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FINAL SITE SCREENING PROCESS REPORT AT SITE 43 NSWC INDIAN HEAD MD

10/1/2009

NAVFAC WASHINGTON

FINAL

Site Screening Process Report

Site 43 – Toluene Disposal

Naval Support Facility Indian Head

Indian Head, Maryland

Naval Facilities Engineering Command Washington
Contract Number N62472-03-D-0057
Contract Task Order 114

October 2009

TETRA TECH

FINAL

SITE SCREENING PROCESS REPORT

SITE 43 – TOLUENE DISPOSAL

NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

Submitted to:
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Submitted under:
COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT
CONTRACT NUMBER N62472-03-D-0057

CONTRACT TASK ORDER 114

OCTOBER 2009

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ACRONYMS AND ABBREVIATIONS

B&R	Brown & Root
bgs	below ground surface
BTAG	Biological Technical Assistance Group
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COPC	chemical of potential concern
CTO	Contract Task Order
DAF	dilution attenuation factor
DNAPL	dense non-aqueous phase liquid
DoN	Department of the Navy
DPT	Direct Push Technology
E/A&H	Ensafe/Allen & Hoshall
ECD	Electron Capture Detector
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
FDA	Food and Drug Administration
FFA	Federal Facility Agreement
FID	Flame Ionization Detector
FS	feasibility study
HI	hazard index
HQ	hazard quotient
HSA	hollow-stem auger
IDW	investigation-derived waste
IHDIV-NSWC	Indian Head Division, Naval Surface Warfare Center
IHIRT	Indian Head Installation Restoration Team
ILCR	incremental lifetime cancer risk
MIP	Membrane interface probe
MS	matrix spike
MSD	matrix spike duplicate
NAD	North American Datum
NGDV29	National Geodetic Vertical Datum, 1929
NOEC	no observed effects concentration
NSF-IH	Naval Support Facility, Indian Head
ORNL	Oak Ridge National Laboratory
PA	Preliminary Assessment

PID	Photoionization Detector
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RBC	risk-based concentration
RDA	Recommended Daily Allowance
RI	remedial investigation
RSL	Regional Screening Levels
SI	Site Inspection
SOW	Statement of Work
SSL	soil screening level
SSP	Site Screening Process
SQG	Soil Quality Guideline
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TtNUS	Tetra Tech NUS, Inc.
USATHAMA	United States Army Toxic and Hazardous Materials Agency
UTL	upper tolerance limit
VOC	volatile organic compound

EXECUTIVE SUMMARY

INTRODUCTION

This Site Screening Process (SSP) Report for Naval Support Facility Indian Head (NSF-IH) in Indian Head, Maryland was prepared by Tetra Tech NUS, Inc. (TtNUS) in response to Contract Task Order 114 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-D-03-0057. NSF-IH is a Naval Support Activity South Potomac facility within the Naval District Washington Region. Until October 1, 2005, NSF-IH was referred to as Naval District Washington, Indian Head. The report describes the SSP for Site 43 – Toluene Disposal.

The objective of the SSP at Site 43 was to collect and evaluate sufficient data to provide the basis for a determination that either: (1) additional investigation or remediation is needed or (2) the area does not pose a threat or potential threat to public health, welfare, or the environment and should be removed from further study under the Federal Facility Agreement (FFA) (EPA Region 3 and DoN, 2000). The field investigations leading to this report were outlined in three site-specific work plans (TtNUS, 2005, 2007, and 2009) that detailed the environmental samples and analytical methods needed to make a decision for this site.

Site 43 includes two areas, separated by approximately 700 feet, along Gallery Road in the southwestern portion of the Main Area of NSF-IH. The first area is near the northern corner of Building 1040 near the intersection of Gallery and Schuyler Roads. The second area is near a utility pole approximately 30 feet northwest of and across Gallery Road from Building 1041. It was reported that, for a period of more than 2 years during parts-cleaning operations, unknown quantities of spent solvents were improperly disposed in the drainage swale outside the door of Building 1040 (acetone) and at the base of the pole near Building 1041 (acetone and toluene). Contaminants present in the waste would have been deposited in the immediate vicinity of disposal, could have migrated to downstream areas of the drainage swales present at both areas, and/or could have migrated to shallow groundwater.

FIELD INVESTIGATIONS AND DATA EVALUATION

Prior to the SSP investigation, no environmental sampling had been conducted at the Building 1040 area. A Site Inspection was performed in 1992 in the Building 1041 area (E/A&H, 1994). Four surface soil samples were collected near the utility pole, and acetone was detected at one location. Ten soil-gas borings were completed, and soil-gas samples were collected. Toluene and chlorinated solvents were detected at 3 of the 10 soil-gas locations. According to the FFA, a remedial investigation/feasibility study

is required at Site 43. However, the Indian Head Installation Restoration Team decided to conduct the SSP to verify that a remedial investigation was necessary.

As part of the SSP, surface soil, subsurface soil, and shallow groundwater samples were collected at each area. In addition, a membrane interface probe (MIP) was used to characterize subsurface conditions as well. Quality control samples (duplicates and blanks) were also collected. The samples were analyzed for Target Compound List volatile organic compounds (VOCs), explosives, nitrocellulose, nitroglycerin, nitroguanidine, Target Analyte List metals, and/or cyanide.

Building 1040 Area

Two soil borings were installed to depths of 8 and 20 feet in and downgradient of the suspected disposal area. One of the soil borings was converted into a shallow groundwater monitoring well.

Two surface soil samples were collected from depths of 0 to 1 foot below ground surface (bgs). One VOC (methylene chloride), one explosive (nitrocellulose), and many metals were detected.

Subsurface soil samples from the soil borings were field screened for organic vapors and were to be collected from the depth interval with the highest organic vapor reading. No organic vapors were detected; therefore, the samples from the depth interval directly below the surface soil sampling interval (1 to 2 feet bgs) were submitted for laboratory analysis. One VOC (trichloroethene) and many metals were detected. Explosives were not detected.

A shallow groundwater sample was collected from the monitoring well installed in one of the soil borings. Two VOCs (cis-1,2-dichloroethene and trichloroethene) were detected at very high concentrations. The explosive RDX and several metals were detected.

A MIP investigation was conducted on 2 occasions in the vicinity of Building 1040. Groundwater samples were collected during the 2005 field investigation from one permanent and 5 temporary wells.

The human health risk characterization resulted in an incremental lifetime cancer risk (ILCR) of 2×10^{-2}, which is many orders of magnitude greater than the United States Environmental Protection Agency (EPA) acceptable risk range of 1×10^{-4} to 1×10^{-6}. The total hazard index (HI) was 5, which is also many times higher than the EPA threshold of 1.0. The cancer and noncancer risks are driven by the high concentration (36,000 µg/L) of trichloroethene detected in shallow groundwater. There are no unacceptable risks to human health associated with exposure to soil near Building 1040 under a residential land use scenario.

Based on the ecological risk screening, VOCs, explosives, and metals were identified as preliminary chemicals of potential concern (COPCs). Following Step 3A, none of these chemicals were retained as COPCs.

Although migration of soil contaminants to groundwater is not considered to be problematic, the source of the trichloroethene detected in shallow groundwater was not found during the SSP investigation.

Building 1041 Area

Three soil borings were installed to depths of 8 feet, and one soil boring was advanced to a depth of 20 feet. The deeper soil boring was converted into a shallow groundwater monitoring well. The boring locations were based on the suspected disposal location and the detections of VOCs in previous soil-gas samples.

Two surface soil samples were collected from depths of 0 to 1 foot bgs. Two surface soil samples were collected from depths of 1 to 2 feet because the depth interval from 0 to 1 foot bgs consisted of asphalt pavement and road gravel. Several VOCs (2-butanone, acetone, carbon disulfide, methylene chloride, and toluene), one explosive (3-nitrotoluene), and many metals were detected.

Subsurface soil samples from the soil borings were field screened for organic vapors and were to be collected from the depth interval with the highest organic vapor reading. No organic vapors were detected; therefore, the samples from the depth interval directly below the surface soil sampling interval (1 to 2 feet or 2 to 3 feet bgs) were submitted for laboratory analysis. A few VOCs (2-butanone, acetone, and methylene chloride) and many metals were detected. Explosives were not detected.

A shallow groundwater sample was collected from the monitoring well installed in one of the soil borings. Four VOCs (1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, and trichloroethene), two explosives (HMX and RDX), and several metals were detected.

A MIP investigation was conducted in the vicinity of Building 1041 in 2007. Four probes were advanced during the effort; however, no significant contamination was identified in the subsurface.

The human health risk characterization resulted in an ILCR of 1×10^{-5}, which is within the EPA acceptable risk range of 1×10^{-4} to 1×10^{-6}. The total HI exceeded 1.0 even when the HI for each target organ was considered. The risk was associated with an elevated cobalt concentration detected in site groundwater.

Based on the ecological risk screening, VOCs, explosives, and metals were identified as preliminary COPCs. Following Step 3A, none of these chemicals were retained as COPCs.

The potential for migration of soil contaminants to groundwater is not considered to be problematic.

CONCLUSIONS AND RECOMMENDATIONS

Building 1040 Area

- There are unacceptable risks to human health based on a residential use scenario.
- There are no unacceptable risks to ecological receptors based on exposure to surface soil.
- Although migration of soil contaminants to groundwater is not considered to be problematic, the source of the trichloroethene detected in shallow groundwater was not found during the SSP investigation.
- Prior activities have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents at concentrations of potential environmental concern.
- Based on the nature and extent of chemicals detected in soil and shallow groundwater and the human health risk screening, additional investigation is warranted to determine the source and extent of shallow groundwater contamination detected near Building 1040.

Building 1041 Area

- There are unacceptable risks to human health based on a residential land use scenario.
- There are no unacceptable risks to ecological receptors based on exposure to surface soil.
- The potential for migration of soil contaminants to groundwater is not considered to be problematic.
- Prior activities have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous substances at concentration of potential environmental concern.
- Based on the nature and extent of the chemicals detected in shallow groundwater and the human health risk screening additional investigation is warranted to determine the source and extent of shallow groundwater contamination detected near Building 1041.

1.0 INTRODUCTION

This Site Screening Process (SSP) Report for Naval Support Facility Indian Head (NSF-IH) in Indian Head, Maryland was prepared by Tetra Tech NUS, Inc. (TtNUS) in response to Contract Task Order (CTO) 114 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-03-D-0057. NSF-IH is a Naval Support Activity South Potomac facility within the Naval District Washington Region. Until October 1, 2005, NSF-IH was referred to as Naval District Washington, Indian Head. The report describes the SSP for Site 43 – Toluene Disposal.

1.1 PURPOSE AND REPORT ORGANIZATION

The purpose of the SSP was to determine whether operations at Site 43 have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents at concentrations of potential environmental concern. According to the Federal Facility Agreement (FFA) (EPA Region 3 and DoN, 2000), a remedial investigation (RI)/feasibility study (FS) is required at Site 43. However, the Indian Head Installation Restoration Team (IHIRT) decided to conduct the SSP to verify that an RI was necessary.

Section 1.0 presents the purpose, objectives, and scope of this report and summarizes facility background information. Sections 2.0 and 3.0 provide the general investigative procedures and evaluation methods, respectively. Section 4.0 provides the results of the SSP for Site 43.

1.2 OBJECTIVE AND SCOPE

The objective of the SSP investigation was to collect sufficient data to provide the basis for a determination that either: (1) an RI/FS, an FS, another investigation, and/or removal action, as appropriate, is required by the area addressed by the SSP or (2) the area does not pose a threat or potential threat to public health, welfare, or the environment and therefore the area should be removed from further study under the FFA. The general scope of the SSP investigation at Site 43 was agreed upon by the IHIRT through approval of the SSP Investigation Work Plan (TtNUS, 2005). Subsequent to the initial investigation, two additional investigations were completed, the scope of each approved by the IHIRT through approval of follow-on work plans (TtNUS, 2007 and TtNUS, 2009).

The investigation process consisted of research, media sampling, and analytical data evaluation. The research consisted of a review of historical facility documents related to operations at Site 43. Soil and shallow groundwater samples were collected. Analytical data were evaluated via a formal data validation process, background comparisons, and human health and ecological risk screening analyses.

1.3 FACILITY BACKGROUND

NSF-IH is located in northwestern Charles County, Maryland. As shown on Figure 1-1, NSF-IH is approximately 25 miles southwest of Washington, D.C. NSF-IH is a military facility consisting of the Main Area on the Cornwallis Neck Peninsula and the Annex on Stump Neck. As shown on Figure 1-2, the Main Area is bounded by the Potomac River on the northwest, west, and south, Mattawoman Creek to the south and east, and the Town of Indian Head to the northeast. Stump Neck Annex is located across Mattawoman Creek and is not contiguous with the Main Area. The location of Site 43 is shown on Figure 1-2.

The primary mission of the Indian Head Division, Naval Surface Warfare Center (IHDIV-NSWC), the main tenant of NSF-IH, is as follows:

- To provide services in energetics for all warfare centers through engineering, fleet and operation support, manufacturing technology, limited production, and industrial base support.

- To provide research, development, testing, and evaluation of energetic materials, ordnance devices and components, and other related ordnance engineering standards including chemicals, propellants and their propulsion systems, explosives, pyrotechnics, warheads, and simulators.

- To provide support to all warfare centers, military departments, and the ordnance industry for special weapons, explosive safety, and ordnance environmental issues.

- To execute other responsibilities as assigned by the Commander of the IHDIV-NSWC.

2.0 GENERAL INVESTIGATIVE PROCEDURES

The initial investigation at Site 43 was conducted in accordance with the SSP Work Plan (TtNUS, 2005). This plan was developed to identify the presence or absence of contamination. Surface soil, subsurface soil, and shallow groundwater samples were collected. Following the completion of initial investigation, two additional investigations were conducted (2007 and 2009) to further characterize the site.

2.1 FIELD SAMPLING

2.1.1 Surface Soil Sampling

Six surface soil samples were collected from two locations near Building 1040 and four locations near Building 1041 using disposable trowels. The sample locations at Building 1040 and 1041 are provided on Figures 2-1 and 2-2, respectively. The samples were generally collected from depth intervals of 0 to 1 foot below ground surface (bgs). However, two samples near Building 1041 were collected from depth intervals of 1 to 2 feet bgs because the depth interval of 0 to 1 foot bgs consisted of asphalt pavement and road gravel. Sample log sheets and chain of custody forms are provided in Appendix A.

2.1.2 Subsurface Soil Sampling

Six subsurface soil samples were collected from two locations near Building 1040 and four locations near Building 1041 using disposable trowels. Four soil borings were advanced to depths of approximately 8 feet bgs using hollow-stem auger (HSA) drilling. Two soil borings were advanced to depths of approximately 20 feet bgs using HSA drilling and converted into shallow groundwater monitoring wells. Split-spoon samples were collected at 2-foot intervals and screened for organic vapors. The subsurface soil interval with the highest organic vapor reading was to be collected for analysis. No organic vapor readings were obtained during drilling; therefore, the subsurface soil samples were collected from the interval directly below the surface soil sample (i.e., 1 to 2 feet bgs or 2 to 3 feet bgs). Boring logs, sample log sheets, and chain of custody forms are provided in Appendix A.

2.1.3 Groundwater Sampling

Soil borings were converted into shallow groundwater monitoring wells at one location near Building 1040 and one location near Building 1041. The wells were constructed of 2-inch diameter polyvinyl chloride (PVC) with 10-foot long screens and were fitted with flush-mount surface casings. The wells were developed until field measurements for temperature, pH, specific conductance, and turbidity indicated stable conditions. Prior to sampling, the wells were purged using a low-flow peristaltic pump until the above field parameters had stabilized. Shallow groundwater samples were obtained using the same low-

flow pump. Well construction diagrams, well development records, low-flow purge data, sample log sheets, and chain of custody forms are provided in Appendix A.

2.1.4 Quality Control Samples

Quality assurance (QA)/quality control (QC) samples were collected in accordance with the work plan (TtNUS, 2005) and included field duplicates, equipment rinsate blanks, trip blanks, and matrix spike (MS) and matrix spike duplicate (MSD) samples. One field duplicate was collected for each type of sample (i.e., surface soil, subsurface soil, and groundwater). Equipment rinsate blanks were generated by pouring reagent grade water over the sampling equipment. A trip blank was included in every cooler containing samples for volatile organic compound (VOC) analysis One MS/MSD sample was collected for each medium (i.e., soil and groundwater).

2.2 2007 FIELD SAMPLING

Following the 2005 field investigation, a number of data gaps were identified by the IHIRT requiring attention at Site 43.

- What is the operational history of buildings in the area?
- Are sewer lines present that may be a source of contamination?
- What is the groundwater flow direction?
- What is the extent of the groundwater contaminant plume?
- Is dense non-aqueous phase liquid (DNAPL) present?
- What is the lithology of the area and is there a confining unit present?
- Where is the source of contamination?
- Samples should be analyzed for the full suite of analytical parameters.

To address some of these data gaps, a work plan was developed and approved that included the collection of subsurface data in the vicinity of Buildings 1040 and 1041 (TtNUS, 2007). The work plan was to be implemented as part of phased investigation of the site.

2.2.1 Membrane Interface Probe

The 2007 field investigation included expedited site characterization using direct-push technology (DPT) and Membrane Interface Probe (MIP) analyses as the initial phase. The MIP was used to detect VOCs in the subsurface at 10 locations (Figure 2-3). The MIP probe was mounted on a standard direct-push rod, with a carrier gas line running from the probe to a detector through the inside of the tooling. The device allowed the field geologist to detect VOCs as the MIP was driven to the specified depth. VOCs were

drawn through the system's semi-permeable membrane and transported via a clean carrier gas to a detector at the surface where VOCs were measured.

During the investigation, the MIP unit was equipped with three sensors. An electronic capture detector (ECD) sensor was used to detect chlorinated compounds such as TCE; a photoionization detector (PID) was used to detect aromatic hydrocarbons (e.g., benzene, toluene, ethylbenzene, and xylene); while a flame ionization detector (FID) was used to detect straight-chain hydrocarbons such as methane. The detectors could not identify individual compounds, however they were used to provide semi-quantitative results (low, medium, and high concentrations based on the relative response of the detector) for total VOCs appropriate to the specific detector. The logs

The MIP also incorporated a lithologic sensor to evaluate the subsurface characteristics of the area and the presence of any confining unit or aquitard.

Measurements of total VOCs were obtained between the water table and the confining unit to obtain a vertical profile of groundwater contamination at each location. The logs obtained during the investigation are provided in Appendix B.

2.2.2 Groundwater Sampling

Following the MIP investigation, a groundwater grab sample was collected at selected locations to confirm the MIP results and from existing wells S43MW001 and S43MW002 to update the results of the 2005 investigation. All groundwater samples were analyzed for TCL VOCs and were evaluated for the presence of dense non-aqueous phase liquid (DNAPL) using the Oil Red O dye field test. The test consists of dropping a drop of Oil Red O dye into the sample.

