	$116,000
LEGAL, ADMIN, PERMITTING		5.0%	$2,324,000	116,000
ENGINEERING		10.0%	$2,996,000	300,000
SERVICES DURING CONSTRUCTION		10.0%	$2,324,000	232,000
TOTAL INDIRECT COSTS				$764,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$3,088,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
TOTAL LANDFILL: 30 YEARS @ 5%			$73,000	$1,122,000
TOTAL COSTS OF ALT 3				$4,210,000
CONTINGENCY ITEMS D4, D5, & D6 IN YEAR 3 INCL INDIRECT COSTS LESS ENGINEERING				$731,000
TOTAL GROUNDWATER O&M: YEARS 3 – 30 @ 5%			$109,000	$1,473,000
TOTAL COSTS OF ALT 3 INCLUDING CONTIGENCY ITEMS D4, D5, D6				$6,414,000

PROJECT: OU1 – ALTERNATIVE 3B (RA 3) JOB #7565–26
BASELINE ALTERNATIVE 3 + CONTINGENCY ITEMS D2 AFTER YEAR 5 REVIEW
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM (25% OF LANDFILL AREA)				$2,017,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				228,000
D1 – INTRINSIC BIOREMEDIATION				N/A
D2 – NUTRIENT INFILTRATION (CONTINGENCY AFTER YEAR 5 REVIEW)				N/A
D3 – GROUNDWATER COLLECTION				N/A
D4 – CREEK COLLECTION SYSTEM				N/A
D5 – ON–SITE TREATMENT SYSTEM				N/A
D6 – SURFACE WATER DISCHARGE				N/A
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				59,000
				$2,324,000
INDIRECT COSTS				
HEALTH AND SAFETY		5.0%	$2,324,000	$116,000
LEGAL, ADMIN, PERMITTING		5.0%	$2,324,000	116,000
ENGINEERING		10.0%	$3,367,000	337,000
SERVICES DURING CONSTRUCTION		10.0%	$2,324,000	232,000
TOTAL INDIRECT COSTS				$801,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$3,125,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
TOTAL LANDFILL: 30 YEARS @ 5%			$73,000	$1,122,000
TOTAL COSTS OF ALT 3				$4,247,000
CONTINGENCY ITEMS D2 YEAR 5 INCL INDIRECT COSTS LESS ENGINEERING				$981,000
TOTAL GROUNDWATER O&M: YEARS 6 – 17 @ 5%			$38,000	$264,000
TOTAL COSTS OF ALT 3 INCLUDING CONTIGENCY ITEM D2				$5,492,000

PROJECT: OU1 – ALTERNATIVE 3C (RA 3) JOB #7565–26
BASELINE ALTERNATIVE 3 + CONTINGENCY ITEMS D2, D4, D5, & D6 IN YEAR 3
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM (25% OF LANDFILL AREA)				$2,017,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				228,000
D1 – INTRINSIC BIOREMEDIATION				N/A
D2 – NUTRIENT INFILTRATION (CONTINGENCY AFTER YEAR 5 REVIEW)				N/A
D3 – GROUNDWATER COLLECTION				N/A
D4 – CREEK COLLECTION SYSTEM (CONTINGENCY IN YEAR 3)				N/A
D5 – ON–SITE TREATMENT SYSTEM (CONTINGENCY IN YEAR 3)				N/A
D6 – SURFACE WATER DISCHARGE (CONTINGENCY IN YEAR 3)				N/A
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				59,000
				$2,324,000
INDIRECT COSTS				
HEALTH AND SAFETY		5.0%	$2,324,000	$116,000
LEGAL, ADMIN, PERMITTING		5.0%	$2,324,000	116,000
ENGINEERING		10.0%	$4,039,000	404,000
SERVICES DURING CONSTRUCTION		10.0%	$2,324,000	232,000
TOTAL INDIRECT COSTS				$868,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$3,192,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
TOTAL LANDFILL: 30 YEARS @ 5%			$73,000	$1,122,000
TOTAL COSTS OF ALT 3				$4,314,000
CONTINGENCY ITEMS D4, D5, & D6 IN YEAR 3 INCL INDIRECT COSTS LESS ENGINEERING				$731,000
CONTINGENCY ITEMS D2 AFTER YEAR 5 REVIEW INCL INDIRECT COSTS LESS ENGINEERING				$981,000
TOTAL D4, D5, D6 O&M: YEARS 3 – 17 @ 5%			$109,000	$1,026,000
TOTAL D2 O&M: YEARS 6 – 17 @ 5%			$38,000	$264,000
TOTAL COSTS OF ALT 3 INCLUDING CONTIGENCY ITEMS D2, D4, D5, D6				$7,316,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB # 7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
EQUIPMENT – DOZER	6	EA	500.00	$3,000
(IN or FRONT END LOADER	2	EA	500.00	1,000
OUT) DUMP TRUCKS	4	EA	250.00	1,000
BACKHOE	2	EA	500.00	1,000
WATER TRUCK	4	EA	250.00	1,000
SHEEPSFOOT ROLLER	4	EA	500.00	2,000
OFFICE TRAILER	5	MON	150.00	750
STORAGE TRAILER	5	MON	150.00	750
TRAILER SET–UP & DELIVERY, REMOVAL	2	EA	300.00	600
TOILET (2 EA* 5 MON/EA*4.2 WK/MON)	42	WK	25.00	1,050
WATER CLR (2EA*5MON/EA*4.2WK/MON)	42	WK	25.00	1,050
WATER (42 WK * 5 DAY/WK)	210	DAY	15.00	3,150
TELEPHONE SERVICE	5	MON	500.00	2,500
ELECTRICAL HOOK–UP	1	LS	5000.00	5,000
ELECTRICAL POWER	5	MON	100.00	500
PICK–UP (2 EA * 5 MON/EA)	10	MON	1000.00	10,000
OFFICE EQUIPMENT	5	MON	1000.00	5,000
WATER TRUCK & DRIVER (2 EA)	10	MON	13500.00	135,000
PUMPS, TOOLS MINOR EQUIPMENT	1	LS	5000.00	5,000
GRADE CONTRACTOR'S AREA	1	AC	3000.00	3,000
PAVE CONTRACTOR'S AREA				
6" GRAVEL BASE	4840	SY	3.00	14,520
6" 3/4" STONE	4840	SY	5.50	26,620
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	29.50	4,720
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	37.50	6,000
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	41.00	6,560
SITE SUPERINTENDANT (5 MON*210 HR/MON)	1050	MNHR	60.00	63,000
FOREMAN (5 MON * 210 HR/MON)	1050	MNHR	50.00	52,500
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	21,000
UNDEVELOPED DESIGN DETAILS ~20%				75,730
TOTAL MOB/DEMOB				$453,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB # 7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
SUBGRADE FILL (135,000 CY – CONTAMINATED SOIL PLACED IN LANDFILL)				
SUPPLY & DELIVER FROM OFF–SITE SOURCE	124100	CY	4.25	$527,425
SPREAD & COMPACT (INCL CONT SOIL)	135000	CY	0.80	108,000
GAS RELIEF RISERS	23	EA	500.00	11,500
UNDEVELOPED DESIGN DETAILS ~20%				129,075
TOTAL SUBGRADE FILL				$776,000
30 MIL PVC GEOMEMBRANE LINER				
FURNISH AND INSTALL 30 MIL PVC GEOMEMBRANE LINER	250470	SF	0.30	$75,141
UNDEVELOPED DESIGN DETAILS ~20%				14,85[illegible]
TOTAL 30 MIL PVC GEOMEMBRANE LINER				$90,000
COMMON FILL LAYER				
COMMON FILL – 18" THICK	55800	CY	4.25	$237,150
SPREAD & COMPACT	55800	CY	0.80	44,640
UNDEVELOPED DESIGN DETAILS ~20%				56,210
TOTAL COMMON BORROW LAYER				$338,000
VEGETATIVE LAYER				
VEGETATIVE LAYER	18600	CY	7.00	$130,200
SPREAD & COMPACT	18600	CY	0.80	14,880
SEED, FERTILIZE, MULCH	23	AC	2500.00	57,500
UNDEVELOPED DESIGN DETAILS ~20%				40,420
TOTAL VEGETATIVE LAYER				$243,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB # 7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DETENTION BASIN				
CLEAR AND GRUB	1.15	AC	6000.00	$6,900
BASIN EXCAVATION	4650	CY	2.00	9,300
LOAD & HAUL 2 MILE	3845	CY	4.50	17,303
SPREAD & COMPACT FOR BERM	805	CY	3.50	2,818
6" SAND BUFFER LAYER	850	SY	4.25	3,613
40 MIL HDPE LINER	5050	SY	5.00	25,250
4" LOAM	2130	SY	7.00	14,910
SEED, FERTILIZE, MULCH	2130	SY	0.50	1,065
OUTLET STRUCTURE				
EXCAVATION	27	CY	5.00	135
BACKFILL OR SPOIL	27	CY	5.00	135
CONCRETE BASE SLAB	5	CY	300.00	1,500
WALLS	5	CY	400.00	2,000
ELEVATED SLAB	2	CY	600.00	1,200
1.5" GRATING	4	SF	50.00	200
24" DIA RCP	8	LF	35.00	280
3'x5' BOX CULVERT	50	LF	150.00	7,500
RIPRAP EROSION CONTROL	70	CY	50.00	3,500
UNDEVELOPED DESIGN DETAILS ~20%				19,393
TOTAL DETENTION BASIN				$117,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER (25% OF LANDFILL AREA)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL MOB/DEMOB				$453,000
TOTAL SUBGRADE FILL				776,000
TOTAL 30 MIL PVC GEOMEMBRANE LINER				90,000
TOTAL COMMON BORROW LAYER				338,000
TOTAL VEGETATIVE LAYER				243,000
TOTAL DETENTION BASIN				117,000
TOTAL A1 – 30 MIL PVC GEOMEMBRANE LINER				$2,017,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