Field forms, including groundwater sample log sheets, temporary well construction forms, and chain-of-custody records, are provided in Appendix B.

2.3 2009 FIELD SAMPLING

Following the 2007 field investigation, the IHIRT recommended the collection of additional MIP data at Site 43. The plan for the field efforts was detailed in a work plan and approved by the IHIRT (TtNUS, 2009).

The 2009 field investigation included the placement of DPT probes at 14 locations, 9 adjacent to Building 1040 and 5 located near Building 1041. The locations are identified on Figure 2-4. As with the 2007

event, the MIP unit was equipped with an ECD, PID and FID to characterize VOCs in the subsurface. The logs from this investigation are provided in Appendix C.

2.4 LABORATORY ANALYSIS

The soil and groundwater samples collected in 2005 were analyzed for Target Compound List (TCL) VOCs, explosives, nitrocellulose, nitroglycerin, nitroguanidine, Target Analyte List (TAL) metals, and cyanide. The following analytical methods were used:

- TCL VOCs via Contract Laboratory Program (CLP) Statement of Work (SOW) OLC03.2 (shallow groundwater and aqueous QA/QC blanks) and SOW OLM04.2 (solids)
- Explosives and nitroguanidine via SW-846 Method 8330
- Nitrocellulose via United States Army Toxic and Hazardous Materials Agency (USATHAMA) method
- Nitroglycerin via SW-846 Method 8332
- TAL metals and cyanide via CLP SOW ILM04.1

The groundwater samples collected in 2007 were analyzed for TCL VOCs.

2.5 INVESTIGATION-DERIVED WASTE HANDLING

The investigation-derived waste (IDW) produced during the SSP investigation included borehole cuttings, decontamination fluids, disposable sampling equipment, personnel protective equipment (PPE), and miscellaneous trash. Borehole cuttings and decontamination fluids were placed in separate 55-gallon drums for subsequent testing and disposal. Samples were collected by the IDW disposal subcontractor and analyzed for the characteristics of a hazardous waste. Based on this testing, the IDW was hauled off site and disposed as nonhazardous waste. Disposable sampling equipment, PPE, and trash were double bagged in plastic trash bags and disposed in a dumpster at the facility.

2.6 SURVEYING

A registered land surveyor licensed to practice in the State of Maryland surveyed the soil boring and monitoring well locations during the 2005 field investigation. Horizontal locations were surveyed to Maryland State Plane coordinates [North American Datum (NAD) 1983]. Vertical elevations were surveyed to National Geodetic Vertical Datum, 1929 (NGVD29).

During the 2007 and 2009 field investigations, horizontal locations of the MIP points were determined using a global positioning system.

3.0 GENERAL DATA EVALUATION METHODS

3.1 DATA VALIDATION

All samples were subjected to data validation. Data validation is an objective, systematic process in which analytical data are reviewed to ascertain the validity of the reported results and to identify for the data user the possible limitations of these results. This section summarizes the various aspects of the data validation process. Appendix D contains the analytical data for all samples. Data validation memoranda are provided in Appendix E.

3.1.1 General Data Validation Procedures

Validation of the data generated for samples collected during the field effort was completed in accordance with United States Environmental Protection Agency (EPA) National Functional Guidelines for Organic and Inorganic Data Review as modified for use in EPA Region 3 (EPA, 1994a and 1993).

The organic data review was based on data completeness, holding times, gas chromatograph/mass spectrometer tuning, initial and continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, field duplicate precision, and detection limits.

The inorganic data review was based on data completeness, holding times, calibration data, laboratory method and preparation blanks, interference check sample results, MS results, laboratory duplicate results, post-digestion spike results, laboratory control sample results, field duplicate results, inductively coupled plasma serial dilution results, detection limits, and analyte quantitation.

Evaluation of laboratory and field QC blanks aided in the elimination of false positive results, which were identified as laboratory and/or field artifacts. Noncompliances observed during the validation process resulted in qualification of analytical data. The qualifiers alert the data user to imprecise or estimated results and, in the worst case, unreliable or unusable data.

The results of the validation process were summarized in sample delivery group-specific technical reports consisting of a memorandum, qualified analytical results, results as reported by the laboratory, and supporting documentation that provided the rationale for changes and/or qualification of the data. These memoranda provide a detailed explanation of the results of the data validation review. Copies of the data validation memoranda are included in Appendix E. All other data validation documentation is retained on field at the TtNUS Pittsburgh, Pennsylvania office.

3.1.2 Data Validation Qualifiers

Various qualifiers were attached to analytical data by the laboratory and as a result of the data validation process. The attachment of data qualifiers to analytical results signified the occurrence of QC noncompliance. The data qualifiers assigned to the analytical results for Site 43 are defined as follows:

- B – This qualifier is added to a positive result reported by the laboratory if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis. The result is considered to be a false positive.

- J – Indicates that the chemical was detected. However, based on laboratory noncompliances, the associated numerical result is not a precise representation of the amount that is actually present in the sample. The concentration reported by the laboratory is considered to be an estimated value. The bias (high or low) of this result cannot be determined.

- K – Indicates that the chemical was detected. However, the associated numerical result is not a precise representation of the amount that is actually in the sample. The concentration reported by the laboratory is considered to be biased high based on laboratory noncompliances noted during the data validation process.

- L – Indicates that the chemical was detected. However, the associated numerical result is not a precise representation of the amount that is actually in the sample. The concentration reported by the laboratory is considered to be biased low based on laboratory noncompliances noted during the data validation process.

- U – Indicates that the chemical was not detected at the numerical detection limit (sample-specific quantitation limit) noted. Nondetect results are reported in this manner by the laboratory.

- UJ – Indicates that the chemical was not detected. However, the detection limit (sample-specific quantitation limit) is considered to be estimated based on problems encountered during laboratory analysis, as noted during the data validation process. The associated numerical detection limit is regarded as inaccurate or imprecise. The bias (high or low) of this result cannot be determined.

- UL – Indicates that the chemical was not detected. However, the detection limit (sample-specific quantitation limit) is considered to be biased low based on problems encountered during laboratory

analysis, as noted during the data validation process. The associated numerical detection limit is regarded as inaccurate or imprecise.

- UR – Indicates that the chemical may or may not be present. The nondetect analytical result reported by the laboratory is considered to be unreliable and unusable. During the data validation process, this qualifier is applied in cases of gross laboratory technical deficiencies (i.e., holding times missed by a factor two times the specified time limit, severe calibration noncompliances, and extremely low QC recoveries).

The preceding data qualifiers may be categorized as indicative of major or minor problems. Major problems are defined as issues that result in the rejection of data, qualified with UR data validation qualifiers. These data are considered invalid and were not used for risk screening analysis or decision-making purposes. Minor problems are defined as issues resulting in estimation of data, qualified with B, J, K, L, UJ, and UL data validation qualifiers. Analytical results qualified as estimated or biased are suitable for risk screening analysis and decision-making purposes.

3.2 BACKGROUND DATABASE

A basewide background investigation was conducted at NSF-IH in 1997 (B&R Environmental, 1997). Additional background samples were collected, and the background investigation was revised in 2002 (TtNUS, 2002). The purpose of this investigation was to establish a basewide background database that would be used as a tool to evaluate analytical results for soil. The data are used to determine whether soil samples at NSF-IH contain chemicals at concentrations that are higher than naturally occurring background concentrations.

With few exceptions, the inorganic concentrations reported in background soils are within the range of background concentrations reported for soils in the eastern United States (Shacklette and Boerngen, 1984) and the State of Maryland (Dragun, 1991).

The background values for surface and subsurface soils are presented in Table 3-1. For the SSP, the 95-percent upper tolerance limit (UTL) was used as the threshold background concentration. Chemicals detected in soil samples at concentrations less than background were not considered as chemicals of potential concern (COPCs).

3.3 HUMAN HEALTH RISK SCREENING METHODOLOGY

The purpose of the human health risk screening was to conservatively estimate the potential risks to human health so that management decisions can be made (e.g., additional study or no further action).

The risk screening analysis conducted for SSP sites consists of the following steps, which are similar to those in a baseline human health risk assessment:

- Data evaluation (i.e., selection of COPCs)
- Exposure assessment
- Toxicity assessment
- Risk characterization

The risk screening analysis is based on methodologies used to calculate the Oak Ridge National Laboratory (ORNL) Regional Screening Levels (RSLs), which are the risk-based concentrations (RBCs) used by Region 3, to conservatively assess potential exposure and toxicity to human receptors. The RSLs for residential soil are based on a lifetime resident for carcinogens and a child resident for noncarcinogens. The RSLs for tap water are based on an adult resident for both carcinogens and noncarcinogens.

3.3.1 Selection of Chemicals of Potential Concern

The following factors were considered in the selection of COPCs for human receptors:

- Occurrence and distribution of chemicals in environmental media
- Chemical toxicity
- Comparison of site-specific concentrations with representative basewide background concentrations

3.3.1.1 Occurrence and Distribution

The initial list of COPCs included any chemical detected at least once in environmental samples. Essential human nutrients not otherwise known to be associated with the site (calcium, magnesium, potassium, and sodium) and present at low concentrations and toxic only at high doses were not included in the initial list of COPCs.

3.3.1.2 Chemical Toxicity

After the initial list of COPCs was completed, the data were further screened on the basis of chemical toxicity. For purposes of this report, the values used to select COPCs based on chemical toxicity are referred to as “risk screening levels.” In general, if the maximum detected concentration was greater than a risk screening level, the chemical was identified as a COPC. Because of the additive noncarcinogenic effects of some chemicals (some chemicals impact the same target organ or exhibit similar mechanisms of action), one-tenth of the RSL for noncarcinogenic effects was used as the risk screening level.

For soil, the following risk screening levels were used to select COPCs:

- ORNL RSLs for soil under residential land use (ORNL, April 2009)
- ORNL soil screening levels (SSLs) for migration of chemicals to groundwater (ORNL, April 2009)
- EPA SSLs for inhalation (transfers from soil to air) (calculated at http://rais.ornl.gov/epa/ssl1.shtml, March 2009)

Table 3-2 summarizes the human health risk screening levels for soil.

For groundwater, ORNL RSLs for tap water (ORNL, April 2009) were used to select COPCs. Table 3-3 summarizes the human health risk screening levels for groundwater.

3.3.1.3 Background

COPCs for inorganics in soil were also selected based on a comparison of site concentrations to representative basewide background concentrations. If the maximum detected concentration was greater than both the risk screening level and the representative background concentration, the chemical was retained as a COPC for further risk evaluation. If the maximum concentration was less than the background concentration, the chemical was not retained as a COPC.

3.3.2 Exposure Assessment

The human health exposure assessment defines and evaluates, quantitatively or qualitatively, the type and magnitude of human exposure to the COPCs. Potential human exposure to environmental media at Site 43 is expected to be limited. Based on the current and anticipated future land use and location of the site, military personnel, civilian employees, contractors, and trespassers are the most likely individuals exposed. However, to evaluate the site on a conservative basis, the risks were evaluated based on a hypothetical future residential exposure scenario.

For purposes of the risk screening analysis, maximum detected site concentrations and exposure assumptions used to derive the ORNL RSLs for soil ingestion, SSLs for inhalation (transfers from soil to air), and ORNL RSLs for tap water were used to assess potential exposure to environmental media.

3.3.3 Risk Characterization

The equations and exposure factors used by ORNL to calculate RSLs based on residential land use were used to estimate potential carcinogenic and noncarcinogenic risks at Site 43. For carcinogens, the

incremental lifetime cancer risk (ILCR) was calculated for each COPC by dividing the maximum concentration by the RSL based on an ILCR of $1X10^{-6}$. The individual ILCRs were added and compared to the EPA target risk range of $1X10^{-6}$ to $1X\ 10^{-4}$. If the total ILCR is within or less than this range, no action is needed at a site based on potential carcinogenic risk. For noncarcinogens, the hazard quotient (HQ) was calculated for each COPC by dividing the maximum concentration by the RSL based on an HQ of 1.0. The individual HQs were added to calculate the hazard index (HI), which was compared to the EPA target level of 1.0. If the HI is less than this value, no action is needed based on potential noncarcinogenic risk.

3.4 ECOLOGICAL RISK SCREENING METHODOLOGY

The screening-level ecological risk assessment (ERA) was conducted in accordance with EPA guidance (EPA, 1997 and 1998) and Navy policy (DoN, 1999). Steps 1 and 2 consist of a site visit, pathway identification/problem formulation, toxicity evaluation, exposure estimation, and risk calculation. Step 3A of the Navy approach consists of refining the conservative exposure assumptions, which may result in a reduced list of COPCs.

The goal of this ecological risk screening was to conduct an initial screening of the analytical data using conservative screening values and assumptions to determine whether Site 43 needed to be further evaluated as part of a baseline ERA. The following steps were completed for this risk screening:

- Problem formulation
- Exposure assessment
- Ecological effects assessment
- Risk characterization
- Step 3A – Refinement of COPCs

3.4.1 Problem Formulation

Problem formulation is the first step of the ERA and discusses the goals, breadth, and focus of the assessment. It includes a general description of the site with emphasis on the habitats and ecological receptors present. This phase also involves characterization of the site-related contaminants, contaminant sources, migration routes, and an evaluation of routes of contaminant exposure.

3.4.2 Exposure Assessment

This portion of the ecological risk screening includes identification of contaminant concentration data used to represent ecological exposure to various media and the selection of exposure point concentrations.

The ecological risk screening uses the maximum detected concentration as the exposure point concentration.

3.4.3 Ecological Effects Assessment

In the ecological effects assessment, screening levels for toxicity of each chemical to terrestrial receptors were compiled. There are no potential aquatic receptors at Site 43.

The EPA Ecological SSLs (EPA, 2005b) were used to screen for soil COPCs. These screening levels were supplemented with EPA Region 3 Biological Technical Assistance Group (BTAG) screening levels for soil (EPA, 1995), when necessary. Table 3-4 summarizes the ecological screening levels used to evaluate surface soil concentrations at Site 43.

3.4.4 Preliminary Risk Characterization

The preliminary risk characterization compares maximum site concentrations to ecological screening levels. When maximum concentrations are less than ecological screening levels, it is an indication that ecological receptors are not at risk. However, when maximum concentrations are greater than screening levels, additional evaluation of data is necessary to confirm with greater certainty whether ecological receptors are potentially at risk, especially because most screening levels are developed using conservative exposure assumptions or studies.

Chemicals that do not have screening levels were also retained as COPCs for further evaluation but will only be evaluated qualitatively. Calcium, magnesium, potassium, and sodium were excluded as COPCs because they are essential nutrients that can be tolerated by living systems even at high concentrations. Therefore, these chemicals will not be discussed in the ecological risk screening.

3.4.5 Step 3A – Refinement of Chemicals of Potential Concern

Step 3 of the eight-step ERA process is baseline ERA problem formulation. This step consists of several sub-steps designed to develop the goals, breadth, and focus of the baseline ERA. Generally this step is beyond the scope of the initial, screening-level ERA. However, the initial sub-step in the process is the refinement of COPCs. The use of conservative screening levels and maximum detected concentrations in the ecological risk screening is necessary to ensure that potential risks are not underestimated. However, if a comparison to conservative screening levels is used as the single factor for including a COPC in the baseline ERA without consideration of other information, additional studies such as toxicity testing or tissue analysis could be undertaken to investigate risks from a COPC that may not in actuality

pose significant risk. Step 3A involves certain tools to reduce the uncertainties and the conservative nature of the screening-level ERA. These items include the following:

- Alternate guidelines
- Background data (for inorganics)
- Frequency of detection/spatial analysis of concentrations exceeding guidelines

Table 3-5 presents the maximum chemical concentrations in soil samples that were collected for toxicity tests at Site 47 at NSF-IH as part of a baseline ERA (CH2MHILL, 2005). Because none of the surface soil was considered to be toxic, the maximum detected concentrations are considered no observed effects concentrations (NOECs), although they were not designated as such in the Site 47 baseline ERA. The Background Soil Investigation Report for Indian Head (TtNUS, 2002) concluded that the distinction between grain sizes in surface soil produced data sets that in most cases were not statistically significantly different from each other. The pH values in the background soils ranged from 4.5 to 7, but most results were between 4.5 and 5.5 and were similar to the pH levels in the soil at Site 47 (4.1 to 7.1, with most of the pH levels less than 6.0). The pH of soil at Site 43 was not measured but is likely within the pH range of Site 47 because background soils across NSF-IH are within that range. Grain size analysis was not conducted on the surface soil at Site 43, but the sampling logs describe the samples as silt to silty sand with gravel and clayey silt. The soil in the samples collected at Site 47 had varying levels of sand, silt, and gravel (CH2MHILL, 2005). Because the soil types appear to be relatively similar between Sites 43 and 47, the results of the earthworm toxicity tests conducted at Site 47 were used as a lines-of-evidence approach in the Step 3A evaluation for Site 43, where appropriate.

4.0 SITE SCREENING PROCESS RESULTS

4.1 BACKGROUND

Site 43 – Toluene Disposal includes two areas, separated by approximately 700 feet, along Gallery Road in the southwestern portion of the Main Area of NSF-IH. The first area is near the northern corner of Building 1040 near the intersection of Gallery and Schuyler Roads. The second area is near a utility pole approximately 30 feet northwest of and across Gallery Road from Building 1041. It was reported that, for a period of more than 2 years during parts-cleaning operations, unknown quantities of spent solvents were improperly disposed in the drainage ditch outside the door of Building 1040 (acetone) and at the base of the pole near Building 1041 (acetone and toluene).

A Preliminary Assessment (PA) was performed at Site 43 in 1991 (NEESA, 1992). The PA recommended a Site Inspection (SI) for the area near the utility pole across the road from Building 1041. Sampling was not recommended for the area near Building 1040 because acetone would readily volatilize under ambient conditions rather than migrate through the soil to groundwater.

An SI was performed in the Building 1041 area (E/A&H, 1994). Ten soil-gas borings were completed to approximately 12 feet bgs, and soil-gas samples were analyzed for VOCs. Toluene and chlorinated solvents were detected at 3 of the 10 soil-gas locations. Four surface soil samples (0 to 1 foot bgs) were collected near the utility pole and analyzed for VOCs and semivolatile organic compounds (SVOCs). The VOC acetone was detected at one location. No other VOCs or SVOCs were detected. The SI recommended additional sampling to determine whether VOCs were present in subsurface soil near the utility pole.

4.2 SITE CHARACTERISTICS

4.2.1 Topography and Surface Features

As illustrated on Figure 4-1, the area near Building 1040 is relatively flat. The area surrounding the building southwest of Schuyler Road is mostly covered with mowed grasses. The area northeast of Schuyler Road is mostly covered with unmowed grasses and trees.