B1 – SURFACE SOIL EXCAVATION AND LANDFILLING

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB EXCAVATION AREA	6	AC	6500.00	$39,000
EXCAVATION OF CONTAMINATED SOIL & PLACEMENT IN LANDFILL				
DOZER & OPERATOR	15	DAY	1600.00	24,000
FRONT END LOADER & OPERATOR	15	DAY	1500.00	22,500
LABORER (2 EA)	30	DAY	250.00	7,500
22 CY DUMP TRUCK & DRIVER (2 EA)	30	DAY	1300.00	39,000
REPLACEMENT SOIL				
COMMON BORROW	4500	CY	4.25	19,125
VEGETATIVE SOIL	4500	CY	7.00	31,500
SPREAD & COMPACT	9000	CY	0.80	7,200
UNDEVELOPED DESIGN DETAILS ~20%				38,175
TOTAL B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				$228,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB # 7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D2 – NUTRIENT INFILTRATION

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
PILOT STUDY	1	LS	312400.00	$312,400
WORKPLAN DEVELOPMENT	1	LS	22700.00	22,700
EQUIPMENT & INSTALLATION	1	LS	396000.00	396,000
LOAD & HAUL CONTAMINATED SOIL TO LANDFILL				
FRONT END LOADER & OPERATOR	30	DAY	1500.00	45,000
LABORER (2 EA)	60	DAY	250.00	15,000
22 CY DUMP TRUCK & DRIVER (2 EA)	60	DAY	1300.00	78,000
UNDEVELOPED DESIGN DETAILS ~20%				173,900
TOTAL D2 – NUTRIENT INFILTRATION				$1,043,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565-26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D4 – CREEK COLLECTION SYSTEM

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB CREEK	2800	LF	2.00	$5,600
EXCAVATION OF CONTAMINATED SEDIMENT & OFF-SITE DISPOSAL (2800'x8'=800 CY)				
DOZER & OPERATOR	5	DAY	1600.00	8,000
FRONT END LOADER & OPERATOR	5	DAY	1500.00	7,500
LABORER (2 EA)	10	DAY	250.00	2,500
22 CY DUMP TRUCK & DRIVER (2 EA)	10	DAY	1300.00	13,000
OFF-SITE DISPOSAL	800	CY	200.00	160,000
NON WOVEN GEOTEXTILE (2800'x4')	22400	SF	0.20	4,480
MIRADRAIN	11200	SF	2.00	22,400
3/4" CRUSHED STONE ~6" THICK	200	CY	50.00	10,000
GCL (2800'x8')	22400	SF	2.00	44,800
6" LOAM	22400	SF	0.50	11,200
COLLECTION SUMP & PUMP STATION	1	LS	25000.00	25,000
FORCE MAIN	200	LF	25.00	5,000
POWER & INSTRUMENTATION CIRCUITS	500	LF	10.00	5,000
UNDEVELOPED DESIGN DETAILS ~20%				64,520
TOTAL D4 – CREEK COLLECTION SYSTEM				$389,000

(CONTINGENCY COST ADDED IN YEAR 3 IF REQUIRED)

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565-26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D5 – ON-SITE LEACHATE TREATMENT SYSTEM

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TREATMENT BUILDING – COMPLETE	1600	SF	75.00	$120,000
POWER SUPPLY	200	LF	10.00	2,000
WATER SERVICE	200	LF	25.00	5,000
TREATMENT EQUIPMENT				
TRENCH PUMPS	1	EA	2000.00	2,000
EQUALIZATION TANK	1	LS	1200.00	1,200
EQUALIZATION TANK MIXER	1	EA	600.00	600
PACKAGE FLOCULATOR/CLARIFIER	1	EA	28000.00	28,000
GAC FILTER	1	EA	2400.00	2,400
GAC FILTER FEED TANK	1	EA	1200.00	1,200
GAC FILTER FEED PUMP	2	EA	2000.00	4,000
SLUDGE PUMP	1	EA	800.00	800
CHEMICAL MAKE-UP TANK, MIXER, PUMP	2	LS	2000.00	4,00
AIR COMPRESSOR	1	LS	1200.00	1,20
ELECTRICAL DISTRIBUTION EQUIPMENT	1	LS	10000.00	10,000
POWER CIRCUITS	800	LF	10.00	8,000
CONTROL PANEL	1	LS	10000.00	10,000
CONTROL CIRCUITS	800	LF	7.50	6,000
PROCESS PIPING, FITTINGS, VALVES	1	LS	14000.00	14,000
UTILITY PIPING, FITTINGS, VALVES	1	LS	4000.00	4,000
UNDEVELOPED DESIGN DETAILS ~20%				44,600
TOTAL D5 – ON-SITE LEACHATE TREATMENT SYSTEM				$269,000

(CONTINGENCY COST ADDED IN YEAR 3 IF REQUIRED)

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D6 – SURFACE WATER DISCHARGE TO UNNAMED CREEK

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
12" DIA GRAVITY DISCHARGE PIPE	200	LF	30.00	$6,000
MANHOLE	1	LS	3000.00	3,000
HEADWALL	1	LS	2500.00	2,500
UNDEVELOPED DESIGN DETAILS ~20%				2,500
TOTAL D6 – SURFACE WATER DISCHARGE TO UNNAMED CREEK				$14,000

(CONTINGENCY COST ADDED IN YEAR 3 IF REQUIRED)

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565–26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USAGE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
INSTITUTIONAL CONTROLS	1	LS	20000.00	$20,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3)
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)

JOB #7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E2 – SEDIMENT EXCAVATION AND PLACEMENT IN LANDFILL PRIOR TO CAPPING

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB EXCAVATION AREA	2350	LF	2.00	$4,700
EXCAVATION OF CONTAMINATED SOIL & PLACEMENT IN LANDFILL				
DOZER & OPERATOR	6	DAY	1600.00	9,600
FRONT END LOADER & OPERATOR	6	DAY	1500.00	9,000
LABORER (2 EA)	12	DAY	250.00	3,000
22 CY DUMP TRUCK & DRIVER (2 EA)	12	DAY	1300.00	15,600
REPLACEMENT SOIL – VEGETATIVE	900	CY	7.00	6,300
SPREAD & COMPACT	900	CY	0.80	720
UNDEVELOPED DESIGN DETAILS ~20%				10,080
TOTAL E2 – SEDIMENT EXCAVATION AND PLACEMENT IN LANDFILL PRIOR TO CAPPING				$59,000

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565-26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

ANNUAL OPERATION & MAINTENANCE COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
ANNUAL LANDFILL POST CLOSURE CARE & MONITORING				
MOWING	1	EVENT	2000.00	$2,000
PERODIC INSPECTION & MAINTENANCE	4	EVENT	750.00	3,000
5-YEAR SITE REVIEW	0.1810	YR	20000.0000	3,619
GROUNDWATER & SURFACE WATER MONITORING	4	QTR	13000.00	52,000
UNDEVELOPED DESIGN DETAILS ~20%				12,381
TOTAL ANNUAL LANDFILL POST CLOSURE CARE & MONITORING				$73,000
ANNUAL GROUNDWATER OPERATION & MAINTENANCE				
GROUNDWATER TREATMENT O&M				
POLYMER	1	LS	1200.00	$1,200
SLUDGE DISPOSAL	1	LS	50400.00	50,400
CARBON REPLACEMENT	1	LS	720.00	720
KMnO4	1	LS	200.00	200
ELECTRICITY	70080	KWHR	0.0750	5,256
SAMPLING & ANALYSIS	1	LS	4000.00	4,000
LABOR	832	HR	35.00	29,120
UNDEVELOPED DESIGN DETAILS ~20%				18,104
TOTAL ANNUAL GROUNDWATER OPERATION & MAINTENANCE				$109,000