As illustrated on Figure 4-1, the utility pole associated with Building 1041 is next to Gallery Road. A relatively steep earthen, grass-covered bunker is located immediately northwest of the utility pole. The area northeast of the site is relatively flat and covered with mowed grasses and a few trees.

Figure 4-2 shows photographs of the site near both buildings.

4.2.2 Surface Water

A drainage ditch is located between Building 1040 and Schuyler Road. The Building 1041 utility pole is located in a drainage ditch adjacent to Gallery Road. Runoff either infiltrates into the soil or is combined with other runoff from nearby areas. The combined runoff flows toward and eventually discharges to Mattawoman Creek through a series of drainage ditches and storm water pipes. The discharge point is more than 2,000 feet south of the site.

4.2.3 Geology/Soils

Logs from soil borings installed near Building 1040 indicate that shallow geologic conditions consist primarily of silty clay, clayey sand, and sandy clay overlain by silt to silty sand. Some gravel is present. The shallow geologic conditions near Building 1041 consist primarily of clayey sand, silty sand, sandy clay, and clayey silt overlain by clayey silt, silty clay, and silty sand. Some gravel is present, especially at locations near Gallery Road. Soil borings are provided in Appendices A and B.

4.2.4 Hydrogeology

The shallow groundwater beneath both areas is unconfined. Shallow groundwater was encountered at a depth of approximately 6.6 feet bgs near Building 1040 and 10.9 feet bgs near Building 1041. The shallow groundwater flow direction could not be determined from the two wells installed; however, the potentiometric surface is higher near Building 1040 than near Building 1041. A groundwater level measurement sheet is provided in Appendix A.

4.3 FIELD INVESTIGATION AND RESULTS

Surface and subsurface soil samples were collected at both site areas. One of the soil borings at each area was converted to a monitoring well, and shallow groundwater samples were collected on two occasions. The samples and analyses are summarized in Table 4-1. Sample log sheets are provided in Appendices A and B. Summaries of positive results for surface soil and subsurface soil samples are provided in Tables 4-2 and 4-3, respectively. A summary of the VOCs detected in groundwater during the 2005 and 2007 field efforts is provided in Table 4-4. All analytical data are provided in Appendix D.

4.3.1 Soil Boring and Monitoring Well Installation

In 2005, two soil borings (S43SB001 and S43SB002) were installed near Building 1040 to depths of 20 and 8 feet bgs, respectively, using HSA drilling. Monitoring well S43MW001 was installed at boring S43SB001 with a screened interval of 9 to 19 feet bgs.

In 2005, three soil borings (S43SB003 through S43SB005) were installed near Building 1041 to a depth of 8 feet bgs using HSA drilling. Soil boring S43SB006 was installed using HSA drilling to a depth of 23 feet bgs and was used to install monitoring well S43MW002 with a screened interval of 12 to 22 feet bgs.

The shallow groundwater monitoring wells were constructed of 2-inch-diameter PVC riser and screen and equipped with flush-mount surface casings with locks.

Soil boring logs, well construction diagrams, and State of Maryland well completion reports are provided in Appendix A.

4.3.2 Surface Soil Sampling

Surface soil samples were collected from two locations (S43SS001 and S43SS002) near Building 1040 and four locations (S43SS003 through S43SS006) near Building 1041. The soil samples were collected from depths of 0 to 1 foot bgs at locations S43SS001 through S43SS004. The samples at locations S43SS005 and S43SS006 were collected from depths of 1 to 2 feet bgs because the depth interval from 0 to 1 foot bgs consisted of asphalt pavement and road gravel. A field duplicate sample was collected at location S43SS003.

One VOC (methylene chloride), one explosive (nitrocellulose), and several metals were detected near Building 1040. Several VOCs (2-butanone, acetone, carbon disulfide, methylene chloride, and toluene), one explosive (3-nitrotoluene), and several metals were detected near Building 1041.

4.3.3 Subsurface Soil Sampling

Subsurface soil samples were collected from two locations (S43SB001 and S43SB002) near Building 1040 and four locations (S43SB003 through S43SB006) near Building 1041. Subsurface soil samples were field screened for organic vapors and were to be collected from the depth interval with the highest organic vapor reading. No organic vapors were detected; therefore, the depth intervals directly below the surface soil sampling interval were sampled (1 to 2 feet bgs at locations S43SB001 through S43SB004 and 2 to 3 feet bgs at locations S43SB005 and S43SB006). A field duplicate sample was collected at location S43SB003.

One VOC (trichloroethene) and several metals were detected near Building 1040. A few VOCs (2-butanone, acetone, and methylene chloride) and several metals were detected near Building 1041. Explosives were not detected in any subsurface soil sample.

4.3.4 Groundwater Sampling

In 2005, shallow groundwater samples were collected from the monitoring wells installed near Building 1040 (S43MW001) and Building 1041 (S43MW002). A field duplicate sample was collected at location S43MW001.

Two VOCs (cis-1,2-dichloroethene and trichloroethene), one explosive (RDX), and several metals were detected in shallow groundwater near Building 1040. Several VOCs (1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, and trichloroethene), two explosives (HMX and RDX), and several metals were detected in shallow groundwater near Building 1041. The VOC concentrations were many orders of magnitude greater in the sample near Building 1040.

In 2007, a groundwater grab sample was collected at 5 locations to confirm the MIP results and from groundwater monitoring wells S43MW001 and S43MW002 to update the results of the 2005 investigation. A field duplicate was collected at location S43MW01.

The samples were analyzed for TCL VOCs. Several VOCs were detected near Building 1040, however, TCE was the only constituent detected at a significant level. Table 4-4 provides a summary of positive detections of VOCs in groundwater near Buildings 1040 and 1041 and a comparison to screening criteria from the 2005 and 2007 investigations.

4.3.5 Membrane Interface Probes

During the 2007 field efforts, Membrane Interface Probe (MIP) locations were laid out at approximate 100-foot intervals to the north, east, south, and west of the existing permanent well (S43MW001). A MIP point was also located adjacent to this monitoring well. Initial MIP points were located 200 feet to the north, east, south, and west from S43MW001. VOCs were not detected at any of these locations, and subsequent MIP points were located 100 feet closer to S43MW001 on each line. An additional MIP point was located at an intermediate point off the initial lines. Groundwater grab samples were collected at each MIP location where VOCs were not detected. If two MIP locations on a particular line indicated no detections, the groundwater sample was collected from the location closest to S43MW001. Sampling locations are shown on Figure 4-1.

During the MIP investigation completed at Site 43 in November 2007, the most contaminated portion of the aquifer was identified at S43MIP01, with contamination extending west to S43MIP05. These were the only MIP locations with positive electron capture detector (ECD) readings. At S43MIP05, the ECD readings were lower than those at S43MIP01. The ECD log indicated contamination from approximately

19 feet below ground surface (bgs) to 27 feet bgs. The ECD log indicated a confining layer beginning at approximately 25 feet bgs. A summary of the 2007 results is provided in Table 4-5.

S43MIP01 was installed near existing well S43MW001. The MIP logs showed a significant positive response. A groundwater sample was collected from S43MW001 to confirm the MIP results and the results from the 2005 SSP investigation.

S43MIP02 was installed approximately 200 feet north of S43MIP01. The MIP logs did not show evidence of contamination; therefore, S43MIP03 was installed approximately 100 feet north of S43MIP01. The MIP logs did not show evidence of contamination. Temporary well S43TW004 was installed near S43MIP03, and a groundwater sample was collected to confirm the MIP results.

S43MIP07 was installed approximately 200 feet east of S43MIP01. The MIP logs did not show evidence of contamination; therefore, S43MIP08 was installed approximately 100 feet east of S43MIP01. The MIP logs did not show evidence of contamination. Temporary well S43TW005 was installed near S43MIP08, and a groundwater sample was collected to confirm the MIP results.

S43MIP06 was installed approximately 200 feet south of S43MIP01. The MIP logs did not show evidence of contamination; therefore, S43MIP09 was installed approximately 100 feet south of S43MIP01. The MIP logs did not show evidence of contamination. Temporary well S43TW003 was installed near S43MIP09, and a groundwater sample was collected to confirm the MIP results.

S43MIP04 was installed approximately 200 feet west of S43MIP01. The MIP logs did not show evidence of contamination; therefore S43MIP05 was installed 100 feet west of S43MIP01. The MIP logs did show a significant positive response. Temporary well S43TW002 was installed near S43MIP04, and a groundwater sample was collected to confirm the MIP results.

S43MIP10 was installed approximately 100 feet north of S43MIP05 and approximately 175 northwest of S43MIP01 to estimate the extent of contamination detected at locations S43MIP01 and S43MIP05. The MIP logs did not show evidence of contamination. However, temporary well S43TW001 was installed near S43MIP10, and a groundwater sample was collected to confirm the MIP results.

The MIP also has a soil conductivity, or electrical conductivity (EC), probe to evaluate subsurface characteristics and the presence of any confining unit or aquitard. Soil boring S43SB07 was installed near S43MIP10 using DPT. Soil borings S43SB002 (for existing monitoring well S43MW001) and S43SB07 were used to evaluate the correlation between the MIP EC logs and the lithologic logs from the

borings. Soil from these borings was screened for organic vapors in the field using a hand-held PID. None were detected.

During the investigation completed in 2009, MIPs were advanced at nine locations near Building 1040 and at five locations in the vicinity of Building 1041.

At Building 1040, MIP points S43MIP16 through S43MIP24 were advanced to further refine the limits of contamination near monitoring well S43MW001. The probes were advanced to depths ranging from approximately 25 to 29 feet bgs. As indicated by the conductivity probe, a confining unit was identified in the subsurface at a depth ranging from approximately 23 to 25 feet bgs. Elevated ECD readings, indicating the presence of chlorinated compounds, were recorded at S43MIP17 (at 12 feet bgs), S43MIP19 (at 18 feet bgs) and S43MIP20 (at 12 feet bgs). All 3 locations were located within 45 feet of S43MW001, the location of the elevated TCE measurements during the prior investigations. No other significant readings were recorded adjacent to Building 1040.

At Building 1041, MIP points S43MIP11 through S43MIP15 were placed. The probes were advanced to depths ranging from approximately 19 to 25 feet bgs, with a confining unit identified in the subsurface at a depth ranging from approximately 16 to 23 feet bgs. No significant detections were made at any location; however, a PID reading in the shallow subsurface at S43MIP13 was noted. The result is indicative of a surface release of aromatic hydrocarbons, possibly fuel associated with lawn maintenance activities.

4.4 HUMAN HEALTH RISK SCREENING EVALUATION

This section contains the results of the human health risk screening evaluation. The methodology used to screen for COPCs and to estimate risks is provided in Section 3.3. Separate risk screening evaluations were conducted for the site areas near Buildings 1040 and 1041 because the shallow groundwater concentrations are much greater near Building 1040.

4.4.1 Building 1040 Area

Tables 4-6 and 4-7 are summaries of the Building 1040 surface soil and subsurface soil data, respectively, and include frequencies of detection, ranges of detections, samples containing maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The tables also compare maximum concentrations to representative basewide background concentrations and to human health screening criteria and summarize COPC selection and rationale. The only COPC for surface soil is chromium, and the only COPC for subsurface soil is manganese.

The maximum concentrations of two VOCs (methylene chloride in surface soil and trichloroethene in subsurface soil) exceeded screening levels for migration from soil to groundwater. Methylene chloride was not detected in shallow groundwater. Although trichloroethene was detected in shallow groundwater, the soil concentration (8 µg/kg) would not be expected to cause the concentration detected in shallow groundwater (36,000 µg/L). Although the exceedance of the SSL for migration of soil to groundwater indicates that trichloroethene could potentially migrate to groundwater, the source of the trichloroethene detected in shallow groundwater was not found during the SSP investigation.

The maximum concentrations of several metals in surface and subsurface soil also exceeded screening levels for migration from soil to groundwater. The maximum concentrations of arsenic, chromium, cobalt, iron, lead, and manganese in surface soil exceeded the ORNL SSLs for protection of groundwater. In subsurface soil, arsenic, chromium, cobalt, iron, and manganese exceeded these screening levels. However, if the screening value were based on a DAF of 20 (i.e., the screening level were multiplied by 20), which is more appropriate for metals, only arsenic, cobalt, and iron in surface soil and arsenic and iron in subsurface soil would exceed the SSLs. Additionally, the maximum concentrations of arsenic, cobalt, and iron are less than site background concentrations. Cobalt, iron, and manganese were selected as COPCs in groundwater. However, the maximum concentrations of iron and manganese in groundwater were within one order of magnitude of the tap water risk screening levels used. The concentrations of iron and manganese in groundwater are also less than the actual RSLs for these metals (1/10 the RSL was used as the noncarcinogenic risk screening level). Therefore, migration of metals from site soil to groundwater is not considered to be problematic.

Table 4-8 is a summary of the Building 1040 shallow groundwater data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares maximum concentrations to current human health screening criteria and summarizes COPC selection and rationale. COPCs for shallow groundwater are bromoform, trichloroethene, antimony, cobalt, iron, and manganese.

Table 4-9 provides a human health risk evaluation for the COPCs discussed above for soil and shallow groundwater. The total ILCR was estimated by dividing the maximum concentrations by the respective carcinogenic RSLs (based on residential exposure and a $1X\ 10^{-6}$ cancer risk) and adding the results for each COPC. The total HQ was estimated by dividing the maximum concentrations by the respective noncarcinogenic RSLs (based on residential exposure) and adding the results for each COPC. The estimated cumulative ILCR is $2X\ 10^{-2}$, which is approximately two orders of magnitude greater than the EPA acceptable risk range of $1X\ 10^{-4}$ to $1X\ 10^{-6}$. The total HI is 5, which is greater than the EPA threshold of 1.0. The cancer risk is primarily driven by trichloroethene in shallow groundwater.

Trichloroethene was detected in only 2 of 6 groundwater samples, with positive detections of 3.6 µg/L and 36,000 µg/L. Cobalt in shallow groundwater is a primary risk driver for noncarinogenic risk. There are no unacceptable risks to human health associated with exposure to soil near Building 1040 under a residential land use scenario.

4.4.2 Building 1041 Area

Tables 4-10 and 4-11 are summaries of the Building 1041 surface soil and subsurface soil data, respectively, and include frequencies of detection, ranges of detections, samples containing the maximum detected concentration, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The tables also compare maximum concentrations to representative basewide background concentrations and to human health screening criteria and summarize COPC selection and rationale. There are no COPCs for surface soil. Iron is the only COPC for subsurface soil.

The maximum concentration of one VOC (methylene chloride) in surface and subsurface soil exceeded screening levels for migration from soil to groundwater. Methylene chloride was not detected in shallow groundwater; therefore, migration of VOCs to groundwater is not considered to be problematic.

The maximum concentrations of several metals in surface and subsurface soil also exceeded screening levels for migration from soil to groundwater. The maximum concentrations of barium, chromium, cobalt, and lead in surface soil and chromium, cobalt, and lead in subsurface soil exceeded these screening levels based on a DAF of 1 but not for a DAF of 20, which is more appropriate for metals. In addition, the maximum concentrations of arsenic, chromium, cobalt, iron, and lead in surface and subsurface soil and manganese in surface soil were less than basewide background concentrations. The maximum concentrations of arsenic and iron in surface and subsurface soil and manganese is surface soil exceeded these screening level based on a DAF of 20; however, the maximum concentrations for these metals were less than basewide background concentrations. Neither arsenic nor chromium was a COPC for groundwater, as discussed below. Although manganese was identified as a COPC for groundwater, it is below background soil concentrations and does not pose an unacceptable risk to human health in groundwater, as discussed below.

Table 4-12 is a summary of the Building 1041 shallow groundwater data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares maximum concentrations to current human health screening criteria and summarizes COPC selection and rationale. COPCs for shallow groundwater are 1,1-dichloroethane, trichloroethene, antimony, cobalt, manganese, and nickel.

Table 4-13 provides a human health risk evaluation for the COPCs discussed above for soil and shallow groundwater. The total ILCR was estimated by dividing the maximum concentrations by the respective carcinogenic RSLs (based on residential exposure and a 1X 10^{-6} cancer risk) and adding the results for each COPC. The total HQ was estimated by dividing the maximum concentrations by the respective noncarcinogenic RSLs (based on residential exposure) and adding the results for each COPC. The estimated cumulative ILCR is 1X 10^{-5}, which is within the EPA acceptable range of 1X 10^{-4} to 1X 10^{-6}. The cumulative HI is 12, which is greater than the EPA threshold of 1.0. The HI for soil is 0.75, which is less than the EPA threshold. Therefore, there are no unacceptable risks to human health associated with soil exposure for residential land use. However, the HI for groundwater is 10.8, which is greater than the EPA threshold. The noncancer risk is primarily driven by cobalt. Cumulative HIs for several target organs (central nervous system, cardiovascular system, immune system) are greater than 1.0.

4.5 ECOLOGICAL RISK SCREENING EVALUATION

This section contains the results of the ecological risk screening evaluation. The methodology used to screen for COPCs and to estimate risks is provided in Section 3.4. Information on site features is discussed elsewhere in this report and is not repeated in this section.

VOCs, explosives, and metals could have been present in the waste solvents that were disposed near Buildings 1040 and 1041 and were detected in soil samples collected in these areas. Contaminants present in the waste would have been deposited in the immediate vicinity of disposal or could have migrated to downstream areas of the drainage swales present at both areas.

The ecological risk screening is not an in-depth evaluation because of the relatively small sizes of the suspected disposal areas near Buildings 1040 and 1041 and the site setting (semi-industrial area). Likely receptors for exposure to surface soil contaminants would be soil invertebrates and plants rather than wildlife. However, the lowest available screening level was used for the preliminary screening.

4.5.1 Steps 1 and 2 – Preliminary Screening

Table 4-14 is a summary of the Site 43 surface soil data and includes frequencies of detection, ranges of detections, samples containing the maximum detected concentrations, ranges of nondetected concentrations, average concentrations, and concentrations used for screening (i.e., maximum concentrations). The table also compares the maximum concentrations to representative basewide background concentrations for surface soil and ecological screening levels and summarizes COPC selection and rationale. Ecological COPCs for surface soil include VOCs (2-butanone, acetone, and

carbon disulfide), explosives (3-nitrotoluene and nitrocellulose), and metals (barium, chromium, copper, lead, mercury, nickel, and zinc).

4.5.2 Step 3A – Refinement of COPCs

The methodology for refinement of COPCs is discussed in Section 3.4.5. VOCs, explosives, and metals were identified as preliminary COPCs.

4.5.2.1 Volatile Organic Compounds

Three VOCs (acetone, 2-butanone, and carbon disulfide) were initially selected as COPCs because screening levels are not available for these chemicals. Although no toxicity data are available to evaluate risks to plants and invertebrates from these chemicals, VOCs are typically not very toxic to ecological receptors at low concentrations, as indicated by the relatively high BTAG screening levels for other VOCs (100 or 300 µg/kg). The maximum detected concentrations of acetone, 2-butanone, and carbon disulfide were less than 100 µg/kg. Therefore, impacts to plants or invertebrates from these VOCs are unlikely. Consequently, they are eliminated as COPCs in surface soil for risks to plants and invertebrates.

4.5.2.2 Explosives

Two explosives were initially selected as COPCs because screening levels are not available for these chemicals. Nitrocellulose is generally an inert substance and, as such, is not expected to be toxic to plants or invertebrates. 3-Nitrotoluene was only detected in one sample (S43SS0050001) that was collected at a depth interval of 1 to 2 feet bgs beneath a layer of asphalt pavement and road gravel. This would limit exposure to plants and invertebrates. Therefore, impacts to plants or invertebrates from these explosives are unlikely. Consequently, they are eliminated as COPCs in surface soil for risks to plants and invertebrates.

4.5.2.3 Metals

Barium was initially selected as a COPC because it was detected at a concentration that exceeded its screening level, which is based on risks to soil invertebrates. The exceedance occurred in a field duplicate sample (S43SS0030001-D). However, the concentration in the sample associated with the duplicate was 165 mg/kg, which is less than the screening level (330 mg/kg). The average concentration at this location was 311 mg/kg, which is also less than the screening level. No other samples had barium concentrations greater than the screening level. Also, no samples had concentrations greater than the Oak Ridge National Laboratory (ORNL) plant benchmark value of 500 mg/kg (Efroymson, et al., 1997), so impacts to plants are not likely. Although it is possible that soil invertebrates may be impacted at one location, the elevated barium level appears to be an isolated occurrence. Therefore, potential impacts

are not widespread, and barium is eliminated as a COPC in surface soil for risks to plants and invertebrates.

Chromium was initially selected as a COPC because it was detected at a concentration that exceeded its screening level, which is based on risks to mammals and birds. The Canadian Soil Quality Guideline (SQG) for chromium (EC, 1999a), which is protective of plants and invertebrates, is 64 mg/kg. The maximum chromium concentration (37.5 mg/kg) was less than the SQG, so impacts to plants and invertebrates are unlikely. Therefore, chromium is eliminated as a COPC in surface soil for risks to plants and invertebrates.

Lead was initially selected as a COPC because it was detected at concentrations that exceeded its screening level, which is based on risks to mammals and birds. The SSLs for plants and invertebrates (EPA, 2005b) are 120 and 1,700 mg/kg, respectively. No samples had lead concentrations greater than these SSLs, so impacts to plants or invertebrates are not likely. Therefore, lead is eliminated as a COPC in surface soil for risks to plants and invertebrates.

Mercury was initially selected as a COPC because it was detected at concentrations that exceeded its screening level. The Canadian SQG for mercury (EC, 1999b), which is protective of plants and invertebrates, is 12 mg/kg. Also, the NOEC from the Site 47 baseline ERA (CH2MHILL, 2005) is 3 mg/kg. The maximum detected concentration (0.34 mg/kg) in one sample (S43SS0040001) was much less that the Canadian SQG and the NOEC, so impacts to plants and invertebrates are not expected. Therefore, mercury is eliminated as a COPC in surface soil for risks to plants and invertebrates.

Copper, nickel, and zinc were initially selected as COPCs because they were detected at concentrations that exceeded their respective screening levels. The Canadian SQGs for copper, nickel, and zinc (EC, 1999c, 1999d, and 1999e), which are protective of plants and invertebrates, are 63, 50, and 200 mg/kg, respectively. The maximum concentrations of copper (25.7 mg/kg), nickel (38.8 mg/kg), and zinc (70.8 mg/kg) were less than the SQGs, so impacts to plants and invertebrates are not likely. Therefore, these metals are eliminated as COPCs in surface soil for risks to plants and invertebrates.

4.5.3 Ecological Risk Screening Summary

VOCs (acetone, 2-butanone, and carbon disulfide), explosives (nitrocellulose and 3-nitrotoluene), and metals (barium, chromium, copper, lead, mercury, nickel, and zinc) were identified as preliminary COPCs for surface soil based on comparisons of the maximum detected concentrations to conservative screening levels. For Step 3A, the maximum concentrations were then compared to alternate guidelines. The frequencies of detection and the distribution of the COPCs were also evaluated.

No toxicity data are available to evaluate risks to plants and invertebrates from the detected VOCs, which are typically not very toxic to ecological receptors at low concentrations. However, the maximum detected concentrations are less than screening levels for other VOCs. Therefore, VOCs were not retained as COPCs.

There are no alternative guidelines for the explosives. Nitrocellulose is considered to be an inert substance and, as such, is not expected to be toxic to plants or invertebrates. 3-Nitrotoluene was only detected at one location at a depth of 1 to 2 feet bgs, which would limit exposure to ecological receptors. Therefore, explosives were not retained as COPCs.

The maximum detected concentration of barium occurred in a field duplicate sample (S43SS0050001-D). However, the concentration in all other samples, including the sample associated with the duplicate, were less than the screening level and alternate guidelines. The maximum detected concentrations of the other metals were less than alternate guidelines. Therefore, metals were not retained as COPCs.

4.6 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

4.6.1 Building 1040 Area

- The portion of Site 43 near Building 1040 is a small area where spent solvents were disposed in a drainage ditch. Waste constituents would have been deposited directly in the ditch, could have migrated to downstream areas, and/or could have migrated to shallow groundwater.

- In 2005, two soil borings were installed, and one of the borings was converted into a monitoring well. A surface soil and subsurface soil sample were collected from each boring, and a shallow groundwater sample was collected from the monitoring well. All samples were analyzed for TCL VOCs, explosives, nitrocellulose, nitroglycerin, nitroguanidine, TAL metals, and cyanide. Groundwater samples were collected in 2007 and analyzed for TCL VOCs. The 2007 groundwater data replaced the 2005 groundwater data for VOCs in the human health risk screening evaluation.

- Based on the human health risk screening, chromium was identified as a COPC for surface soil, manganese was identified as a COPC for subsurface soil, and bromoform, trichloroethene, antimony, cobalt, iron, and manganese were identified as COPCs for shallow groundwater. The risk characterization resulted in a total ILCR of 2X 10^{-2}, which is approximately 2 orders of magnitude greater than the EPA acceptable risk range. The total HI was 5, which exceeds the EPA threshold of 1.0. The unacceptable cancer risk is driven primarily by the high detection (36,000 µg/L) of trichloroethene in shallow groundwater. The noncancer risk is driven by cobalt in shallow

groundwater. There are no unacceptable risks to human health associated with exposure to soil under a residential land use scenario.

- Although the criteria exceedance for trichloroethene indicates the potential for migration of trichloroethene from soil to groundwater, the source of the trichloroethene detected in shallow groundwater was not found during the SSP investigation.

- The vapor intrusion pathway was not assessed in the human health risk screening evaluation. Potential vapor intrusion risks due to trichloroethene will be investigated in a future evaluation.

- VOCs, explosives, and metals were identified as preliminary ecological COPCs for surface soil. Following Step 3A, none of these chemicals were retained as COPCs.

- Prior activities have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents at concentrations of potential environmental concern.

- Based on the nature and extent of chemicals detected in soil and shallow groundwater and the human health risk screening, additional investigation is warranted to determine the source and extent of shallow groundwater contamination. The investigation would include the installation of permanent monitoring wells to verify the nature and extent of groundwater contamination and the groundwater flow direction. Samples collected from the new and existing monitoring wells would be analyzed for TCL VOCs, TCL SVOCs, pesticides, and polychlorinated biphenyls, explosives, TAL metals, and cyanide. In addition slug tests would be conducted in all new and existing monitoring wells to determine hydraulic conductivity.

4.6.2 Building 1041 Area

- The portion of Site 43 near Building 1041 is a small area near a utility pole where spent solvents were disposed on the ground. Waste constituents would have been deposited directly on the ground, could have migrated to downgradient areas, and/or could have migrated to shallow groundwater.

- In 2005, four soil borings were installed around the utility pole, and one of the borings was converted into a monitoring well. Surface and subsurface soil samples were collected from each boring, and a shallow groundwater sample was collected. All samples were analyzed for TCL VOCs, explosives, nitrocellulose, nitroglycerin, nitroguanidine, TAL metals, and cyanide. In 2007, groundwater samples were collected and analyzed for TCL VOCs. The 2007 groundwater data replaced the 2005 groundwater data for VOC analytes in the human health risk screening evaluation.

- Based on the human health risk screening, iron was identified as a COPC for subsurface soil and 1,1-dichloroethane, trichloroethene, antimony, cobalt, manganese, and nickel were identified as COPCs for shallow groundwater. There were no COPCs for surface soil. The risk characterization resulted in a total ILCR of 1E-05, which is within the EPA acceptable risk range. The HI for some target organs exceeded the EPA threshold of 1.0, caused by the concentrations of cobalt in groundwater. There are no unacceptable risks to human health associated with exposure to soil under a residential land use scenario.

- The potential for migration of soil contaminants to groundwater is not considered to be problematic.

- VOCs, explosives, and metals were identified as preliminary ecological COPCs for surface soil. Following Step 3A, none of these chemicals were retained as COPCs.

- Prior activities have resulted in the release of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents at concentrations of potential environmental concern.

- Based on the nature and extent of the chemicals detected in soil, the area of Site 43 near Building 1041 does not pose a threat or potential threat to public health, welfare, or the environment. The noncancer risk results of the human health risk screening exceeded the EPA target level due to cobalt in groundwater. Additional investigation is warranted to determine the source and extent of shallow groundwater contamination. Given the limited number of COPCs (cobalt) detected, the existing monitoring well would be resampled to confirm the prior finding. The installation of additional monitoring wells may then be needed. Also a comparison with background data at the facility would be performed to characterize the nature of the contamination.

REFERENCES

Brown & Root (B&R) Environmental, 1997. Background Investigation Report for Indian Head and Stump Neck Annex, Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland. Prepared for Engineering Field Activity Chesapeake, Naval Facilities Engineering Command, Washington Navy Yard, D.C. King of Prussia, Pennsylvania.

CH2MHILL, 2005. Draft Baseline Ecological Risk Assessment, Site 47, Naval District Washington, Indian Head, Maryland. Prepared for the Department of the Navy, Naval Facilities Engineering Command, Washington. Herndon, Virginia.

DoN (Department of the Navy), 1999. Navy Policy for Conducting Ecological Risk Assessments. Memo from Chief of Naval Operations to Commander, Naval Facilities Engineering Command, 05 April 1999, Department of the Navy, Washington, D.C.

Dragun, J., 1991. Elements in North American Soils. HMCRI, Greenbelt, Maryland.

E/A&H (Ensafe/Allen & Hoshall), 1994. Final Site Inspection Report, Phase II, Indian Head Division, Naval Warfare Center. Memphis, Tennessee.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten, 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revisions. ES/ER/TM-85-R3, Oak Ridge National Laboratory, Tennessee.

EC (Environmental Canada), 1999a. Canadian Soil Quality Guidelines for Chromium. Scientific Supporting Document. National Guidelines and Standards Office, Environmental Quality Branch, Environment Canada. Ottawa, Ontario.

EC, 1999b. Canadian Soil Quality Guidelines for Mercury. Scientific Supporting Document. National Guidelines and Standards Office, Environmental Quality Branch, Environment Canada. Ottawa, Ontario.

EC, 1999c. Canadian Soil Quality Guidelines for Copper. Scientific Supporting Document. National Guidelines and Standards Office, Environmental Quality Branch, Environment Canada. Ottawa, Ontario.

EC, 1999d. Canadian Soil Quality Guidelines for Nickel. Scientific Supporting Document. National Guidelines and Standards Office, Environmental Quality Branch, Environment Canada. Ottawa, Ontario.

EC, 1999e. Canadian Soil Quality Guidelines for Zinc. Scientific Supporting Document. National Guidelines and Standards Office, Environmental Quality Branch, Environment Canada. Ottawa, Ontario.

EPA (United States Environmental Protection Agency), 1993. Region 3 Modifications to National Functional Guidelines for Inorganic Data Review, Multi-Media, Multi-Concentration. Philadelphia, Pennsylvania.

EPA, 1994a. Region 3 Modifications to National Functional Guidelines for Organic Data Review, Multi-Media, Multi-Concentration. Philadelphia, Pennsylvania.

EPA, 1994b. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. Office of Solid Waste and Emergency Response, Washington, D.C.

EPA, 1995. Region 3 BTAG Screening Levels. Region 3 Biological Technical Assistance Group (BTAG). Philadelphia, Pennsylvania.

EPA, 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006, Office of Solid Waste and Emergency Response, Washington, D.C.

EPA, 1998. Final Guidelines for Ecological Risk Assessment. EPA/630/R-95/002F, Risk Assessment Forum, Washington, D.C.

EPA, 2003. EPA Region 3 Risk-Based Concentration Table: Technical Background Information, Revised April 16, 2003. Philadelphia, Pennsylvania.

EPA, 2004. Soil Screening Guidance for Chemicals. Calculations from EPA Internet Site http://risk.lsd.ornl.gov/calc_start.shtml. Washington, D.C.

EPA, 2005a. Region 3 Risk-Based Concentrations (October update). Hazardous Waste Management Division, Philadelphia, Pennsylvania.

EPA, 2005b. EPA Ecological Soil Screening Levels (http://www.epa.gov/ecotox/ecossl/). Washington, D.C.

EPA Region 3 and DoN, 2000. Federal Facility Agreement. U.S. Department of the Navy, Naval Surface Warfare Center, Indian Head Division, Indian Head, Maryland. Docket Number: III-FCA-CERC-018.

NEESA (Naval Energy and Environmental Support Activity), 1992. Preliminary Assessment Report, Naval Ordnance Station, Indian Head, Maryland. Port Hueneme, California.

ORNL (Oak Ridge National Laboratory), 2009. Regional Screening Levels for Chemical Contaminants at Superfund Sites, April.

Shacklette, Hansord T., and Josephine G. Boerngen, 1984. Element Concentrations in Soils and other Surficial Materials in the Conterminous United States. United States Geological Survey Professional Paper 1270, Washington, D.C.

TtNUS (Tetra Tech NUS, Inc.), 2002. Background Soil Investigation Report for Indian Head and Stump Neck Annex, Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland. Prepared for Engineering Field Activity Chesapeake, Naval Facilities Engineering Command, Washington Navy Yard, D.C. King of Prussia, Pennsylvania.

TtNUS, 2005. Work Plan for Site Screening Process Investigation at Site 43 – Toluene Disposal, Naval District Washington, Indian Head, Maryland. Prepared for Naval Facilities Engineering Command Washington, Washington Navy Yard, D.C. King of Prussia, Pennsylvania.

TtNUS, 2007. Technical Memorandum, Site 43 Phase 1 Supplemental SSP Investigation Work Plan, Site 43 - Toluene Disposal, NSF-IH, Indian Head, Maryland.

TtNUS, 2009. Technical Memorandum, Site 43 Phase 1A Supplemental SSP Investigation Work Plan, Site 43 - Toluene Disposal, NSF-IH, Indian Head, Maryland.

USEPA, 2009. Soil Screening Levels. EPA Internet Site, March. http://risk.lsd.ornl.gov/calc.start.htm.

TABLE 3-1

BASEWIDE BACKGROUND CONCENTRATIONS
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Surface Soil (mg/kg)[(1)]	Subsurface Soil (Non-Clay-Like) (mg/kg)[(1)]
Aluminum	19,700	21,400
Antimony	ND	ND
Arsenic	14.9	28.7
Barium	80.4	66.5
Beryllium	1.1	1.5
Cadmium	2.5	0.61
Calcium	2,060	1,270
Chromium	33.4	59.1
Cobalt	22.3	14.7
Copper	20.3	47.6
Iron	38,500	35,200
Lead	62.5	38.6
Magnesium	1,620	2,940
Manganese	1,390	155
Mercury	0.16	0.14
Nickel	15.4	15.9
Potassium	1,470	3,440
Selenium	1.2	3.8
Silver	0.84	1.1
Sodium	120	461
Thallium	2.3	4.1
Vanadium	53.3	102
Zinc	37.5	49.7

1 95-percent upper tolerance limit.

Source: TtNUS, 2002.

ND – Not detected.