(CONTINGENCY COST ADDED IN YEAR 3 IF REQUIRED)

PROJECT: OU1 – ALTERNATIVE 3 (RA 3) JOB #7565-26
BASELINE ALTERNATIVE 3 (NO CONTINGENCIES)
LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

ANNUAL OPERATION & MAINTENANCE COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
ANNUAL GROUNDWATER OPERATION & MAINTENANCE				
NUTRIENT INFILTRATION	1	YR	31600.00	$31,600
UNDEVELOPED DESIGN DETAILS ~20%				6,400
TOTAL ANNUAL GROUNDWATER OPERATION & MAINTENANCE COSTS				$38,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM				$2,010,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				228,000
D2 – NUTRIENT INFILTRATION				1,043,000
D3 – GROUNDWATER COLLECTION				N/A
D4 – CREEK COLLECTION SYSTEM				N/A
D5 – ON–SITE TREATMENT SYSTEM				N/A
D6 – SURFACE WATER DISCHARGE				N/A
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				59,000
				$3,360,000
INDIRECT COSTS				
HEALTH AND SAFETY			5.00%	$168,000
LEGAL, ADMIN, PERMITTING			5.00%	168,000
ENGINEERING			10.00%	336,000
SERVICES DURING CONSTRUCTION			10.00%	336,000
TOTAL INDIRECT COSTS				$1,008,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$4,368,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
LANDFILL: YEARS 1 – 30 @ 5%			$73,000	$1,122,000
GROUNDWATER: YEARS 1 – 12 @ 5%			$38,000	$337,000
TOTAL PRESENT WORTH OF O&M COSTS				$1,459,000
TOTAL COSTS OF ALT 4				$5,827,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
EQUIPMENT – DOZER	6	EA	500.00	$3,000
(IN or FRONT END LOADER	2	EA	500.00	1,000
OUT) DUMP TRUCKS	4	EA	250.00	1,000
BACKHOE	2	EA	500.00	1,000
WATER TRUCK	4	EA	250.00	1,000
SHEEPSFOOT ROLLER	4	EA	500.00	2,000
OFFICE TRAILER	5	MON	150.00	750
STORAGE TRAILER	5	MON	150.00	750
TRAILER SET–UP & DELIVERY, REMOVAL	2	EA	300.00	600
TOILET (2 EA* 5 MON/EA*4.2 WK/MON)	42	WK	25.00	1,050
WATER CLR (2EA*5MON/EA*4.2WK/MON)	42	WK	25.00	1,050
WATER (42 WK * 5 DAY/WK)	210	DAY	15.00	3,150
TELEPHONE SERVICE	5	MON	500.00	2,500
ELECTRICAL HOOK–UP	1	LS	5000.00	5,000
ELECTRICAL POWER	5	MON	100.00	500
PICK–UP (2 EA * 5 MON/EA)	10	MON	1000.00	10,000
OFFICE EQUIPMENT	5	MON	1000.00	5,000
WATER TRUCK & DRIVER (2 EA)	10	MON	13500.00	135,000
PUMPS, TOOLS MINOR EQUIPMENT	1	LS	5000.00	5,000
GRADE CONTRACTOR'S AREA	1	AC	3000.00	3,000
PAVE CONTRACTOR'S AREA				
6" GRAVEL BASE	4840	SY	3.00	14,520
6" 3/4" STONE	4840	SY	5.50	26,620
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	29.50	4,720
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	37.50	6,000
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	41.00	6,560.
SITE SUPERINTENDANT (5 MON*210 HR/MON)	1050	MNHR	60.00	63,000
FOREMAN (5 MON * 210 HR/MON)	1050	MNHR	50.00	52,500
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	21,000
UNDEVELOPED DESIGN DETAILS ~20%				75,730
TOTAL MOB/DEMOB				$453,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
SUBGRADE FILL (135,000 CY – CONTAMINATED SOIL PLACED IN LANDFILL)				
SUPPLY & DELIVER FROM OFF-SITE SOURCE	122600	CY	4.25	$521,050
SPREAD & COMPACT (INCL CONT SOIL)	135000	CY	0.80	108,000
GAS RELIEF RISERS	23	EA	500.00	11,500
UNDEVELOPED DESIGN DETAILS ~20%				128,450
TOTAL SUBGRADE FILL				$769,000
30 MIL PVC GEOMEMBRANE LINER				
FURNISH AND INSTALL 30 MIL PVC GEOMEMBRANE LINER	250470	SF	0.30	$75,141
UNDEVELOPED DESIGN DETAILS ~20%				14,859
TOTAL 30 MIL PVC GEOMEMBRANE LINER				$90,000
COMMON FILL LAYER				
COMMON FILL – 18" THICK	55800	CY	4.25	$237,150
SPREAD & COMPACT	55800	CY	0.80	44,640
UNDEVELOPED DESIGN DETAILS ~20%				56,210
TOTAL COMMON BORROW LAYER				$338,000
VEGETATIVE LAYER				
VEGETATIVE LAYER	18600	CY	7.00	$130,200
SPREAD & COMPACT	18600	CY	0.80	14,880
SEED, FERTILIZE, MULCH	23	AC	2500.00	57,500
UNDEVELOPED DESIGN DETAILS ~20%				40,420
TOTAL VEGETATIVE LAYER				$243,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DETENTION BASIN				
CLEAR AND GRUB	1.15	AC	6000.00	$6,900
BASIN EXCAVATION	4650	CY	2.00	9,300
LOAD & HAUL 2 MILE	3845	CY	4.50	17,303
SPREAD & COMPACT FOR BERM	805	CY	3.50	2,818
6" SAND BUFFER LAYER	850	SY	4.25	3,613
40 MIL HDPE LINER	5050	SY	5.00	25,250
4" LOAM	2130	SY	7.00	14,910
SEED, FERTILIZE, MULCH	2130	SY	0.50	1,065
OUTLET STRUCTURE				
EXCAVATION	27	CY	5.00	135
BACKFILL OR SPOIL	27	CY	5.00	135
CONCRETE BASE SLAB	5	CY	300.00	1,500
WALLS	5	CY	400.00	2,000
ELEVATED SLAB	2	CY	600.00	1,200
1.5" GRATING	4	SF	50.00	200
24" DIA RCP	8	LF	35.00	280
3'x5' BOX CULVERT	50	LF	150.00	7,500
RIPRAP EROSION CONTROL	70	CY	50.00	3,500
UNDEVELOPED DESIGN DETAILS ~20%				19,393
TOTAL DETENTION BASIN				$117,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL MOB/DEMOB				$453,000
TOTAL SUBGRADE FILL				769,000
TOTAL 30 MIL PVC GEOMEMBRANE LINER				90,000
TOTAL COMMON BORROW LAYER				338,000
TOTAL VEGETATIVE LAYER				243,000
TOTAL DETENTION BASIN				117,000
TOTAL A1 – 30 MIL PVC GEOMEMBRANE LINER				$2,010,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB # 7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

B1 – SURFACE SOIL EXCAVATION AND LANDFILLING

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB EXCAVATION AREA	6	AC	6500.00	$39,000
EXCAVATION OF CONTAMINATED SOIL & PLACEMENT IN LANDFILL				
DOZER & OPERATOR	15	DAY	1600.00	24,000
FRONT END LOADER & OPERATOR	15	DAY	1500.00	22,500
LABORER (2 EA)	30	DAY	250.00	7,500
22 CY DUMP TRUCK & DRIVER (2 EA)	30	DAY	1300.00	39,000
REPLACEMENT SOIL				
COMMON BORROW	4500	CY	4.25	19,125
VEGETATIVE SOIL	4500	CY	7.00	31,500
SPREAD & COMPACT	9000	CY	0.80	7,200
UNDEVELOPED DESIGN DETAILS ~20%				38,175
TOTAL B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				$228,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D2 – NUTRIENT INFILTRATION

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
PILOT STUDY	1	LS	312400.00	$312,400
WORKPLAN DEVELOPMENT	1	LS	22700.00	22,700
EQUIPMENT & INSTALLATION	1	LS	396000.00	396,000
LOAD & HAUL CONTAMINATED SOIL TO LANDFILL				
FRONT END LOADER & OPERATOR	30	DAY	1500.00	45,000
LABORER (2 EA)	60	DAY	250.00	15,000
22 CY DUMP TRUCK & DRIVER (2 EA)	60	DAY	1300.00	78,000
UNDEVELOPED DESIGN DETAILS ~20%				173,900
TOTAL D2 – NUTRIENT INFILTRATION				$1,043,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USAGE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
INSTITUTIONAL CONTROLS	1	LS	20000.00	$20,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E2 – SEDIMENT EXCAVATION AND PLACEMENT IN LANDFILL PRIOR TO CAPPING

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB EXCAVATION AREA	2350	LF	2.00	$4,700
EXCAVATION OF CONTAMINATED SOIL & PLACEMENT IN LANDFILL				
DOZER & OPERATOR	6	DAY	1600.00	9,600
FRONT END LOADER & OPERATOR	6	DAY	1500.00	9,000
LABORER (2 EA)	12	DAY	250.00	3,000
22 CY DUMP TRUCK & DRIVER (2 EA)	12	DAY	1300.00	15,600
REPLACEMENT SOIL – VEGETATIVE	900	CY	7.00	6,300
SPREAD & COMPACT	900	CY	0.80	720
UNDEVELOPED DESIGN DETAILS ~20%				10,080
TOTAL E2 – SEDIMENT EXCAVATION AND PLACEMENT IN LANDFILL PRIOR TO CAPPING				$59,000

PROJECT: OU1 – ALTERNATIVE 4 (RA 4) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

ANNUAL OPERATION & MAINTENANCE COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
ANNUAL LANDFILL POST CLOSURE CARE & MONITORING				
MOWING	1	EVENT	2000.00	$2,000
PERODIC INSPECTION & MAINTENANCE	4	EVENT	750.00	3,000
5–YEAR REVIEWS	0.1810	YR	20000.00	3,619
GROUNDWATER AND SURFACE WATER MONITORING	4	QTR	13000.00	52,000
UNDEVELOPED DESIGN DETAILS ~20%				12,381
TOTAL ANNUAL LANDFILL OPERATING & MAINTENANCE COSTS				$73,000
ANNUAL GROUNDWATER OPERATION & MAINTENANCE				
NUTRIENT INFILTRATION	1	YR	31600.00	$31,600
UNDEVELOPED DESIGN DETAILS ~20%				6,400
TOTAL ANNUAL GROUNDWATER OPERATION & MAINTENANCE COSTS				$38,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

COST SUMMARY TABLE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DIRECT COSTS (N/A = NOT APPLICABLE)				
A1 – 30 MIL PVC GEOMEMBRANE COVER SYSTEM				$2,013,000
A2 – VERTICAL BARRIER				N/A
A3 – PERIMETER DRAINAGE SYSTEM				N/A
B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				228,000
D1 – INTRINSIC BIOREMEDIATION				N/A
D2 – NUTRIENT INFILTRATION				N/A
D3 – GROUNDWATER COLLECTION				836,000
D4 – CREEK COLLECTION SYSTEM				197,000
D5 – ON-SITE TREATMENT SYSTEM				679,000
D6 – SURFACE WATER DISCHARGE				19,000
E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USE				20,000
E2 – SEDIMENT EXCAVATION AND LANDFILLING				59,000
				$4,051,000
INDIRECT COSTS				
HEALTH AND SAFETY			5.00%	$203,000
LEGAL, ADMIN, PERMITTING			5.00%	203,000
ENGINEERING			10.00%	405,000
SERVICES DURING CONSTRUCTION			10.00%	405,000
TOTAL INDIRECT COSTS				$1,216,000
TOTAL CAPITAL (DIRECT + INDIRECT) COST				$5,267,000
OPERATING AND MAINTENANCE COSTS			ANNUAL COST	TOTAL PW
TOTAL LANDFILL: 30 YEARS @ 5%			$73,000	$1,122,000
TOTAL GROUNDWATER: 27 YEARS @ 5%			$273,000	$3,998,000
TOTAL PRESENT WORTH OF O&M COSTS				$5,120,000
TOTAL COSTS OF ALT 5				$10,387,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
EQUIPMENT – DOZER	6	EA	500.00	$3,000
(IN or FRONT END LOADER	2	EA	500.00	1,000
OUT) DUMP TRUCKS	4	EA	250.00	1,000
BACKHOE	2	EA	500.00	1,000
WATER TRUCK	4	EA	250.00	1,000
SHEEPSFOOT ROLLER	4	EA	500.00	2,000
OFFICE TRAILER	5	MON	150.00	750
STORAGE TRAILER	5	MON	150.00	750
TRAILER SET–UP & DELIVERY, REMOVAL	2	EA	300.00	600
TOILET (2 EA* 5 MON/EA*4.2 WK/MON)	42	WK	25.00	1,050
WATER CLR (2EA*5MON/EA*4.2WK/MON)	42	WK	25.00	1,050
WATER (42 WK * 5 DAY/WK)	210	DAY	15.00	3,150
TELEPHONE SERVICE	5	MON	500.00	2,500
ELECTRICAL HOOK–UP	1	LS	5000.00	5,000
ELECTRICAL POWER	5	MON	100.00	500
PICK–UP (2 EA * 5 MON/EA)	10	MON	1000.00	10,000
OFFICE EQUIPMENT	5	MON	1000.00	5,000
WATER TRUCK & DRIVER (2 EA)	10	MON	13500.00	135,000
PUMPS, TOOLS MINOR EQUIPMENT	1	LS	5000.00	5,000
GRADE CONTRACTOR'S AREA	1	AC	3000.00	3,000
PAVE CONTRACTOR'S AREA				
6" GRAVEL BASE	4840	SY	3.00	14,520
6" 3/4" STONE	4840	SY	5.50	26,620
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	29.50	4,720
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	37.50	6,000
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	41.00	6,560
SITE SUPERINTENDANT (5 MON*210 HR/MON)	1050	MNHR	60.00	63,000
FOREMAN (5 MON * 210 HR/MON)	1050	MNHR	50.00	52,500
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	21,000
UNDEVELOPED DESIGN DETAILS ~20%				75,730
TOTAL MOB/DEMOB				$453,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
SUBGRADE FILL (135,000 CY – CONTAMINATED SOIL PLACED IN LANDFILL)				
SUPPLY & DELIVER FROM OFF-SITE SOURCE	123300	CY	4.25	$524,025
SPREAD & COMPACT (INCL CONT SOIL)	135000	CY	0.80	108,000
GAS RELIEF RISERS	23	EA	500.00	11,500
UNDEVELOPED DESIGN DETAILS ~20%				128,475
TOTAL SUBGRADE FILL				$772,000
30 MIL PVC GEOMEMBRANE LINER				
FURNISH AND INSTALL 30 MIL PVC GEOMEMBRANE LINER	250470	SF	0.30	$75,141
UNDEVELOPED DESIGN DETAILS ~20%				14,859
TOTAL 30 MIL PVC GEOMEMBRANE LINER				$90,000
COMMON FILL LAYER				
COMMON FILL – 18" THICK	55800	CY	4.25	$237,150
SPREAD & COMPACT	55800	CY	0.80	44,640
UNDEVELOPED DESIGN DETAILS ~20%				56,210
TOTAL COMMON BORROW LAYER				$338,000
VEGETATIVE LAYER				
VEGETATIVE LAYER	18600	CY	7.00	$130,200
SPREAD & COMPACT	18600	CY	0.80	14,880
SEED, FERTILIZE, MULCH	23	AC	2500.00	57,500
UNDEVELOPED DESIGN DETAILS ~20%				40,420
TOTAL VEGETATIVE LAYER				$243,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB # 7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
DETENTION BASIN				
CLEAR AND GRUB	1.15	AC	6000.00	$6,900
BASIN EXCAVATION	4650	CY	2.00	9,300
LOAD & HAUL 2 MILE	3845	CY	4.50	17,303
SPREAD & COMPACT FOR BERM	805	CY	3.50	2,818
6" SAND BUFFER LAYER	850	SY	4.25	3,613
40 MIL HDPE LINER	5050	SY	5.00	25,250
4" LOAM	2130	SY	7.00	14,910
SEED, FERTILIZE, MULCH	2130	SY	0.50	1,065
OUTLET STRUCTURE				
EXCAVATION	27	CY	5.00	135
BACKFILL OR SPOIL	27	CY	5.00	135
CONCRETE BASE SLAB	5	CY	300.00	1,500
WALLS	5	CY	400.00	2,000
ELEVATED SLAB	2	CY	600.00	1,200
1.5" GRATING	4	SF	50.00	200
24" DIA RCP	8	LF	35.00	280
3'x5' BOX CULVERT	50	LF	150.00	7,500
RIPRAP EROSION CONTROL	70	CY	50.00	3,500
UNDEVELOPED DESIGN DETAILS ~20%				19,393
TOTAL DETENTION BASIN				$117,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB # 7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