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	ORNL Regional Screening Level[1]			EPA SSL[2]	
	Residential Soil		Soil to GW (DAF=1)	Soil to Air	
Volatile Organics (µg/kg)					
1,1,1-Trichloroethane	9,000,000	N	3,300	1,200,000	sat
1,1,2,2-Tetrachloroethane	590	C	0.028	580	C
1,1,2-Trichloroethane	1,100	C	0.082	970	C
1,1,2-Trichlorotrifluoroethane	43,000,000	N	150,000	930,000	sat
1,1-Dichloroethane	3,400	C	0.7	1,200,000	N
1,1-Dichloroethene	250,000	N	120	290,000	N
1,2,4-Trichlorobenzene	87,000	N	13	180,000	N
1,2-Dibromo-3-chloropropane	5.6	C	0.00015	23,000	N
1,2-Dibromoethane	34	C	0.0019	0.1	C
1,2-Dichlorobenzene	2,000,000	N	400	600,000	sat
1,2-Dichloroethane	450	C	0.044	360	C
1,2-Dichloropropane	930	C	0.13	15,000	N
1,3-Dichlorobenzene	---		---	---	
1,4-Dichlorobenzene	2,600	C	0.46	11,000,000	N
2-Butanone	28,000,000	N	1,500	24,000,000	sat
2-Hexanone	---		---	---	
4-Methyl-2-pentanone	5,300,000	N	440	2,700,000	sat
Acetone	61,000,000	N	4,400	---	
Benzene	1,100	C	0.23	830	C
Bromodichloromethane	280	C	0.033	---	
Bromoform	61,000	C	2.3	52,000	C
Bromomethane	7,900	N	2.2	9,400	N
Carbon disulfide	670,000	N	270	720,000	sat
Carbon tetrachloride	250	C	0.079	330	C
Chlorobenzene	310,000	N	68	130,000	N
Chlorodibromomethane	700	C	0.04	470	C
Chloroethane	15,000,000	N	6000	1,200,000	sat
Chloroform	300	C	0.055	280	C
Chloromethane	120000	N	49	2,100	C
cis-1,2-Dichloroethene	780000	N	110	---	
cis-1,3-Dichloropropene	1,700[3]	C	0.16[3]	1100[3]	C
Cyclohexane	7,200,000	N	13,000	8.51E+12	N
Dichlorodifluoromethane	190,000	N	610	250,000	N
Ethylbenzene	5,700	C	1.9	400,000	sat
Fluorotrichloromethane	800,000	N	840	1,100,000	N
Isopropylbenzene	2,200,000	N	1,300	850,000	sat
Methyl acetate	78,000,000	N	7,600	---	
Methyl tert-butyl ether	39,000	C	2.7	8,700,000	sat
Methylcyclohexane	---		---	490,000	sat
Methylene chloride	11,000	C	1.2	13,000	C

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND
PAGE 2 OF 3

Chemical	ORNL Regional Screening Level[1]			EPA SSL[2]	
	Residential Soil		Soil to GW (DAF=1)	Soil to Air	
Volatile Organics (µg/kg) (Continued)					
Styrene	6,500,000	N	2,000	1,500,000	sat
Tetrachloroethene	570	C	0.052	10,000	C
Toluene	5,000,000	N	1,700	650,000	sat
Total Xylenes	600,000	N	230	700,000	N
trans-1,2-Dichloroethene	110,000	N	34	---	
trans-1,3-Dichloropropene	1,700[3]	C	0.16[3]	1100[3]	C
Trichloroethene	2,800	C	0.61	71	C
Vinyl chloride	60	C	0.0056	280	C
Explosives (mg/kg)					
1,3,5-Trinitrobenzene	2,200	N	2.6	---	
1,3-Dinitrobenzene	6.1	N	0.0023	---	
2,4,6-Trinitrotoluene	36[4]	N	0.0087	---	
2,4-Dinitrotoluene	1.6	C	0.0002	---	
2,6-Dinitrotoluene	61	N	0.034	---	
2-Amino-4,6-dinitrotoluene	150	N	0.029	---	
2-Nitrotoluene	2.9	C	0.00025	---	
3-Nitrotoluene	1200	N	0.6	---	
4-Amino-2,6-dinitrotoluene	150	N	0.029	---	
4-Nitrotoluene	240[4]	N	0.0034	---	
HMX	3,800	N	7.1	---	
Nitrobenzene	4.4	C	0.000071	90	N
Nitrocellulose	---		---	---	
Nitroglycerin	6.1	N	0.0017	---	
Nitroguanidine	6100	N	0.92	---	
RDX	5.5	C	0.00036	---	
Tetryl	240	N	0.65	---	
Inorganics (mg/kg)					
Aluminum	77,000	N	55,000	7090000	N
Antimony	31	N	0.66	---	
Arsenic	0.39	C	0.0013	769	C
Barium	15,000	N	300	709,000	N
Beryllium	160	N	58	1,380	C
Cadmium	70[5]	N	1.4	1,840	C
Calcium	---		---	---	
Chromium	230[4][6]	N	2.1[6]	276	C
Cobalt	23	N	0.49	1,180	C
Copper	3,100	N	51	---	
Iron	55,000	N	640	---	
Lead	400[7]		14[11]	---	
Magnesium	---		---	---	

TABLE 3-2

HUMAN HEALTH SCREENING CRITERIA - SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	ORNL Regional Screening Level[1]			EPA SSL[2]	
	Residential Soil		Soil to GW (DAF=1)	Soil to Air	
Inorganics (mg/kg) (Continued)					
Manganese	1,800[8]	N	57	70,900	N
Mercury	23[9]	N	0.57	2.9	sat
Nickel	1,500	N	48	13,800	C
Potassium	---		---	---	
Selenium	390	N	0.95	---	
Silver	390	N	1.6	---	
Sodium	---		---	---	
Thallium	5.1	N	0.17	---	
Vanadium	390	N	180	---	
Zinc	23,000	N	680	---	
Miscellaneous Parameters (mg/kg)					
Cyanide	1,600[10]	N	7.4	---	

1 Oak Ridge National Laboratory (ORNL) Regional Screening Levels for Residential Soil (ORNL, April 2009).
2 USEPA Soil Screening Levels (SSLs). EPA Internet Site at http://risk.lsd.ornl.gov/calc_start.htm.
3 Value is for 1,3-dichloropropene.
4 One tenth of the noncarcinogenic value is less than the carcinogenic value; therefore, the noncarcinogenic value is presented.
5 Based on oral reference dose for diet.
6 Value is for hexavalent chromium.
7 Office of Solid Waste and Emergency Response soil screening level (EPA, 1994b)
8 Based on reference dose for water.
9 Value is for mercury, inorganic salts.
10 Value is for free cyanide.
11 MCL-based SSL.

---: No screening level available. If detected, a surrogate value will be used, if appropriate.
C - Carcinogen.
DAF - Dilution attenuation factor.
EPA - United States Environmental Protection Agency.
GW - Groundwater.
MCL - Maximum Contaminant Level.
N - Noncarcinogen.
SSL - Soil screening level.

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	ORNL Tap Water Regional Screening Level[1]	
Volatile Organics (µg/L)		
1,1,1-Trichloroethane	9,100	N
1,1,2,2-Tetrachloroethane	0.067	C
1,1,2-Trichloroethane	0.24	C
1,1,2-Trichlorotrifluoroethane	59,000	N
1,1-Dichloroethane	2.4	C
1,1-Dichloroethene	340	N
1,2,4-Trichlorobenzene	8.2	N
1,2-Dibromo-3-chloropropane	0.00032	C
1,2-Dibromoethane	0.0065	C
1,2-Dichlorobenzene	370	N
1,2-Dichloroethane	0.15	C
1,2-Dichloropropane	0.39	C
1,3-Dichlorobenzene	---	N
1,4-Dichlorobenzene	0.43	C
2-Butanone	7,100	N
2-Hexanone	---	
4-Methyl-2-pentanone	2,000	N
Acetone	22,000	N
Benzene	0.41	C
Bromodichloromethane	0.12	C
Bromoform	8.5	C
Bromomethane	8.7	N
Carbon disulfide	1,000	N
Carbon tetrachloride	0.2	C
Chlorobenzene	91	N
Chlorodibromomethane	0.15	C
Chloroethane	21000	N
Chloroform	0.19	C
Chloromethane	190	N
cis-1,2-Dichloroethene	370	N
cis-1,3-Dichloropropene	0.43[2]	C
Cyclohexane	13,000	N
Dichlorodifluoromethane	390	N
Ethylbenzene	1.5	C
Fluorotrichloromethane	1,300	N
Isopropylbenzene	680	N
Methyl acetate	37,000	N
Methyl tert-butyl ether	12	C
Methylcyclohexane	---	

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	ORNL Tap Water Regional Screening Level[1]	
Volatile Organics (µg/L) (Continued)		
Methylene chloride	4.8	C
Styrene	1,600	N
Tetrachloroethene	0.11	C
Toluene	2,300	N
Total Xylenes	200[3]	N
trans-1,2-Dichloroethene	110	N
trans-1,3-Dichloropropene	0.43[2]	C
Trichloroethene	1.7	C
Vinyl chloride	0.016	C
Explosives (µg/L)		
1,3,5-Trinitrobenzene	1,100	N
1,3-Dinitrobenzene	3.7	N
2,4,6-Trinitrotoluene	36[4]	N
2,4-Dinitrotoluene	0.22	C
2,6-Dinitrotoluene	37	N
2-Amino-4,6-dinitrotoluene	73	N
2-Nitrotoluene	0.31	C
3-Nitrotoluene	730	N
4-Amino-2,6-dinitrotoluene	73	N
4-Nitrotoluene	4.2	C
HMX	1,800	N
Nitrobenzene	0.12	C
Nitrocellulose	---	
Nitroglycerin	3.7	N
Nitroguanidine	3700	N
RDX	0.61	C
Tetryl	150	N
Inorganics (µg/L)		
Aluminum	37,000	N
Antimony	15	N
Arsenic	0.045	C
Barium	7,300	N
Beryllium	73	N
Cadmium	18[5]	N
Calcium	---	
Chromium	110[6]	N
Cobalt	11	N
Copper	1,500	N
Iron	26,000	N

TABLE 3-3

HUMAN HEALTH SCREENING CRITERIA - GROUNDWATER
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	ORNL Tap Water Regional Screening Level[1]	
Inorganics (µg/L) (Continued)		
Lead	15[7]	
Magnesium	---	
Manganese	880[5]	N
Mercury	11[8]	N
Nickel	730	N
Potassium	---	
Selenium	180	N
Silver	180	N
Sodium	---	
Thallium	2.4	N
Vanadium	180	N
Zinc	11,000	N
Miscellaneous Parameters (µg/L)		
Cyanide	730[9]	N

1 Oak Ridge National Laboratory (ORNL), April 2009.
2 Value is for 1,3-dichloropropene.
3 Value is for Xylene, Mixture.
4 One tenth the noncarcinogenic value is less than the carcinogenic value; therefore, the noncarcinogenic value is presented.
5 Based on the oral reference dose for water.
6 Value is for hexavalent chromium.
7 Action level under Safe Drinking Water Act.
8 Value is for mercuy, inorganic salts.
9 Value is for free cyanide.

---: No screening level available. If detected, a surrogate value will be used, if appropriate.
C - Carcinogen.
N - Noncarcinogen.

TABLE 3-4

ECOLOGICAL SCREENING CRITERIA - SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Screening Value	Source
Volatile Organics (µg/kg)		
1,1,1-Trichloroethane	300[1]	BTAG
1,1,2,2-Tetrachloroethane	300[2]	BTAG
1,1,2-Trichloroethane	300[1]	BTAG
1,1,2-Trichlorotrifluoroethane	---	---
1,1-Dichloroethane	300	BTAG
1,1-Dichloroethene	---	---
1,2,4-Trichlorobenzene	100[3]	BTAG
1,2-Dibromo-3-chloropropane	---	---
1,2-Dibromoethane	5,000	BTAG
1,2-Dichlorobenzene	100	BTAG
1,2-Dichloroethane	870,000	BTAG
1,2-Dichloropropane	---	---
1,3-Dichlorobenzene	---	---
1,4-Dichlorobenzene	100	BTAG
2-Butanone	---	---
2-Hexanone	---	---
4-Methyl-2-pentanone	100,000	BTAG
Acetone	---	---
Benzene	100	BTAG
Bromodichloromethane	450,000	BTAG
Bromoform	1,147,000	BTAG
Bromomethane	---	---
Carbon disulfide	---	---
Carbon tetrachloride	300	BTAG
Chlorobenzene	100	BTAG
Chlorodibromomethane	---	---
Chloroethane	---	---
Chloroform	300	BTAG
Chloromethane	---	---
cis-1,2-Dichloroethene	300	BTAG
cis-1,3-Dichloropropene	300[4]	BTAG
Cyclohexane	---	---
Dichlorodifluoromethane	---	---
Ethylbenzene	100	BTAG
Fluorotrichloromethane	---	---
Isopropylbenzene	---	---
Methyl acetate	---	---
Methyl tert-butyl ether	---	---
Methylcyclohexane	---	---
Methylene chloride	300	BTAG
Styrene	100	BTAG
Tetrachloroethene	300	BTAG

TABLE 3-4

ECOLOGICAL SCREENING CRITERIA - SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Screening Value	Source
Volatile Organics (µg/kg) (Continued)		
Toluene	100	BTAG
Total Xylenes	100	BTAG
trans-1,2-Dichloroethene	300	BTAG
trans-1,3-Dichloropropene	300[4]	BTAG
Trichloroethene	300	BTAG
Vinyl chloride	300	BTAG
Explosives (mg/kg)		
1,3,5-Trinitrobenzene	---	---
1,3-Dinitrobenzene	---	---
2,4,6-Trinitrotoluene	---	---
2,4-Dinitrotoluene	---	---
2,6-Dinitrotoluene	---	---
2-Amino-4,6-dinitrotoluene	---	---
2-Nitrotoluene	---	---
3-Nitrotoluene	---	---
4-Amino-2,6-dinitrotoluene	---	---
4-Nitrotoluene	---	---
HMX	---	---
Nitrobenzene	---	---
Nitrocellulose	---	---
Nitroglycerin	---	---
Nitroguanidine	---	---
RDX	---	---
Tetryl	---	---
Inorganics (mg/kg)		
Aluminum	---[5]	EPA SSL
Antimony	0.27	EPA SSL
Arsenic	18	EPA SSL
Barium	330	EPA SSL
Beryllium	21	EPA SSL
Cadmium	0.36	EPA SSL
Calcium	---	---
Chromium	26	EPA SSL
Cobalt	13	EPA SSL
Copper	15	BTAG
Iron	12	BTAG
Lead	11	EPA SSL
Magnesium	---	---
Manganese	330	BTAG
Mercury	0.058	BTAG
Nickel	2	BTAG
Potassium	---	---
Selenium	1.8	BTAG

TABLE 3-4

ECOLOGICAL SCREENING CRITERIA - SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Screening Value	Source
Inorganics (mg/kg) (Continued)		
Silver	0.0098	BTAG
Sodium	---	---
Thallium	0.001	BTAG
Vanadium	7.8	EPA SSL
Zinc	10	BTAG
Miscellaneous Parameters (mg/kg)		
Cyanide	5	BTAG

1 Value is for trichloroethane.
2 Value is for tetrachloroethane.
3 Value is for trichlorobenzene.
4 Value is for dichloropropene.
5 Potential for ecological risk only if soil pH is less than 5.5.

---: No screening level available.
EPA SSL: United States Environmental Protection Agency (EPA) Soil Screening Level (SSL) (EPA, 2005b).
BTAG: EPA Region 3 Biological Technical Assistance Group (BTAG) screening level (EPA, 1995)

TABLE 3-5

NO OBSERVED EFFECTS CONCENTRATIONS FOR SITE 47 SURFACE SOIL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Concentration[(1)]
Metals (mg/kg)	
Aluminum	16,500
Antimony	0.88
Arsenic	5.2
Barium	73.4
Beryllium	0.67
Boron	3.6
Cadmium	1.4
Calcium	1,890
Chromium	28.5
Cobalt	15.8
Copper	40.6
Iron	18,000
Lead	583
Magnesium	1,790
Manganese	1,100
Mercury	3.0
Molybdenum	16.4
Nickel	16.8
Potassium	1,150
Selenium	1.0
Silver	425
Sodium	133
Thallium	Not detected
Vanadium	42.3
Zinc	219

1 - The concentrations are the maximum concentrations detected in soil samples tested in the Baseline Ecological Risk Assessment for Site 47 (CH2MHILL, 2005). Because none of the soil samples exhibited toxicity to earthworms, the maximum concentrations were considered to be no observed effects concentrations.

TABLE 4-1

2005/2007 SAMPLING AND ANALYSIS SUMMARY
SITE 43 – TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Location	Sample Number	Sample Depth (feet bgs)	Laboratory Analysis		
			TCL VOCs	TAL Metals	Explosives
2005 Soil					
S43SB001	S43SS0010001	0 to 1	X	X	X
	S43SB0010101	1 to 2	X	X	X
S43SB002/MW001	S43SS0020001	0 to 1	X	X	X
	S43SB0020101	1 to 2	X	X	X
S43SB003	S43SS0030001	0 to 1	X	X	X
	S43SS0030001-D	0 to 1	X	X	X
	S43SB0030101	1 to 2	X	X	X
	S43SB0030101-D	1 to 2	X	X	X
S43SB004	S43SS0040001	0 to 1	X	X	X
	S43SB0040101	1 to 2	X	X	X
S43SB005	S43SS0050001	1 to 2[(1)]	X	X	X
	S43SB0050101	2 to 3	X	X	X
S43SB006/MW002	S43SS0060001	1 to 2[(1)]	X	X	X
	S43SB0060101	2 to 3	X	X	X
2005 Groundwater					
S43MW001	S43MW0010101	NA	X	X	X
	S43MW0010101-D	NA	X	X	X
S43MW002	S43MW0020101	NA	X	X	X
2007 Groundwater					
S43MW001	S43MW0010101	NA	X		
	S43MW0010101-D	NA	X		
S43MW002	S43MW0020101	NA	X		
S43MIP10	S43TW001	NA	X		
S43MIP04	S43TW002	NA	X		
S43MIP09	S43TW003	NA	X		
S43MIP03	S43TW004	NA	X		
S43MIP08	S43TW005	NA	X		

1 The depth interval of 0 to 1 foot consisted of asphalt pavement and road gravel.

bgs Below ground surface.
NA Not applicable.
TAL Target Analyte List.
TCL Target Compound List.
VOCs Volatile Organic Compounds.

TABLE 4-2

SUMMARY OF POSITIVE DETECTIONS - SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION	S43SB001	S43SB002	S43SB003	S43SB003	S43SB003	S43SB004	S43SB005	S43SB006
SAMPLE NUMBER	S43SS0010001	S43SS0020001	S43SS0030001	S43SS0030001-AVG	S43SS0030001-D	S43SS0040001	S43SS0050001	S43SS0060001
DEPTH RANGE (FEET)	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	1 - 2	1 - 2
SAMPLE DATE	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05
Volatile Organics (µg/kg)								
2-BUTANONE	15 U	20 U	8 J	8 J	13 U	14 U	10 U	7 U
ACETONE	15 U	20 U	31 J	39.5 J	48 J	12 J	25 J	16 J
CARBON DISULFIDE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	0.8 J
METHYLENE CHLORIDE	8 B	210 J	130 J	66.5 J	6 B	130 J	6 B	9 B
TOLUENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	0.8 J
Explosives (mg/kg)								
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.043 J	0.25 U
NITROCELLULOSE	8 J	9 J	1.2 B	1.25 B	1.3 B	1.4 B	1.4 B	1 B
Metals (mg/kg)								
ALUMINUM	4410 J	7230 J	17000 J	17650 J	18300 J	18400 J	7190 J	3370 J
ARSENIC	4.3	5.3 K	5.7 K	4.8 K	3.9	3.8	5.2 K	4.6
BARIUM	25.9 J	64.0 J	165 J	311 J	457 J	112 J	37.8 J	15.1 J
BERYLLIUM	0.27	0.40	1.2	1.1	0.95	0.63	0.37	0.19
CADMIUM	0.95	0.82 K	0.35 K	0.24 K	0.13	0.22	0.20 K	0.16 K
CALCIUM	1610	1170	279	267.5	256	350	1140	20000
CHROMIUM	19.9 J	37.5 J	20.2 J	18.65 J	17.1 J	20.2 J	27.5 J	23.5 J
COBALT	7.0	19.3	1.7 L	2.05 L	2.4	3.2	5.7	4.1
COPPER	22.8 J	25.7 J	20.2 J	17.1 J	14.0 J	13.9 J	13.0 J	17.1 J
IRON	13500	23400	34600	25700	16800	16500	19700	12100
LEAD	91.0	42.3	22.9	21.3	19.7	15.8	9.5	5.5
MAGNESIUM	3860	765	469	502	535	675	369	11500
MANGANESE	228 J	813 J	9.9 J	9.9 J	9.9 J	15.9 J	156 J	102 J
MERCURY	0.05 U	0.05 U	0.062 K	0.062 K	0.063 U	0.34	0.051 U	0.043 U
NICKEL	38.8	12.6	5.1 L	6.25 L	7.4	7.1	6.6	7.7
POTASSIUM	299	441	366 L	416 L	466	530	351	366
SODIUM	281	465	99.9 K	105 K	111	102	173	133
VANADIUM	39.4	36.0	26.3	25.25	24.2	31.0	37.3	42.0
ZINC	70.8 K	58.4 K	14.5 K	15.35 K	16.2 K	19.4 K	13.2 K	9.7 K

B - Detected in blank; false positive.
J - Estimated.
K - Biased high.
L - Biased low.
U - Not detected.

TABLE 4-3

SUMMARY OF POSITIVE DETECTIONS - SUBSURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

LOCATION SAMPLE NUMBER DEPTH RANGE (FEET) SAMPLE DATE	S43SB001 S43SB0010101 1 - 2 07/14/05	S43SB002 S43SB0020101 1 - 2 07/14/05	S43SB003 S43SB0030101 1 - 2 07/14/05	S43SB003 S43SB0030101-AVG 1 - 2 07/14/05	S43SB003 S43SB0030101-D 1 - 2 07/14/05	S43SB004 S43SB0040101 1 - 2 07/14/05	S43SB005 S43SB0050101 2 - 3 07/14/05	S43SB006 S43SB0060101 2 - 3 07/14/05
Volatile Organics (µg/kg)								
2-BUTANONE	10 U	12 U	9 J	7.5 J	6 J	7 J	8 J	10 U
ACETONE	10 U	12 U	12 J	12.5 J	13 J	10 J	17 J	19 J
METHYLENE CHLORIDE	8 B	5 B	150 J	140 J	130 J	140 J	120 J	8 B
TRICHLOROETHENE	8 J	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
Metals (mg/kg)								
ALUMINUM	3490 J	3380 J	16200 J	16500 J	16800 J	16200 J	18300 J	18500 J
ARSENIC	3.6	2.7	11.3 K	12.4 K	13.5 K	8.5	2.6	3.0
BARIUM	20.4	29.5	93.4	92.9	92.4	106	133	134
BERYLLIUM	0.26	1.6	1.2	1.2	1.2	1.1	0.88	0.91
CADMIUM	0.16	0.40	0.41 K	0.405 K	0.40 K	0.16	0.058	0.10
CALCIUM	176	1280	143	168.5	194	116	296	131
CHROMIUM	18.2 J	17.3 J	18.5 J	20.3 J	22.1 J	16.7 J	17.1 J	17.0 J
COBALT	3.5	4.6	3.0	3.0	3.0	4.9	3.8	2.8
COPPER	9.7	21.9	16.8	17.25	17.7	14.8	12.0	11.6
IRON	14100	18700	41200	41350	41500	19200	8550	13400
LEAD	6.1	7.7	15.6	16.2	16.8	17.0	18.5	17.2
MAGNESIUM	196	777	586	611.5	637	607	629	579
MANGANESE	110 J	227 J	10.9 J	11.6 J	12.3 J	10.2 J	29.9 J	43.4 J
NICKEL	7.0	5.5	7.5 L	7.7 L	7.9 L	9.7	8.2	7.4
POTASSIUM	331	380	420 L	462 L	504 L	408	357	412
SODIUM	288	265	128 K	128.5 K	129 K	263	344	260
VANADIUM	16.2	25.3	49.2	52.5	55.8	38.7	18.3	22.2
ZINC	23.1 K	13.1 K	16.7 K	17.7 K	18.7 K	22.6 K	20.5 K	15.2 K
Miscellaneous (mg/kg)								
CYANIDE	1.4	0.097 U	0.13 U	0.125 U	0.12 U	0.12 U	0.11 U	0.21

B - Detected in blank; false positive.
J - Estimated.
K - Biased high.
L - Biased low.
U - Not detected.

TABLE 4-4

SUMMARY OF POSITIVE DETECTIONS - VOLATILE ORGANICS IN GROUNDWATER
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Parameter	MCL	RSL	S43MW001 2005	S43MW001-D 2005	S43MW001-AVG 2005	S42MW002 2005	S43MW001 2007	S43MW001-D 2007	S43MW001-AVG 2007	S42MW002 2007	S43TW001 2007	S43TW002 2007	S43TW003 2007	S43TW004 2007	S43TW005 2007
Volatile Organics (µg/L)															
2-Butanone	NA	7,100	5000 U	5000 U	5000 U	5 U	8000 U	8000 U	8000 U	5 U	5 U	5 U	4.2 J	5 U	5 U
Acetone	NA	22,000	5000 U	5000 U	5000 U	5 U	8000 U	8000 U	8000 U	5 U	5 U	5 U	17	5 U	5 U
Bromoform	80	8.5	500 U	500 U	500 U	0.5 U	800 U	**960**	**680**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	370	**580**	**480 J**	**530 J**	0.5 U	800 U	800 U	800 U	0.5 U	0.36 J	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	1.7	**53000 J**	**55,000 J**	**54000 J**	1.3 J	**36,000**	**36,000**	**36,000**	3.2	3.2	0.5 U	0.5 U	0.5 U	0.5 U

Shaded cell indicates exceedance of MCL.

µg/L	Micrograms per liter.
D	Field duplicate sample.
J	Estimated.
MCL	Maximum Contaminant Level.
MW	Monitoring well.
NA	Not available.
ORNL	Oak Ridge National Laboratory
RSL	Regional Screening Level (ORNL RSL for tap water, ORNL, April 2009).
TW	Temporary well.
U	Not detected above concentration noted.

TABLE 4-5

SUMMARY OF 2007 MIP LOCATIONS, SOIL BORINGS, AND MONITORING WELLS
SUPPLEMENTAL SITE SCREENING PROCESS INVESTIGATION
SITE 43 – TOLUENE DISPOSAL
NSF INDIAN HEAD, MARYLAND

MIP Location	Soil Boring	Monitoring Well	MIP Depth (ft bgs)	MIP ECD Peak Response ($\mu V \times 10^7$)	Screened Interval (ft bgs)	Screen Length (ft)
S43MIP01	S43SB002	S43MW001	27	1.3	9 - 19	10
S43MIP02	NA	NA	27	ND	NA	NA
S43MIP03	NA	S43TW004	27.5	ND	20 - 24	10
S43MIP04	NA	S43TW002	28	ND	23 - 27	4
S43MIP05	NA	NA	27.5	0.6	NA	NA
S43MIP06	NA	NA	35	ND	NA	NA
S43MIP07	NA	NA	26.5	ND	NA	NA
S43MIP08	NA	S43TW005	27.8	ND	20 - 24	4
S43MIP09	NA	S43TW003	38	ND	10 - 20	10
S43MIP10	S43SB007	S43TW001	31	ND	21 - 25	4

bgs Below ground surface.
ECD Electron capture detector.
ft Feet.
MIP Membrane interface probe.
MW Monitoring well.
NA Not applicable.
ND Not detected.
SB Soil boring.
TW Temporary well.
µV Microvolts.

TABLE 4-6

HUMAN HEALTH DATA EVALUATION - BUILDING 1040 SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Human Health Risk Screening[6]			Selected as a COPC?	Rationale
								ORNL RSL for Residential Soil[7]	ORNL Risk-Based SSL Soil to GW	EPA SSL Soil to Air[7]		
Volatiles (ug/kg)												
METHYLENE CHLORIDE	1/2	210	S43SS0020001	8	107	210	NA	11000	**1.2**	13000	No	BSL
Explosives (mg/kg)												
NITROCELLULOSE	2/2	8 - 9	S43SS0020001	- - -	8.5	9	NA	---	---	---	No	NTX
Metals (mg/kg)												
ALUMINUM	2/2	4410 - 7230	S43SS0020001	- - -	5820	7230	19700	7700	55000	709000	No	BSL, BKG
ARSENIC	2/2	4.3 - 5.3	S43SS0020001	- - -	4.8	5.3	14.9	**0.39**	**0.0013**	769	No	BKG
BARIUM	2/2	25.9 - 64.0	S43SS0020001	- - -	45	64	80.4	1500	300	70900	No	BSL, BKG
BERYLLIUM	2/2	0.27 - 0.4	S43SS0020001	- - -	0.34	0.4	1.1	16	58	1380	No	BSL, BKG
CADMIUM	2/2	0.82 - 0.95	S43SS0010001	- - -	0.89	0.95	2.5	7	1.4	1840	No	BSL, BKG
CALCIUM	2/2	1170 - 1610	S43SS0010001	- - -	1390	1610	2060	---	---	---	No	NUT
CHROMIUM	2/2	19 9 - 37.5	S43SS0020001	- - -	28.7	37.5	**33.4**	**23**	**2.1**	276	Yes	ASL
COBALT	2/2	7 - 19.3	S43SS0020001	- - -	13.2	19.3	22.3	**2.3**	**0.49**	1180	No	BKG
COPPER	2/2	22.8 - 25.7	S43SS0020001	- - -	24.3	25.7	**20.3**	310	51	---	No	BSL
IRON	2/2	13500 - 23400	S43SS0020001	- - -	18450	23400	38500	**5500**	**640**	---	No	BKG
LEAD	2/2	42.3 - 91.0	S43SS0010001	- - -	66.7	91	**62.5**	400	**14**	---	No	BSL
MAGNESIUM	2/2	765 - 3860	S43SS0010001	- - -	2313	3860	**1620**	---	---	---	No	NUT
MANGANESE	2/2	228 - 813	S43SS0020001	- - -	520	813	1390	**180**	**57**	7090	No	BKG
NICKEL	2/2	12.6 - 38.8	S43SS0010001	- - -	25.7	38.8	**15.4**	150	48	13800	No	BSL
POTASSIUM	2/2	299 - 441	S43SS0020001	- - -	370	441	1470	---	---	---	No	NUT
SODIUM	2/2	281 - 465	S43SS0020001	- - -	373	465	**120**	---	---	---	No	NUT
VANADIUM	2/2	36.0 - 39.4	S43SS0010001	- - -	37.7	39.4	53.3	**39**	180	---	No	BKG
ZINC	2/2	58.4 - 70.8	S43SS0010001	- - -	64.6	70.8	**37.5**	2300	680	---	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria or background.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using 1/2 the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-1.
6 Table 3-2.
7 Screening levels for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.

Associated Samples

S43SS0010001
S43SS0020001

Definitions

COPC - Chemical of potential concern.
EPA - United States Environmental Protection Agency.
GW - Groundwater.
NA - Not available/not applicable.
ORNL - Oak Ridge National Laboratory.
RSL - Regional screening level.
SSL - Soil screening level.

Rationale Codes

ASL - Above screening level
BKG - Below background
BSL - Below screening level for direct contact (ORNL RSL for Residential Soil)
NTX - No toxicity information available
NUT - Essential nutrient

TABLE 4-7

HUMAN HEALTH DATA EVALUATION - BUILDING 1040 SUBSURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Human Health Risk Screening[6]			Selected as a COPC?	Rationale
								ORNL RSL for Residential Soil[7]	ORNL Risk-Based SSL Soil to GW	EPA SSL Soil to Air[7]		
Volatiles (µg/kg)												
TRICHLOROETHENE	1/2	8 J	S43SB0010101	12	7	8	NA	2800	**0.61**	71	No	BSL
Metals (mg/kg)												
ALUMINUM	2/2	3380 - 3490	S43SB0010101	- - -	3435	3490	21400	7700	55000	709000	No	BSL, BKG
ARSENIC	2/2	2.7 - 3.6	S43SB0010101	- - -	3.15	3.6	28.7	**0.39**	**0.0013**	769	No	BKG
BARIUM	2/2	20.4 - 29.5	S43SB0020101	- - -	25.0	29.5	66.5	1500	300	70900	No	BSL, BKG
BERYLLIUM	2/2	0.26 - 1.6	S43SB0020101	- - -	0.93	1.6	**1.5**	16	58	1380	No	BSL
CADMIUM	2/2	0.16 - 0.40	S43SB0020101	- - -	0.28	0.4	0.61	7	1.4	1840	No	BSL, BKG
CALCIUM	2/2	176 - 1280	S43SB0020101	- - -	728	1280	**1270**	---	---	---	No	NUT
CHROMIUM	2/2	17.3 - 18.2	S43SB0010101	- - -	17.8	18.2	59.1	23	**2.1**	276	No	BSL, BKG
COBALT	2/2	3.5 - 4.6	S43SB0020101	- - -	4.1	4.6	14.7	**2.3**	**0.49**	1180	No	BKG
COPPER	2/2	9.7 - 21.9	S43SB0020101	- - -	15.8	21.9	47.6	310	51	---	No	BSL, BKG
IRON	2/2	14100 - 18700	S43SB0020101	- - -	16400	18700	35200	**5500**	**640**	---	No	BKG
LEAD	2/2	6.1 - 7.7	S43SB0020101	- - -	6.9	7.7	38.6	400	14	---	No	BSL, BKG
MAGNESIUM	2/2	196 - 777	S43SB0020101	- - -	487	777	2940	---	---	---	No	NUT
MANGANESE	2.2	110 - 227	S43SB0020101	- - -	168.5	227	**155**	**180**	**57**	7090	Yes	ASL
NICKEL	2/2	5.5 - 7.0	S43SB0010101	- - -	6.25	7	15.9	150	48	13800	No	BSL, BKG
POTASSIUM	2/2	311 - 380	S43SB0020101	- - -	346	380	3440	---	---	---	No	NUT
SODIUM	2/2	265 - 288	S43SB0010101	- - -	277	288	461	---	---	---	No	NUT
VANADIUM	2/2	16.2 - 25.3	S43SB0020101	- - -	21.0	25.3	102	39	180	---	No	BSL, BKG
ZINC	2/2	13.1 - 23.1	S43SB0010101	- - -	18.1	23.1	49.7	2300	680	---	No	BSL, BKG
Miscellaneous Parameters (mg/kg)												
CYANIDE	1/2	1.4	S43SB0010101	0.097	0.72	1.4	NA	160	7.4	---	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using 1/2 the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-1.
6 Table 3-2.
7 Screening levels for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.

Associated Samples

S43SB0010101
S43SB0020101

Definitions

COPC - Chemical of potential concern.
EPA - United States Environmental Protection Agency.
GW - Groundwater.
NA - Not available/not applicable.
ORNL - Oak Ridge National Laboratory.
RSL - Regional screening level.
SSL - Soil screening level.

Rationale Codes

ASL - Above screening level
BKG - Below background
BSL - Below screening level for direct contact (ORNL RSL for Residential Soil)
NTX - No toxicity data
NUT - Essential nutrient

TABLE 4-8

HUMAN HEALTH DATA EVALUATION - BUILDING 1040 GROUNDWATER
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Human Health Risk Screening[5] ORNL RSL for Tap Water[6]	Selected as a COPC?	Rationale
Volatiles (µg/L)									
2-BUTANONE	1/6	4.2	S43TW0030102	5 - 8000	670	4.2	710	No	BSL
ACETONE	1/6	17	S43TW0030102	5 - 8000	670	17	2200	No	BSL
BROMOFORM	1/6	960	S43MW0010102-D	0.5 - 800	110	960	**8.5**	Yes	ASL
CIS-1,2-DICHLOROETHENE	1/6	0.36 - 0.36	S43TW0010102	0.5 - 800	67	0.36	37	No	BSL
TRICHLOROETHENE	2/6	3.2 - 36000	S43MW0010102-D, S43MW0010102	0.5	6000	36000	**1.7**	Yes	ASL
Explosives (µg/L)									
RDX	1/1	0.17 - 0.22	S43MW0010101-D	---	0.195	0.22	0.61	No	BSL
Metals (µg/L)									
ALUMINUM	1/1	153	S43MW0010101-D	134	110	153	3700	No	BSL
ANTIMONY	1/1	2	S43MW0010101	2	2	2	**1.5**	Yes	ASL
BARIUM	1/1	197 - 203	S43MW0010101	---	200	203	730	No	BSL
BERYLLIUM	1/1	0.66 - 0.69	S43MW0010101	---	0.68	0.69	7.3	No	BSL
CADMIUM	1/1	0.26 - 0.3	S43MW0010101	---	0.28	0.3	1.8	No	BSL
CALCIUM	1/1	3760 - 3890	S43MW0010101	---	3825	3890	NA	NA	NUT
CHROMIUM	1/1	0.59 - 0.71	S43MW0010101	---	0.65	0.71	11	No	BSL
COBALT	1/1	34.2 - 35.2	S43MW0010101	---	34.7	35.2	**1.1**	Yes	ASL
IRON	1/1	1030 - 4230	S43MW0010101	---	4130	4230	**2600**	Yes	ASL
LEAD	1/1	2.2 - 2.8	S43MW0010101	---	2.5	2.8	15	No	BSL
MAGNESIUM	1/1	2270 - 2340	S43MW0020101	---	2305	2340	NA	NA	NUT
MANGANESE	1/1	296 - 306	S43MW0010101	---	301	306	**88**	Yes	ASL
NICKEL	1/1	39.5 - 40.6	S43MW0010101	---	40.1	40.6	73	No	BSL
POTASSIUM	1/1	1660 - 1680	S43MW0010101	---	1670	1680	NA	NA	NUT
SODIUM	1/1	39100 - 40100	S43MW0010101	---	39600	40100	NA	NA	NUT
VANADIUM	1/1	0.49 - 0.72	S43MW0010101	---	0.61	0.72	18	No	BSL
ZINC	1/1	49.9 - 51.9	S43MW0010101	---	50.9	51.9	1100	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using 1/2 the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-3.
6 Screening levels for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.

Associated Samples*

S43MW0010101
S43MW0010101-D
S43MW0010101-AVG
S43TW0040102
S43TW0030102
S43TW0010102
S43MW0010102
S43MW0010102-AVG
S43MW0010102-D
S43TW0020102
S43TW0050102

Definitions
COPC - Chemical of potential concern.
NA = Not available/not applicable.
ORNL - Oak Ridge National Laboratory.
RSL - Regional screening level.

Rationale Codes
ASL - Above screening level
BSL - Below screening level
NTX - No toxicity information available
NUT - Essential nutrient

*Only groundwater samples collected in 2007 were used for volatiles.