A1 – 30 MIL PVC GEOMEMBRANE LINER

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL MOB/DEMOB				$453,000
TOTAL SUBGRADE FILL				772,000
TOTAL 30 MIL PVC GEOMEMBRANE LINER				90,000
TOTAL COMMON BORROW LAYER				338,000
TOTAL VEGETATIVE LAYER				243,000
TOTAL DETENTION BASIN				117,000
TOTAL A1 – 30 MIL PVC GEOMEMBRANE LINER				$2,013,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

B1 – SURFACE SOIL EXCAVATION AND LANDFILLING

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB EXCAVATION AREA	6	AC	6500.00	$39,000
EXCAVATION OF CONTAMINATED SOIL & PLACEMENT IN LANDFILL				
DOZER & OPERATOR	15	DAY	1600.00	24,000
FRONT END LOADER & OPERATOR	15	DAY	1500.00	22,500
LABORER (2 EA)	30	DAY	250.00	7,500
22 CY DUMP TRUCK & DRIVER (2 EA)	30	DAY	1300.00	39,000
REPLACEMENT SOIL				
COMMON BORROW	4500	CY	4.25	19,125
VEGETATIVE SOIL	4500	CY	7.00	31,500
SPREAD & COMPACT	9000	CY	0.80	7,200
UNDEVELOPED DESIGN DETAILS ~20%				38,175
TOTAL B1 – SURFACE SOIL EXCAVATION AND LANDFILLING				$228,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB # 7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D3 – GROUNDWATER COLLECTION TRENCH

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
INSTALL COLLECTION TRENCH	4000	LF	145.00	$580,000
MOBILIZATION	1	LS	10000.00	10,000
MANHOLES	7	EA	8000.00	56,000
COLLECTION SUMP / PUMP STATION	1	LS	35000.00	35,000
BACKFILL	770	CY	5.00	3,850
VEGETATIVE SOIL	250	CY	8.00	2,000
FORCE MAIN TO TREATMENT PLANT	200	LF	25.00	5,000
POWER & INSTRUMENTATION CIRCUITS	500	LF	10.00	5,000
UNDEVELOPED DESIGN DETAILS ~20%				139,150
TOTAL D3 – GROUNDWATER COLLECTION TRENCH				$836,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D4 – CREEK COLLECTION SYSTEM

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB CREEK	2800	LF	2.00	$5,600
EXCAVATION OF CONTAMINATED SEDIMENT & PLACEMENT IN LANDFILL (2800'x8'=800 CY)				
DOZER & OPERATOR	5	DAY	1600.00	8,000
FRONT END LOADER & OPERATOR	5	DAY	1500.00	7,500
LABORER (2 EA)	10	DAY	250.00	2,500
22 CY DUMP TRUCK & DRIVER (2 EA)	10	DAY	1300.00	13,000
NON WOVEN GEOTEXTILE (2800'x4')	22400	SF	0.20	4,480
MIRADRAIN	11200	SF	2.00	22,400
3/4" CRUSHED STONE ~6" THICK	200	CY	50.00	10,000
GCL (2800'x8')	22400	SF	2.00	44,800
6" LOAM	22400	SF	0.50	11,200
COLLECTION SUMP & PUMP STATION	1	LS	25000.00	25,000
FORCE MAIN	200	LF	25.00	5,000
POWER & INSTRUMENTATION CIRCUITS	500	LF	10.00	5,000
UNDEVELOPED DESIGN DETAILS ~20%				32,520
TOTAL D4 – CREEK COLLECTION SYSTEM				$197,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D5 – ON–SITE LEACHATE TREATMENT SYSTEM

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TREATMENT BUILDING – COMPLETE	4000	SF	75.00	$300,000
POWER SUPPLY	500	LF	10.00	5,000
WATER SERVICE	500	LF	25.00	12,500
TREATMENT EQUIPMENT				
TRENCH PUMPS	2	EA	5000.00	10,000
EQUALIZATION TANK	1	LS	3000.00	3,000
EQUALIZATION TANK MIXER	1	EA	1500.00	1,500
PACKAGE FLOCULATOR/CLARIFIER	1	EA	70000.00	70,000
GAC FILTER	1	EA	6000.00	6,000
GAC FILTER FEED TANK	1	EA	3000.00	3,000
GAC FILTER FEED PUMP	2	EA	5000.00	10,000
SLUDGE PUMP	1	EA	2000.00	2,000
CHEMICAL MAKE–UP TANK, MIXER, PUMP	2	LS	5000.00	10,000
AIR COMPRESSOR	1	LS	3000.00	3,000
ELECTRICAL DISTRIBUTION EQUIPMENT	1	LS	25000.00	25,000
POWER CIRCUITS	2000	LF	10.00	20,000
CONTROL PANEL	1	LS	25000.00	25,000
CONTROL CIRCUITS	2000	LF	7.50	15,000
PROCESS PIPING, FITTINGS, VALVES	1	LS	35000.00	35,000
UTILITY PIPING, FITTINGS, VALVES	1	LS	10000.00	10,000
UNDEVELOPED DESIGN DETAILS ~20%				113,000
TOTAL D5 – ON–SITE LEACHATE TREATMENT SYSTEM				$679,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

D6 – SURFACE WATER DISCHARGE TO UNNAMED CREEK

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
24" DIA GRAVITY DISCHARGE PIPE	200	LF	50.00	$10,000
MANHOLE	1	LS	3000.00	3,000
HEADWALL	1	LS	2500.00	2,500
UNDEVELOPED DESIGN DETAILS ~20%				3,500
TOTAL D6 – SURFACE WATER DISCHARGE TO UNNAMED CREEK				$19,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB # 7565-26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E1 – INSTITUTIONAL CONTROLS FOR GROUNDWATER USAGE

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
INSTITUTIONAL CONTROLS	1	LS	20000.00	$20,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565–26

LOCATION: NAS JACKSONVILLE

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

E2 – SEDIMENT EXCAVATION AND PLACEMENT IN LANDFILL PRIOR TO CAPPING

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CLEAR & GRUB EXCAVATION AREA	2350	LF	2.00	$4,700
EXCAVATION OF CONTAMINATED SOIL & PLACEMENT IN LANDFILL				
DOZER & OPERATOR	6	DAY	1600.00	9,600
FRONT END LOADER & OPERATOR	6	DAY	1500.00	9,000
LABORER (2 EA)	12	DAY	250.00	3,000
22 CY DUMP TRUCK & DRIVER (2 EA)	12	DAY	1300.00	15,600
REPLACEMENT SOIL – VEGETATIVE	900	CY	7.00	6,300
SPREAD & COMPACT	900	CY	0.80	720
UNDEVELOPED DESIGN DETAILS ~20%				10,080
TOTAL E2 – SEDIMENT EXCAVATION AND PLACEMENT IN LANDFILL PRIOR TO CAPPING				$59,000

PROJECT: OU1 – ALTERNATIVE 5 (RA 5) JOB #7565-26

LOCATION: NAS JACKSONVILLE

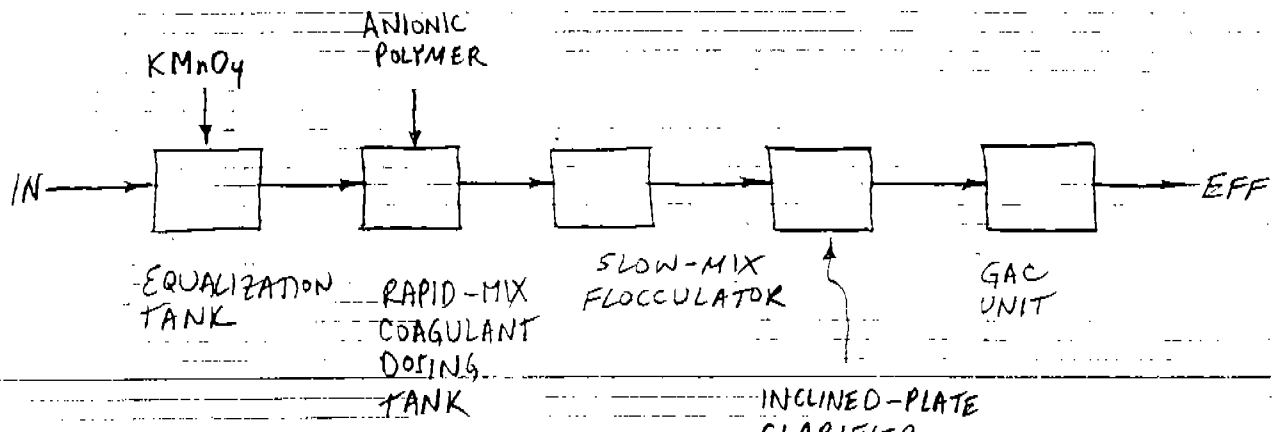
ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