TABLE 4-9

CHEMICAL-SPECIFIC HUMAN HEALTH RISKS - BUILDING 1040
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Maximum Concentration	Carcinogenic Risks		Noncarcinogenic Risks			Evaluation of Target Organ HIs	
		RSL[1]	Estimated ILCR	Primary Target Organ	RSL[1]	Estimated HQ	Target Organ	Total HI
All Soil (mg/kg)								
Chromium	37.5	39	9.6E-07	respiratory	230	0.16	CNS	0.13
Manganese	227	NA[2]	NA[2]	CNS	1800	0.13	respiratory	0.16
		Total ILCR	9.6E-07		**Total**	0.29		
Groundwater (µg/L)								
Bromoform	960	8.5	1.1E-04	liver	730	1.3	blood	0.30
Trichloroethene	36000	1.7	2.1E-02	unspecified	NA[2]	NA[2]	CNS	3.55
Antimony	2	NA[2]	NA[2]	blood, lifespan	15	0.13	CVS	3.20
Cobalt	35.2	NA[2]	NA[2]	CVS, immune, CNS	11	3.20	GI	0.16
Iron	4230	NA[2]	NA[2]	blood, GI, liver	26000	0.16	immune	3.20
Manganese	306	NA[2]	NA[2]	CNS	880	0.35	lifespan	0.13
		Total ILCR	2.1E-02		**Total**	5	liver	0.16
							unspecified	NA
		Total Cumulative ILCR	2E-02		**Cumulative HI**	5		

Cumulative HIs

blood	0.30
CNS	3.67
CVS	3.20
GI	0.16
immune	3.20
lifespan	0.13
liver	0.16
respiratory	0.16
unspecified	NA

Abbreviations:

CNS	Central nervous system.
CVS	Cardiovascular system.
GI	Gastrointestinal.
HI	Hazard index.
HQ	Hazard quotient.
ILCR	Incremental lifetime cancer risk.
RSL	Regional screening level.

Footnotes:

1 RSLs (ORNL, April 2009) for residential soil and tap water.

2 NA - Not applicable. EPA has not established a cancer slope factor or oral reference dose for this chemical.

TABLE 4-10

HUMAN HEALTH DATA EVALUATION - BUILDING 1041 SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detections	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Human Health Risk Screening[6]			Selected as a COPC?	Rationale
								ORNL RSL for Residential Soil[7]	ORNL Risk-Based SSL	EPA SSL Soil to Air[7]		
Volatiles (ug/kg)												
2-BUTANONE	1/4	8	S43SS0030001	7 - 14	5.9	6	NA	2800000	1500	24000000	No	BSL
ACETONE	4/4	16 - 48	S43SS0030001-D	---	46	48	NA	6100000	4400	---	No	BSL
CARBON DISULFIDE	1/4	0.8	S43SS0060001	10 - 14	4.8	0.8	NA	67000	270	720000	No	BSL
METHYLENE CHLORIDE	2/4	130	S43SS0030001, S43SS0040001	6 - 9	51	130	NA	11000	**1.2**	13000	No	BSL
TOLUENE	1/4	0.8	S43SS0060001	10 - 14	4.8	0.8	NA	500000	1700	650000	No	BSL
Explosives (mg/kg)												
3-NITROTOLUENE	1/4	0.043	S43SS0050001	0.25	0.1	0.043	NA	120	0.6	---	No	BSL
Metals (mg/kg)												
ALUMINUM	4/4	3370 - 18400	S43SS0040001	---	15537	18400	19700	**7700**	55000	709000	No	BKG
ARSENIC	4/4	3.8 - 5.7	S43SS0030001	---	4.6	5.7	14.9	**0.39**	**0.0013**	769	No	BKG
BARIUM	4/4	15.1 - 457	S43SS0030001-D	---	119.0	457	**80.4**	1500	**300**	70900	No	BSL
BERYLLIUM	4/4	0.19 - 1.2	S43SS0030001	---	0.58	1.2	**1.1**	16	58	1380	No	BSL
CADMIUM	4/4	0.13 - 0.35	S43SS0030001	---	0.21	0.35	2.5	7	1.4	1840	No	BSL, BKG
CALCIUM	4/4	256 - 20000	S43SS0060001	---	5439	20000	**2060**	---	---	---	No	NUT
CHROMIUM	4/4	17.1 - 27.5	S43SS0050001	---	22.5	27.5	33.4	**23**	**2.1**	276	No	BKG
COBALT	4/4	1.7 - 5.7	S43SS0050001	---	3.8	5.7	22.3	**2.3**	**0.49**	1180	No	BKG
COPPER	4/4	13.0 - 20.2	S43SS0030001	---	15.3	20.2	20.3	310	51	---	No	BSL, BKG
IRON	4/4	12100 - 34600	S43SS0030001	---	18500	34600	38500	**5500**	**640**	---	No	BKG
LEAD	4/4	5.5 - 22.9	S43SS0030001	---	13.0	22.9	62.5	400	**14**	---	No	BSL, BKG
MAGNESIUM	4/4	369 - 11500	S43SS0060001	---	3261	11500	**1620**	---	---	---	No	NUT
MANGANESE	4/4	9.9 - 156	S43SS0050001	---	71.0	156	1390	180	**57**	7090	No	BSL, BKG
MERCURY	2/4	0.062 - 0.34	S43SS0040001	0.043 - 0.063	0.11	0.34	**0.16**	2.3	0.57	2.9	No	BSL
NICKEL	4/4	5.1 - 7.7	S43SS0060001	---	6.9	7.7	15.4	150	48	13800	No	BSL, BKG
POTASSIUM	4/4	351 - 530	S43SS0040001	---	416	530	1470	---	---	---	No	NUT
SODIUM	4/4	99.9 - 173	S43SS0050001	---	128	173	**120**	---	---	---	No	NUT
VANADIUM	4/4	26.3 - 42	S43SS0060001	---	33.9	42	53.3	**39**	180	---	No	BKG
ZINC	4/4	9.7 - 19.4	S43SS0040001	---	14.4	19.4	37.5	2300	680	---	No	BSL, BKG

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using 1/2 the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-1.
6 Table 3-2.
7 Screening levels for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.

Associated Samples

S43SS0030001
S43SS0030001-D
S43SS0040001
S43SS0050001
S43SS0060001

Definitions

COPC - Chemical of potential concern.
DAF - Dilution attenuation factor.
EPA - United States Environmental Protection Agency.
GW - Groundwater.
NA - Not available/not applicable.
ORNL - Oak Ridge National Laboratory.
RSL = Regional screening level.
SSL - Soil screening level.

Rationale Codes

ASL - Above screening level
BKG - Below background
BSL - Below screening level for direct contact (ORNL RSL for Residential Soil)
NTX - No toxicity information available
NUT - Essential nutrient

TABLE 4-11

HUMAN HEALTH DATA EVALUATION - BUILDING 1041 SUBSURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection\	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Human Health Risk Screening[6]			Selected as a COPC?	Rationale
								ORNL RSL for Residential Soil[7]	ORNL Risk-Based SSL	EPA SSL Soil to Air[7]		
Volatiles (µg/kg)												
2-BUTANONE	3/4	7 - 9	S43SB0030101	10	6.9	9	NA	2800000	1500	24000000	No	BSL
ACETONE	4/4	10 - 19	S43SB0060101	---	14.6	19	NA	6100000	1100	---	No	BSL
METHYLENE CHLORIDE	3/4	120 - 150	S43SB0030101	8	101	150	NA	11000	**1.2**	13000	No	BSL
Metals (mg/kg)												
ALUMINUM	4/4	16200 - 18500	S43SB0060101	---	17375	18500	21400	**7700**	55000	709000	No	BKG
ARSENIC	4/4	2.6 - 13.5	S43SB0030101-D	---	6.60	13.5	28.7	**0.39**	**0.0013**	769	No	BKG
BARIUM	4/4	92.4 - 134	S43SB0060101	---	116	134	**66.5**	1500	300	70900	No	BSL
BERYLLIUM	4/4	0.88 - 1.2	S43SB0030101, S43SB00301010-D	---	1.0	1.2	1.5	16	58	1380	No	BSL, BKG
CADMIUM	4/4	0.058 - 0.41	S43SB0030101	---	0.18	0.41	0.61	7	1.4	1840	No	BSL, BKG
CALCIUM	4/4	116 - 296	S43SB0050101	---	178	296	1270	---	---	---	No	NUT
CHROMIUM	4/4	16.7 - 22.1	S43SB0030101-D	---	17.8	22.1	59.1	23	**2.1**	276	No	BSL, BKG
COBALT	4/4	2.8 - 4.9	S43SB0040101	---	3.6	4.9	14.7	**2.3**	**0.49**	1180	No	BKG
COPPER	4/4	11.6 - 17.7	S43SB0030101, S43SB0030101-D	---	13.8	16.8	47.6	310	51	---	No	BSL, BKG
IRON	4/4	8550 - 41500	S43SB0030101-D	---	20625	41500	**35200**	**5500**	**640**	---	Yes	ASL
LEAD	4/4	15.6 - 18.5	S43SB0050101	---	17.2	18.5	38.6	400	**14**	---	No	BSL, BKG
MAGNESIUM	4/4	579 - 637	S43SB0030101-D	---	607	637	2940	---	---	---	No	NUT
MANGANESE	4/4	10.2 - 43.4	S43SB0060101	---	23.8	43.4	155	180	57	7090	No	BSL, BKG
NICKEL	4/4	7.4 - 9.7	S43SB0040101	---	8.25	9.7	15.9	150	48	13800	No	BSL, BKG
POTASSIUM	4/4	357 - 504	S43SB0030101-D	---	410	504	3440	---	---	---	No	NUT
SODIUM	4/4	128 - 344	S43SB0050101	---	249	344	461	---	---	---	No	NUT
VANADIUM	4/4	18.3 - 55.8	S43SB0030101-D	---	32.9	55.8	102	**39**	180	---	No	BKG
ZINC	4/4	15.2 - 22.6	S43SB0040101	---	19.0	22.6	49.7	2300	680	---	No	BSL, BKG
Miscellaneous Parameters (mg/kg)												
CYANIDE	1/4	0.21	S43SB0060101	0.11 - 0.13	0.097	0.21	NA	160	7.4	---	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using 1/2 the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-1.
6 Table 3-2.
7 Screening levels for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.

Associated Samples

S43SB0030101
S43SB0030101-D
S43SB0040101
S43SB0050101
S43SB0060101

Definitions

COPC - Chemical of potential concern.
DAF - Dilution attenuation factor.
EPA - United States Environmental Protection Agency.
GW - Groundwater.
NA - Not available/not applicable.
RSL - Regional screening level.
SSL - Soil screening level.

Rationale Codes

ASL - Above screening level
BKG - Below background
BSL - Below screening level for direct contact (ORNL RSL for Residential Soil)
NTX - No toxicity information available
NUT - Essential nutrient

TABLE 4-12

HUMAN HEALTH DATA EVALUATION - BUILDING 1041 GROUNDWATER
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Human Health Risk Screening[5] ORNL RSL for Tap Water[6]	Selected as a COPC?	Rationale
Volatiles (µg/L)									
1,1,1-TRICHLOROETHANE	1/1	1.3	S43MW0020102	---	1.3	1.3	910	No	BSL
1,1-DICHLOROETHANE	1/1	15	S43MW0020102	---	15	15	**2.4**	Yes	ASL
1,1-DICHLOROETHENE	1/1	3.9	S43MW0020102	---	3.9	3.9	34	No	BSL
TRICHLOROETHENE	1/1	3.2	S43MW0020102	---	3.2	3.2	**1.7**	Yes	ASL
Explosives (µg/L)									
HMX	1/1	3.4	S43MW0020101	---	3.4	3.4	180	No	BSL
RDX	1/1	0.11	S43MW0020101	---	0.11	0.11	0.61	No	BSL
Metals (ug/L)									
ALUMINUM	1/1	215	S43MW0020101	---	205	215	3700	No	BSL
ANTIMONY	1/1	2.1	S43MW0020101	---	2.1	2.1	**1.5**	Yes	ASL
BARIUM	1/1	354	S43MW0020101	---	354	354	730	No	BSL
BERYLLIUM	1/1	4.6	S43MW0020101	---	4.6	4.6	7.3	No	BSL
CADMIUM	1/1	0.61	S43MW0020101	---	0.61	0.61	1.8	No	BSL
CALCIUM	1/1	3450	S43MW0020101	---	3450	3450	NA	NA	NUT
COBALT	1/1	96.4	S43MW0020101	---	96.4	96.4	**1.1**	Yes	ASL
MAGNESIUM	1/1	4640	S43MW0020101	---	4640	4640	NA	NA	NUT
MANGANESE	1/1	270	S43MW0020101	---	270	270	**88**	Yes	ASL
NICKEL	1/1	78.3	S43MW0020101	---	78.3	78.3	**73**	Yes	ASL
POTASSIUM	1/1	1690	S43MW0020101	---	1690	1690	NA	NA	NUT
SODIUM	1/1	60500	S43MW0020101	---	60500	60500	NA	NA	NUT
ZINC	1/1	134	S43MW0020101	---	134.0	134	1100	No	BSL

Shaded cells indicate chemicals selected as COPCs and/or exceedances of criteria. Chemicals are selected as COPCs if the maximum concentration exceeds the applicable risk-based criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using 1/2 the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-3.
6 Screening levels for noncarcinogens are divided by 10 to correspond to a target hazard quotient of 0.1.

Associated Samples*

S43MW0020101
S43MW0020102

Definitions

COPC - Chemical of potential concern.
ORNL - Oak Ridge National Laboratory
NA - Not available/not applicable.
RSL - Regional screening level.

Rationale Codes

ASL - Above screening level
BSL - Below screening level
NTX - No toxicity information available
NUT - Essential nutrient

*Only groundwater samples collected in 2007 were used for volatiles.

TABLE 4-13

CHEMICAL-SPECIFIC HUMAN HEALTH RISKS - BUILDING 1041
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Maximum Concentration	Carcinogenic Risks		Noncarcinogenic Risks			Evaluation of Target Organ HIs	
		RSL[1]	Estimated ILCR	Primary Target Organ	RSL[1]	Estimated HQ	Target Organ	Total HI
All Soil (mg/kg)								
Iron	41500	NA[2]	NA[2]	blood, GI, liver	55000	0.75	blood	0.75
		Total ILCR	0.0E+00		**Total**	0.75	GI	0.75
							liver	0.75
Groundwater (µg/L)								
1,1-Dichloroethane	15	2.4	6.3E-06	kidney, CNS	7300	0.002	blood	0.14
Trichloroethene	3.2	1.7	4.7E-06	unspecified	NA	NA	body weight	0.11
Antimony	2.1	NA[2]	NA[2]	blood, lifespan	15	0.14	CNS	9.07
Cobalt	96.4	NA[2]	NA[2]	CVS, immune, CNS	11	8.76	CVS	8.76
Manganese	270	NA[2]	NA[2]	CNS	880	0.31	immune	8.76
Nickel	78.3	NA[2]	NA[2]	body weight	730	0.11	kidney	0.00
		Total ILCR	1.1E-05		**Total**	9.32	lifespan	0.14
							unspecified	NA

Total Cumulative ILCR	1E-05	**Cumulative HI**	10

Cumulative HIs

blood	0.89
body weight	0.11
CNS	9.07
CVS	8.76
GI	0.75
kidney	0.00
immune	8.76
lifespan	0.14
liver	0.75
unspecified	NA

Abbreviations:

CNS	Central nervous system.
CVS	Cardiovascular system
GI	Gastrointestinal.
HI	Hazard index.
HQ	Hazard quotient.
ILCR	Incremental lifetime cancer risk.
RSL	Regional screening level.

Footnotes:

1 RSLs (ORNL, April 2009) for residential soil and tap water.

2 NA - Not applicable. EPA has not established a cancer slope factor or oral reference dose for this chemical.

TABLE 4-14

ECOLOGICAL DATA EVALUATION - SURFACE SOIL
SITE 43 - TOLUENE DISPOSAL
NSF-IH, INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection[1]	Range of Detections[1]	Sample with Maximum Detection	Range of Nondetects[2]	Average of All Results[3]	Concentration Used for Screening[4]	Background Concentration[5]	Ecological Screening Level[6]	Selected as a COPC?	Rationale
Volatiles (µg/kg)										
2-BUTANONE	1/6	8	S43SS0030001	7 - 20	6.8	8	NA	NA	Yes	NTX
ACETONE	4/6	12 - 48	S43SS0030001	15 - 20	18.3	48	NA	NA	Yes	NTX
CARBON DISULFIDE	1/6	0.8	S43SB0060001	10 - 20	6.1	0.8	NA	NA	Yes	NTX
METHYLENE CHLORIDE	3/6	130 - 210	S43SS0020001	6 - 9	70	210	NA	300	No	BSL
TOLUENE	1/6	0.8	S43SB0060001	10 - 20	6.1	0.8	NA	100	No	BSL
Explosives (mg/kg)										
3-NITROTOLUENE	1/6	0.043	S43SS0050001	0.25	0.11	0.04	NA	NA	Yes	NTX
NITROCELLULOSE	2/6	8 - 9	S43SS0020001	1 - 1.4	3.3	9	NA	NA	Yes	NTX
Metals (mg/kg)										
ALUMINUM	6/6	3370 - 18400	S43SS0040001	---	14562	18400	19700	[7]	No	BKG
ARSENIC	6/6	3.8 - 5.7	S43SS0030001	---	4.7	5.7	14.9	18	No	BSL, BKG
BARIUM	6/6	15.1 - 457	S43SS0030001-D	---	94.3	457	**80.4**	**330**	Yes	ASL
BERYLLIUM	6/6	0.19 - 1.2	S43SS0030001	---	0.49	1.2	**1.1**	21	No	BSL
CADMIUM	6/6	0.13 - 0.95	S43SS0010001	---	0.43	0.95	2.5	**0.36**	No	BKG
CALCIUM	6/6	256 - 20000	S43SB0060001	---	4090	20000	**2060**	NA	No	NUT
CHROMIUM	6/6	17.1 - 37.5	S43SS0020001	---	24.5	37.5	**33.4**	**26**	Yes	ASL
COBALT	6/6	1.7 - 19.3	S43SS0020001	---	6.9	19.3	22.3	**13**	No	BKG
COPPER	6/6	13 - 25.7	S43SS0020001	---	18.3	25.7	**20.3**	**15**	Yes	ASL
IRON	6/6	12100 - 34600	S43SS0030001	---	18483	34600	38500	**12**	No	BKG
LEAD	6/6	5.5 - 91	S43SS0010001	---	30.9	91.0	**62.5**	**11**	Yes	ASL
MAGNESIUM	6/6	369 - 11500	S43SB0060001	---	2945	11500	**1620**	**4400**	No	NUT
MANGANESE	6/6	9.9 - 813	S43SS0020001	---	221	813	1390	**330**	No	BKG
MERCURY	2/6	0.062 - 0.34	S43SS0040001	0.043 - 0.063	0.083	0.34	**0.16**	**0.058**	Yes	ASL
NICKEL	6/6	5.1 - 38.8	S43SS0010001	---	13.2	38.8	**15.4**	**2**	Yes	ASL
POTASSIUM	6/6	299 - 530	S43SS0040001	---	400	530	1470	NA	No	NUT
SODIUM	6/6	99.9 - 465	S43SS0020001	---	210	465	**120**	NA	No	NUT
VANADIUM	6/6	24.2 - 42	S43SB0060001	---	35.2	42.0	53.3	**7.8**	No	BKG
ZINC	6/6	9.7 - 70.8	S43SS0010001	---	31.1	70.8	**37.5**	**10**	Yes	ASL

Shaded cells indicate chemical selected as COPCs and/or exceedances of criteria.