ANNUAL OPERATION & MAINTENANCE COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
ANNUAL LANDFILL POST CLOSURE CARE & MONITORING				
MOWING	1	EVENT	2000.00	$2,000
PERODIC INSPECTION & MAINTENANCE	4	EVENT	750.00	3,000
5-YEAR SITE REVIEW	0.1810	YR	20000.0000	3,619
GROUNDWATER AND SURFACE WATER MONITORING	4	QTR	13000.00	52,000
UNDEVELOPED DESIGN DETAILS ~20%				12,381
TOTAL ANNUAL LANDFILL POST CLOSURE CARE & MONITORING				$73,000
ANNUAL GROUNDWATER OPERATION & MAINTENANCE				
GROUNDWATER TREATMENT O&M				
POLYMER	1	LS	3000.00	$3,000
SLUDGE DISPOSAL	1	LS	126000.00	126,000
CARBON REPLACEMENT	1	LS	1800.00	1,800
KMnO4	1	LS	500.00	500
ELECTRICITY	175200	KWHR	0.0750	13,140
SAMPLING & ANALYSIS	1	LS	10000.00	10,000
LABOR	2080	HR	35.00	72,800
UNDEVELOPED DESIGN DETAILS ~20%				45,760
TOTAL ANNUAL GROUNDWATER OPERATION & MAINTENANCE				$273,000

PROJECT	COMP. BY	JOB NO.
NAS JAX OU 1 FS GW/LEACHATE TREATMENT SYSTEM 1 OF 8	MDK	756526.028
	CHK. BY	DATE 4/27/95



BASE TREATMENT

EQ TANK — INCREASE pH WITH KMnO4 OXIDIZE METALS, RADIONUCLIDES, AND CN

RAPID-MIX — COAGULATE OXIDIZED COMPOUNDS WITH ANIONIC POLYMER

SLOW-MIX FLOCC — FLOCCULATE COAGULATED MASS FOR SEPARATION

CLARIFIER — SEPARATE FLOCC SOLIDS

GAC — POLISH EFFLUENT FOR TRACE ORGANICS

CONTINGENT TREATMENT (NOT ANTICIPATED)

REVERSE OSMOSIS — IF RADIONUCLIDES AND/OR CN IS STILL PRESENT

FINAL EQ TANK — IF pH IS TOO HIGH TO DISCHARGE

PROJECT	COMP. BY	JOB NO.
NAS JAX OU 1 FS CLARIFIER 2 of 8	MDK	756526.028
	CHK. BY	DATE 4/27/95

Estimated Flow Rate – 0.27 ft^3/sec

$$(0.27\ ft^3/sec)(448.83\ gpm/(ft^3/sec)) = 120\ gpm$$

Use 300 gal/day·ft^2 for sufficient settling in inclined plate clarifier (AWWA, 1990).

$$(300\ gal/day \cdot ft^2)(1\ day/1{,}440\ min) = 0.208\ gpm/ft^2$$

Thus, required clarifier area to allow sufficient time for settling is---

$$\frac{(120\ gpm)}{(0.208\ gpm/ft^2)} = 577\ ft^2$$

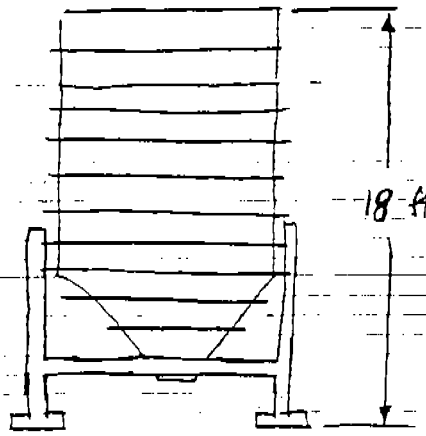
Based on models commercially available (Parkson Corp, Ft. Lauderdale, FL), 80% of settling area is used for clarification.

$$\frac{577\ ft^2}{0.80} = 720\ ft^2 \text{ required}$$

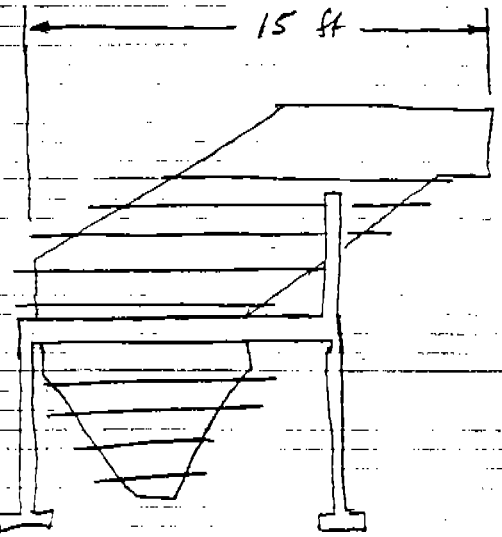
Model # 860/55 (= 860 ft^2 in area) is appropriate.

PROJECT	COMP. BY	JOB NO.
NAS JAX OU1 FS CLARIFIER 3 of 8	MDK	756526.028
	CHK. BY	DATE 4/27/95

Model # 860/55



Front View Sketch



Side View Sketch

Parkson Corporation
Ft. Lauderdale, FL
(305) 974-6610
Bill Rogers (sales); Bret Boyd (eng)

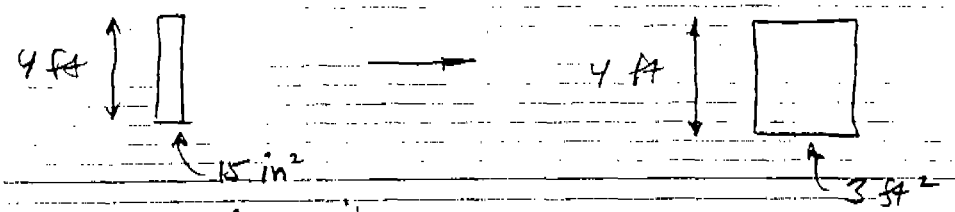
Similar designs from other vendors are also suitable. Parkson model only used for FS cost estimation purposes.

Flash Mixer	$10,000
Flocculator	
Start-up	
Freight	
Clarifier	$50,000

PROJECT	COMP. BY	JOB NO.
NAS JAX OU 1 FS POLYMER DOSAGE 4 of 8	MDK	756526.028
	CHK. BY	DATE 4/27/95

Model #860/55 comes with size "B" flash mixer and flocculator.

rapid-mix tank — slow-mix flocculator



V = 35 gal capacity — V = 200 gal capacity

Anionic polymer coagulant dose is 2 ppm for clarification (Water Engineering & Management, April 1995).

$$2 \text{ ppm} = \left(2 \text{ mg/L}\right)\left(8.345 \times 10^{-6} \frac{\text{lbs/gal}}{\text{mg/L}}\right) = 16.7 \times 10^{-6} \text{ lbs/gal}$$

@ 120 gpm --- $(16.7 \times 10^{-6} \text{ lbs/gal})(120 \text{ gpm})(1{,}440 \text{ min/day})$

$= 2.8$ lbs/day

$= 1{,}000$ lbs/year

@ \$3/lb., --- $(\$3)(1{,}000) = \$3{,}000$/yr for anionic polymer used for coagulation.

PROJECT	COMP. BY	JOB NO.
NAS JAX OU 1 FS — POLYMER SLUDGE DISPOSAL 5 of 8	MDR	756526.028
	CHK. BY	DATE 5/8/95

ASSUME "$2/1,000 gals water treated" BASED ON PROPOSED RULE IN FEDERAL REGISTER (FR 56, 138, P. 33090, JULY 18, 1991) FOR RADIOACTIVE SLUDGE. SLUDGE IS POTENTIALLY RADIOACTIVE BECAUSE OF RADIONUCLIDES THAT WILL BE PRECIPITATED.

TREATED WATER: (120 gpm)(1,440 min/day)(365 days/yr)

$= 6.3 \times 10^7$ gal/yr

ANNUAL O&M COST: ($2/1,000 gals)($6.3 \times 10^7$ gal/yr)

= $126,000 / yr

PROJECT	COMP. BY	JOB NO.
NAS JAX OU 1 FS CARBON 6 of 8	MDK	756526.028
	CHK. BY	DATE 5/8/95

ORGANIC REMOVAL

1,1-DCE	4.22 →	3.2	ppb	(24.2 %)
TCE	93.3 →	80.7	ppb	(13.5 %)
phenanthrene	0.06 →	0.03	ppb	(50 %)
bis-(2-eth)ph	3.41 →	3	ppb	(12 %)

SELECT "TCE" AS TARGET CONTAMINANT FOR CALCS.
USE CALGON CARBON ADSORPTION ISOTHERMS AS REPRESENTATIVE CARBON FOR COSTING.

$(93.3 - 80.7 \text{ ppb})(10^{-3}) = 0.013 \text{ mg TCE/L}$ TO BE REMOVED

$(0.013 \text{ mg/L})(90 \text{ gal/min})(3.785 \text{ L/gal})(2.205 \times 10^{-6} \text{ lbs/mg})(1{,}440 \text{ min/day})$

$= 0.014 \text{ lbs TCE/day}$ TO BE REMOVED

FROM ISOTHERM, @ 93.3 ppb ~ 0.09 mg/L ---

ADSORPTIVE CAPACITY = 18 mg TCE / g carbon

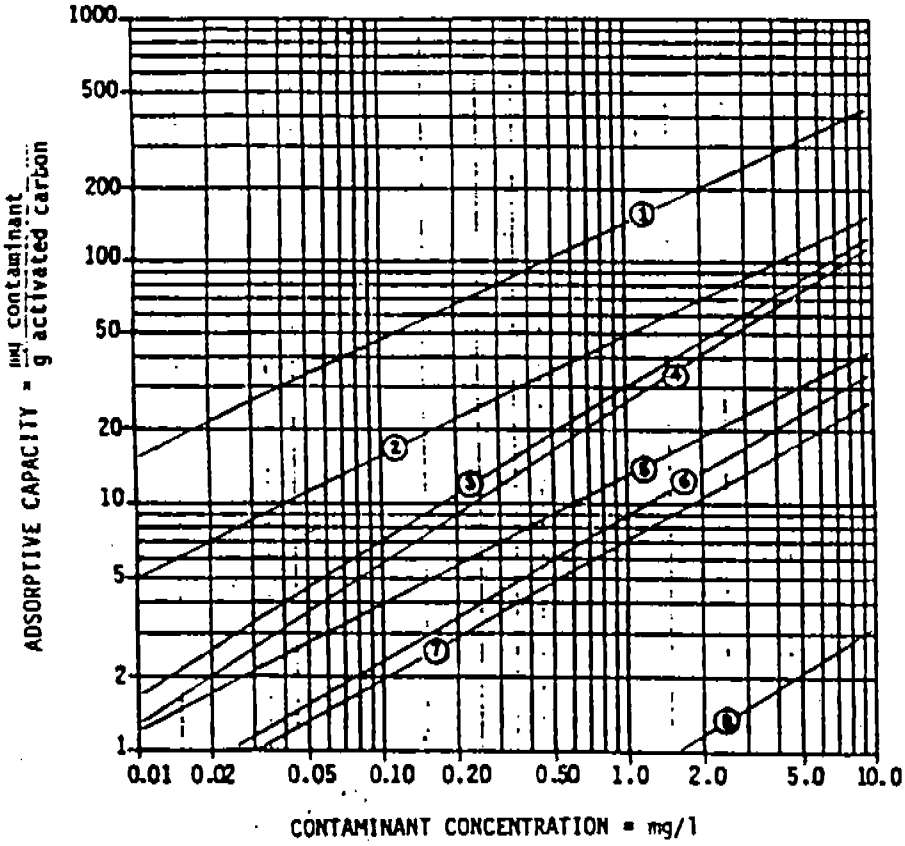
= 0.018 g TCE / g carbon = lb/lb

THUS, $\dfrac{0.014 \text{ lbs TCE/day}}{0.018 \text{ lbs TCE/lb carbon}} \approx 1 \text{ lb carbon/day}$

PROJECT	COMP. BY	JOB NO.
NAS JAX OU 1 FS CARBON 7 OF 8	MDK	756526-028
	CHK. BY	DATE 5/8/95

FIGURE 1

SINGLE CONTAMINANT ADSORPTION ISOTHERMS
CHLORINATED ALIPHATIC SOLVENTS



ISOTHERM CONDITIONS:

Sample Volume	=	137 ml
Temperature	=	Ambient
Agitation Time	=	20 hours
Carbon	=	Filtrasorb 300

ISOTHERM IDENTIFICATION:

(1) Tetrachloroethylene
(2) Trichloroethylene
(3) Carbon Tetrachloride
(4) 1,1,1-Trichloroethane
(5) 1,1-Dichloroethylene
(6) Chloroform
(7) 1,2-Dichloroethane

PROJECT	COMP. BY	JOB NO.
NAS JAX OU / FS CARBON 8 of 8	MAK	756526.028
	CHK. BY	DATE 5/8/95

BECAUSE THIS IS CARBON REQUIRED, BUT OTHER ORGANICS WILL ADSORB TO AND "SPEND" THE CARBON AS WELL, THE CARBON CONSUMPTION RATE WILL BE HIGHER.

APPLYING A SAFETY FACTOR OF "10" WILL ACCOUNT FOR ADSORPTION OF OTHER, NON-TARGET ORGANICS.

(10 lbs CARBON / DAY) (365 DAYS / YR) = 3,650 lbs / YR

USING A CARBTROL 200-lb UNIT FOR COSTING, THE CARBON CHANGE-OUT RATE WOULD BE ---

$$\frac{3{,}650 \text{ lbs / YR}}{200 \text{ lbs / UNIT}} = 19 \text{ UNITS PER YEAR}$$

(TOO FREQUENT)

USING A CARBTROL 1,000-lb UNIT FOR COSTING, THE CARBON CHANGE-OUT RATE WOULD BE ---

$$\frac{3{,}650 \text{ lbs / YR}}{1{,}000 \text{ lbs / UNIT}} = 4 \text{ UNITS PER YEAR}$$

(QUARTERLY CHANGE-OUT; REASONABLE)

CAPITAL COST OF L-4 (1,000-LB) UNIT = $5,000

ANNUAL COST ($2,000 / QUARTER) = $8,000 / YR

(REGENERATION, TRANSPORT, CHANGE-OUT)

ABB
ASEA BROWN BOVERI

ABB Environmental Services, Inc.
Northeast Region
Corporate Place 128
107 Audubon Road
Wakefield, MA 01880
FAX (617) 246-5060

DATE: 5/12/95 **FAX #:** VA

TO: Mary Kauffman

FROM: D. Balcher

NUMBER OF PAGES, INCLUDING COVER SHEET: 5

COMMENTS: Fax out info. Please call if questions. I'll be in the field all next week.

D Balcher

ANY PROBLEMS WITH RECEIVING, PLEASE CALL RENEE AT (617) 245-6606

NAS JAX OU1 Feasibility Study

Items Covered: MM1 and MM4:
Enhanced bioremediation of selected plume sections (sections of 2 plumes with total VOCs > 1000 µg/L).

Enhanced bioremediation:

- Full-scale enhanced bioremediation of selected plume areas will be recommended only upon successful pilot studies (in-situ methanotrophic biodegradation of chlorinated compounds is relatively unproven in the field and site conditions may complicate implementation).
- Based on the compounds present in site groundwater and the premise that vinyl chloride is the primary risk-driving compound present in site groundwater, methanotrophic in-situ bioremediation is recommended for JAX OU1.
- Methanotrophic in-situ biodegradation of selected plume areas would be achieved through the addition of mineral nutrients, oxygen, and methane to the aquifer.
- Mineral nutrients, oxygen, and methane would be introduced to the groundwater in the selected plume areas through a series of injection trenches or wells placed at the forefront of the contaminated plume sections (see figures).
- In-situ bioremediation trenches would be on the order of 300 feet long and 5 - 20 feet deep. 5-foot trenches would be used for density gradient injection/mixing. 15-20 foot deep trenches would be used for in-situ (pump-driven) mixing. The width of the trenches would vary depending upon specific trenching machine used.
- Nutrient injection wells would be on the order of 4-inches in diameter and 40 feet deep (screened the length of the contamination).
- Injection of nutrients, oxygen, and methane would be conducted in a pulsed injection pattern to maximize aquifer dispersion.
- Biological and iron fouling of amendment distribution wells would be determined through injection flow and pressure measurements.
- Biological and iron fouling of the amendment distribution trenches would be determined through comparison of groundwater level and chemistry in piezometers located within and outside the plume area (to detect water going around the trenches).
- The injection of sequestering agents to reduce iron oxidation would be examined during the pilot study.
- The rate of bio/iron fouling would depend upon the grainsize of the well/trench fill, the concentration and source of oxygen added to the aquifer for biological degradation, and other site parameters such groundwater characteristics. The rate of bio/iron fouling in amendment distribution well or trenches would be determined during the bench and pilot scale treatability studies.
- Alleviation of bio/iron fouling would be conducted through standard chemical and physical well treatment techniques (e g. hydrogen peroxide, chlorine, and acid treatment)

Table 1: Cost Estimate

Cost Estimate for In-situ Bioremediation of Selected Plume Sections: JAX OU1

Task	Cost1	Cost2	Cost3
Pilot Treatability Study	$312,401	$312,401	$312,401
Design/WorkPlan Development	$76,300	$76,300	$76,300
Installation/Capitol Cost	$895,727	$350,827	$275,527
Yearly Monitoring	$78,410	$78,410	$78,410
Total (5 years)	$1,676,478	$1,131,578	$1,056,278
+20% Contingency	$2,011,773	$1,357,893	$1,267,533

Note: Cost 1 = Deep Injection Trenches with Piping
Cost 2 = Shallow Injection Trenches
Cost 3 = Injection Wells

Table 1: Cost Estimate

Cost Estimate for In-situ Bioremediation of Selected Plume Sections: JAX OU1

ITEM	Unit	Unit Cost	Quantity	Total Cost
I. **Pilot Study**	LS	$312,401	1	$312,401
II. **Design**				
Engineer (P2)	Hr.	$75.00	400	$30,000
Senior Scientist/Engineer (P3)	Hr.	$90.00	120	$10,800
Senior (Principal) Consulting Review (P4)	Hr.	$140.00	60	$8,400
Drafting	Hr.	$55.00	80	$4,400
III **WorkPlan Development**				
Engineer (P2)	Hr.	$75.00	180	$13,500
Senior Scientist/Engineer (P3)	Hr.	$90.00	40	$3,600
Senior (Principal) Consulting Review (P4)	Hr.	$140.00	40	$5,600
IV **Installation and Equipment**				
Engineer (Includes initial testing of system) (P	Hr.	$75.00	210	$15,750
Technician (P1/T2)	Hr.	$65.00	210	$13,650
Senior (Principal) Consulting Review (P4)	Hr.	$140.00	24	$3,360
Travel	ea	$500	3	$1,500
Subsistence/Lodging	day	$90	28	$2,520
Car Rental	day	$32	26	$832
Trench Machine Rental (Includes Mob/Demo	day	$1,500	12	$18,000
Drill Rig Rental (Includes Mob/Demob)	day	$1,200	6	$7,200
Trenching and GW Piping Installation	ft	$250	1000	$250,000
Gravel/Course Sand Fill	cy	$12	2000	$24,000
Disposal of Excavated Soil (5' wide trenches)	cy	$200	2500	$500,000
GW Monitoring Wells (8 wells, 2" dia. 25-50' bg	ea	$2,000	8	$16,000
GW Mixing Pumps (3 total)	ea	$1,000	5	$5,000
Piping, Valves	ft	$1	1600	$1,600
Pressure Gauge & flow meters	set	$175	5	$875
Nutrient Injection System	LS	$3,500	1	$3,500
Oxygen Injection System	LS	$3,500	1	$3,500
Methane Injection System	LS	$3,500	1	$3,500
Equipment Trailer	LS	$4,500	1	$4,500
Storage Shed	LS	$2,500	1	$2,500
Electrician	hr	$60	24	$1,440
ODCs	LS	$2,000	1	$2,000
GW Piezometers (11 wells, 2" dia. 25' bgs)	ea	$1,000	8	$8,000
Piping and Tranfer Pump (Biofoul Maint)	ft	$2	2000	$3,000
Portable Water Storage (Biofoul Maint)	ea	$3,500	1	$3,500
V. **Monitoring/Consulting (Yearly)**				
Engineer	Hr.	$75.00	160	$12,000
Field Technician (8 hr/wk)	Hr.	$55.00	384	$21,120
Senior Scientist/Engineer	Hr.	$90.00	16	$1,440
Electricity	KWH	$0.08	10000	$800
Nutrients	yr	$3,000	1	$3,000
Oxygen	yr	$2,000	1	$2,000
Methane	yr	$5,000	1	$5,000
Nutrient Testing Equipment	yr	$250	1	$250
Analytical (12 samples/quarter)	ea	$250	48	$12,000
Troubleshooting Labor	Hr.	$75.00	40	$3,000
Troubleshooting Labor	Hr.	$55.00	40	$2,200
Troubleshooting Labor	Hr.	$90.00	40	$3,600
Troubleshooting Subcontracting	LS	$4,000	3	$12,000

Note: Cost Estimate does not include permitting (if required), closeout analytical costs or report.

Design, Installation & Set Up

Subtotal Cost:	$1,284,428
+20% Contingency:	$256,886
Total Estimated Cost:	$1,541,313

Yearly Monitoring/Consulting

Subtotal Cost:	$78,410
+20% Contingency:	$15,682
Total Estimated Cost:	$94,092

5	Year Cost Total	$2,011,773
10	Year Cost Total	$2,482,233

(* inflation, discount rate/cost not included)

Table 2: Cost Estimate

Cost Estimate for In-situ Bioremediation Pilot Study: JAX OU1

ITEM	Unit	Unit Cost	Quantit	Total Cost
I. Design and WorkPlan Development				
Engineer (P2)	Hr.	$75.00	240	$18,000
Senior Scientist/Engineer (P3)	Hr.	$90.00	24	$2,160
Senior (Principal) Consulting Review (P4)	Hr.	$140.00	24	$3,360
Drafting	Hr.	$55.00	16	$880
Procurement	Hr.	$65.00	16	$1,040
II. Laboratory Treatability Screening	LS	$30,000	1	$30,000
III Installation and Equipment				
Engineer (includes initial testing of system) (P	Hr.	$75.00	50	$3,750
Technician (P1/T2)	Hr.	$55.00	50	$2,750
Senior (Principal) Consulting Review (P4)	Hr.	$140.00	16	$2,240
Travel	ea	$500	2	$1,000
Subsistence/Lodging	day	$90	21	$1,890
Drill Rig Rental (includes Mob/Demob)	day	$1,200	10	$12,000
GW Injection/Monitoring Wells (4" dia. 25-50'b	ea	$2,500	4	$10,000
GW Injection/Monitoring Wells (2" dia. 25-50'b	ea	$2,000	8	$16,000
Piezometers (2" diameter, 25 - 50 ft bgs)	ea	$1,500	8	$12,000
Disposal of Excavated Soil	ea	$1,000	4	$4,000
GW Pumps	ea	$1,000	4	$4,000
Piping, Valves	LS	$250	1	$250
Pressure Gauge & flow meters	set	$200	1	$200
Nutrient Injection System	LS	$2,500	1	$2,500
Oxygen Injection System	LS	$2,500	1	$2,500
Carbon Injection System	LS	$2,500	1	$2,500
Nutrients	LS	$1,000	1	$1,000
Oxygen	LS	$1,000	1	$1,000
Methane	LS	$2,000	1	$2,000
Tracer	LS	$1,500	1	$1,500
IV Pilot Test (9 Months)				
Engineer (Startup)	Hr.	$75.00	56	$4,200
Engineer (4 hrs/week)	Hr.	$75.00	144	$10,800
Travel	ea	$500	1	$500
Subsistence/Lodging	day	$80	7	$560
Car Rental	day	$32	7	$224
Field Technician/Engineer (Startup)	Hr.	$65.00	40	$2,600
Field Technician/Engineer (16 hrs/week)	Hr.	$65.00	576	$37,440
Senior Scientist/Engineer	Hr.	$90.00	60	$5,400
Electricity	KWH	$0.08	8000	$640
Nutrient Testing Equipment	yr	$250	1	$250
Analytical (Tracer and VOAs - 4/wk)	ea	$300	144	$43,200
V. Results Analysis				
Engineer (P2)	Hr.	$75.00	120	$9,000
Senior Scientist/Engineer (P3)	Hr.	$90.00	24	$2,160
Senior (Principal) Consulting Review (P4)	Hr.	$140.00	16	$2,240
Field Technician/Engineer (Startup)	Hr.	$65.00	40	$2,600

Note: Cost Estimate does not include permitting (if required), closeout analytical costs or report.

Design, Installation & Set Up	
Subtotal Cost:	$260,334
+20% Contingency:	$52,067
Total Estimated Cost:	$312,401