1 Sample and duplicate are counted as one sample when determining frequency of detection and as two samples when determining range of detections.
2 Values presented are sample-specific quantitation limits.
3 Averages are calculated using 1/2 the detection limit for nondetect samples.
4 The maximum detected concentration is used for screening purposes.
5 Table 3-1.
6 Table 3-4.
7 Only a COPC if pH is less than 5.5.

Associated Samples

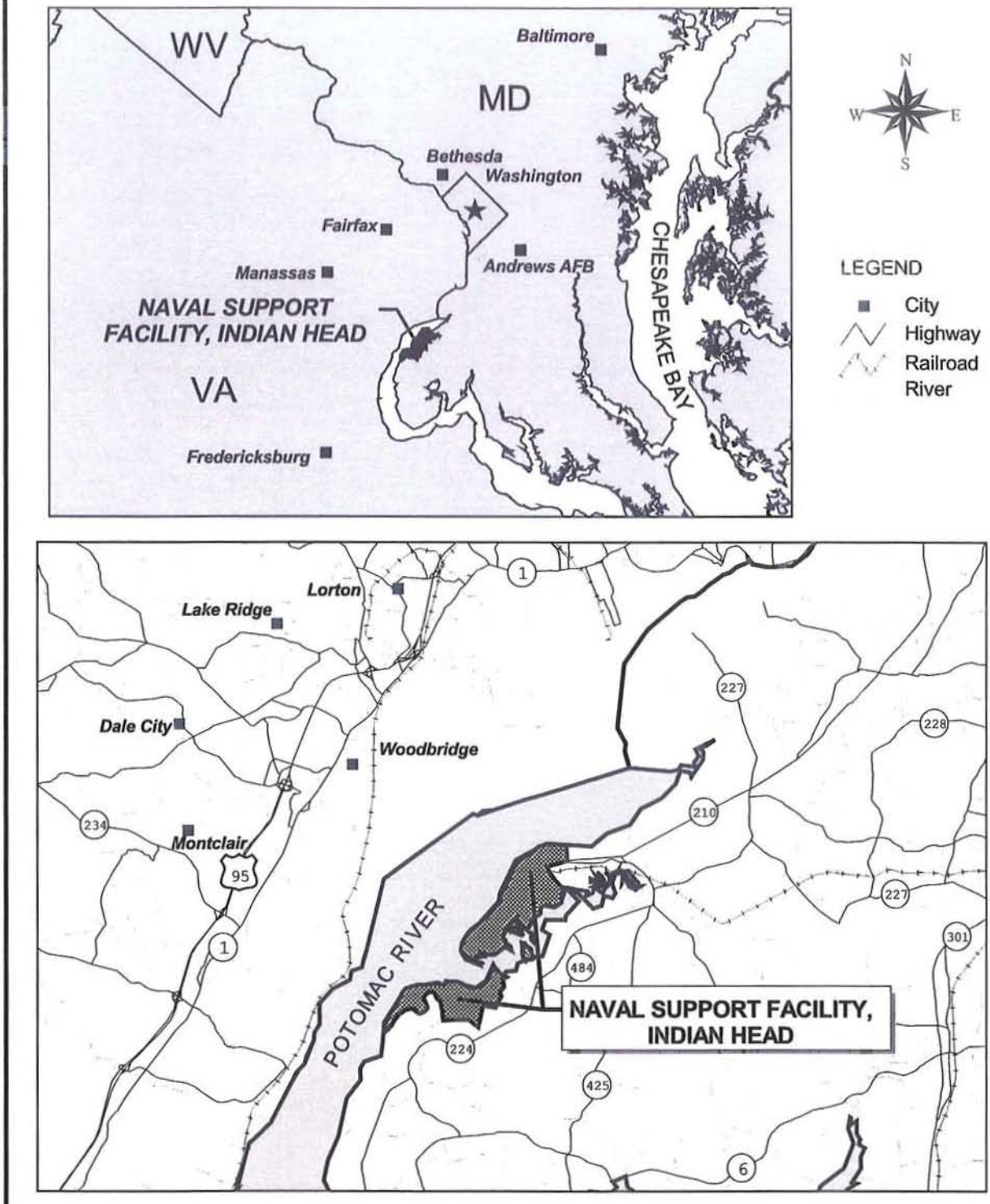
S43SS0010001
S43SS0020001
S43SS0030001
S43SS0030001-D
S43SS0040001
S43SS0050001

Definitions

COPC - Chemical of potential concern.
NA - Not available/not applicable.

Rationale Codes

ASL - Above screening level
BKG - Below background
BSL - Below screening level
NTX - No toxicity information available
NUT - Essential nutrient

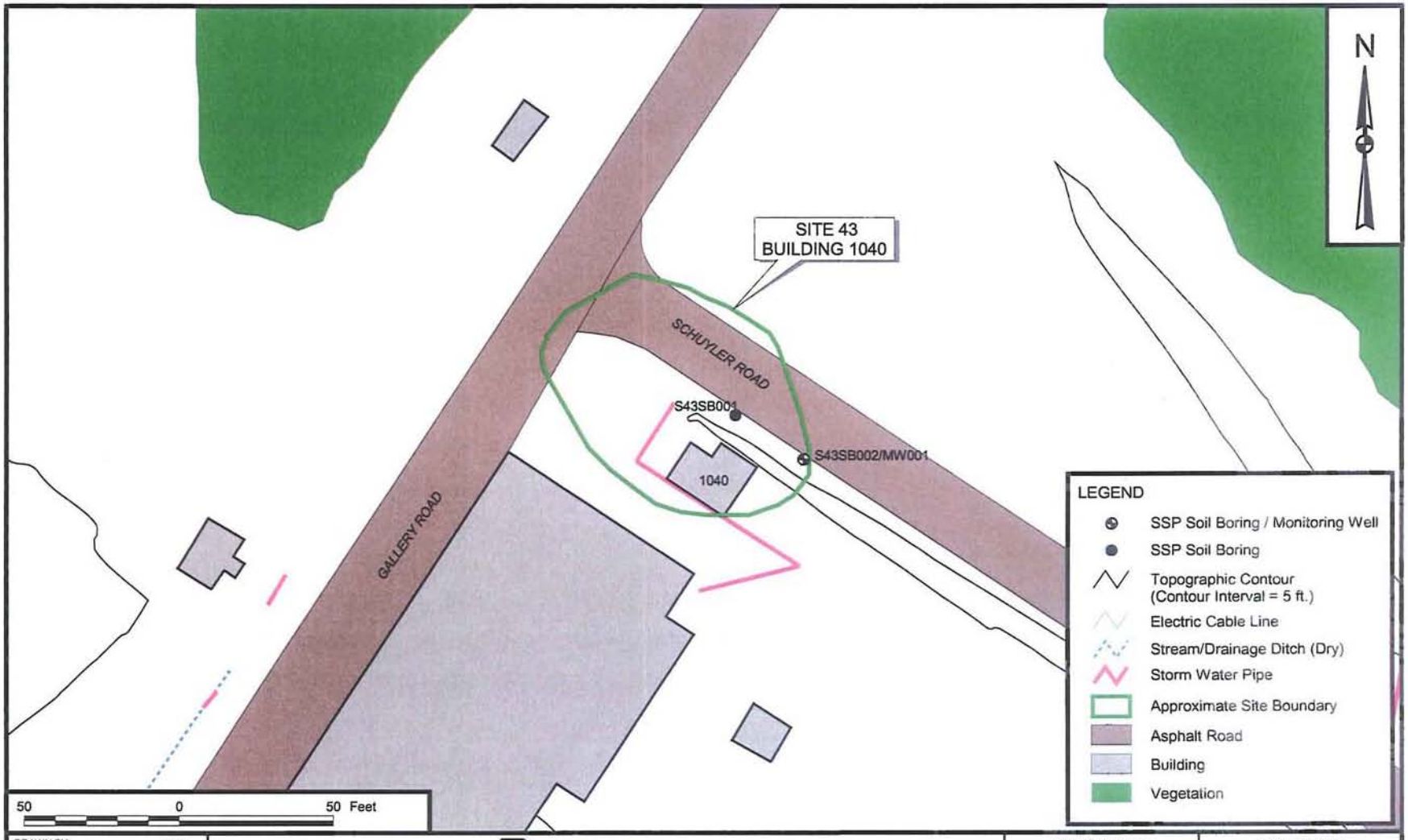


DRAWN BY: K. PEILA — DATE: 2/4/04	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2193	OWNER NO.: 006
CHECKED BY: G. LATULIPPE — DATE: 2/2/04	FACILITY LOCATION MAP NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY: GJL — DATE: 6/4/04	
COST/SCHEDULE-AREA		APPROVED BY: — — DATE: —	
SCALE: AS NOTED		DRAWING NO.: FIGURE 1-1	REV: 0

P:\GIS\NSWC_INDIAN_HEAD\WORKPLAN_SITELOCATION.APR FACILITY LOCATION MAP 12/12/05 KMP

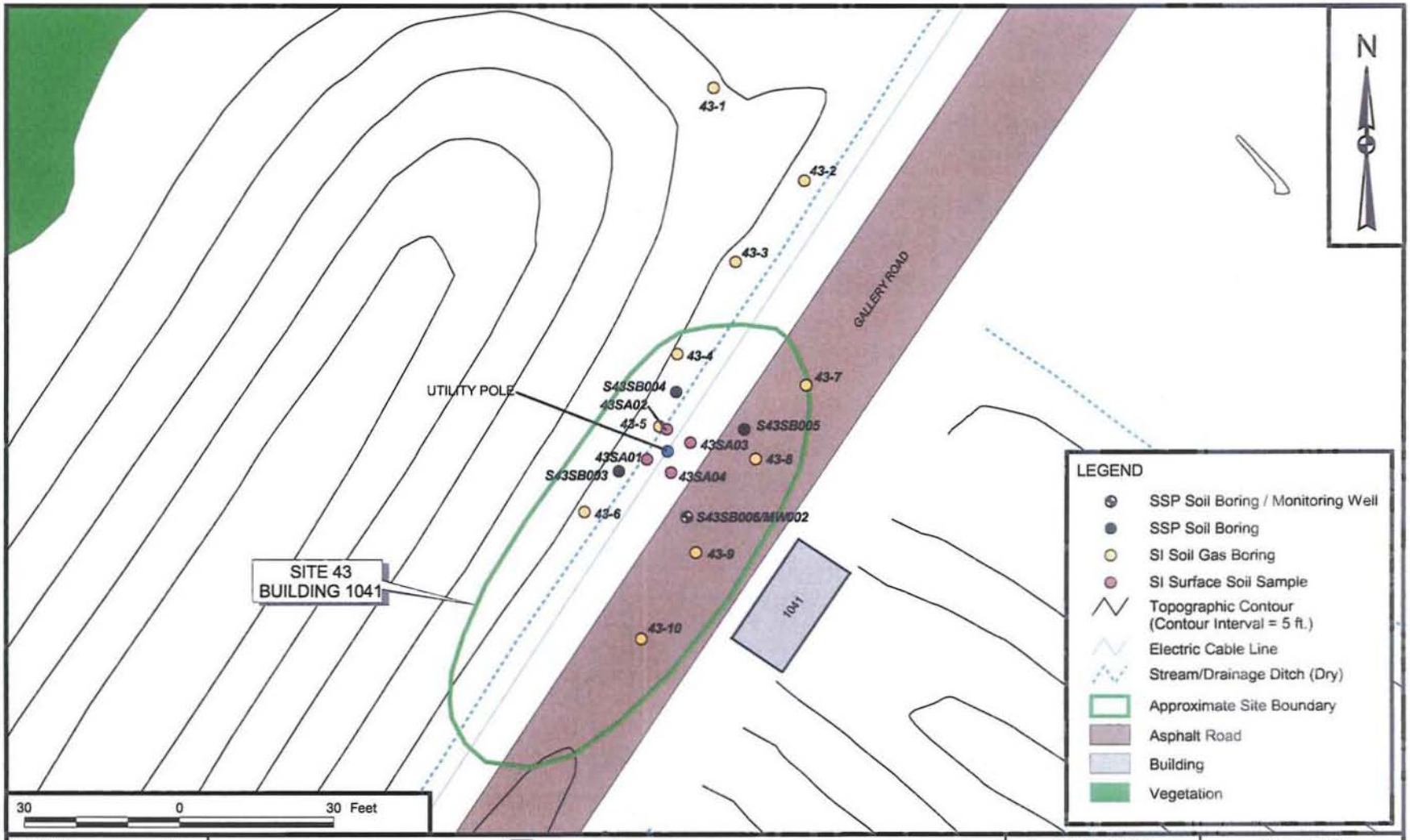
P:\GIS\INDIANHEAD_NSWC\APR\COMMUNITYRELATIONSPLAN.APR SSP SITE 43 12/12/05 KMP

DRAWN BY: K. PEILA — DATE: 6/2/04	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2193	OWNER NUMBER: 0006
CHECKED BY: KCT — DATE: 6/2/04	SITE LOCATION MAP SSP SITE 43 - TOLUENE DISPOSAL NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY: KCT — DATE: 6/2/04	
COST/SCHEDULE-AREA		APPROVED BY: — — DATE: —	
SCALE: AS NOTED		DRAWING NO.: FIGURE 1-2	REV: 0



DRAWN BY: K. PEILA — DATE: 06/03/04	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2193	OWNER NUMBER: CTO 114
CHECKED BY: S. NESBIT — DATE: 07/21/09	BUILDING 1040 SSP SAMPLE LOCATIONS SITE 43 - TOLUENE DISPOSAL NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY: KCT — DATE: 06/03/04	
COST/SCHEDULE-AREA		APPROVED BY: — — DATE: —	
SCALE: AS NOTED		DRAWING NO.: FIGURE 2-1	REV: 0

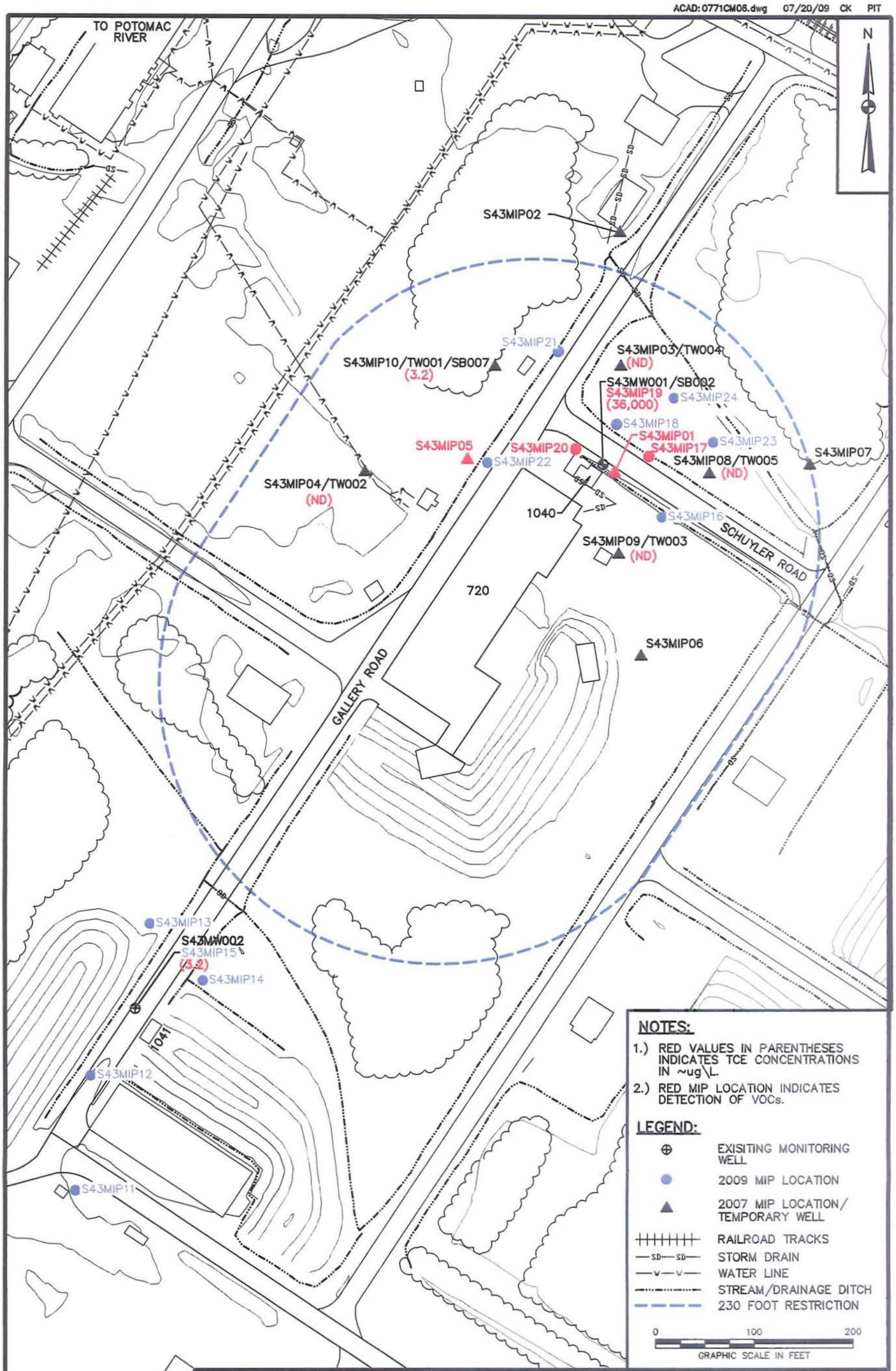
P:\GIS\INDIANHEAD_NSWC\APR\COMMUNITYRELATIONSPLAN.APR SITE 43 1040 SSP LOCATIONS SURVEYED LAYOUT 07/21/09 JEE



DRAWN BY: K. PEILA — DATE: 06/03/04	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2193	OWNER NUMBER: CTO 114
CHECKED BY: S. NESBIT — DATE: 07/12/09	BUILDING 1041 SSP SAMPLE LOCATIONS (2005) SITE 43 - TOLUENE DISPOSAL NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY: KCT — DATE: 06/03/04	
COST/SCHEDULE-AREA		APPROVED BY: — DATE: —	
SCALE: AS NOTED		DRAWING NO.: FIGURE 2-2	REV: 0

P:\GIS\INDIANHEAD_NSWC\APR\COMMUNITYRELATIONSPLAN.APR SITE 43 1041 SURVEYED WORK PLAN LAYOUT 07/12/09 JEE

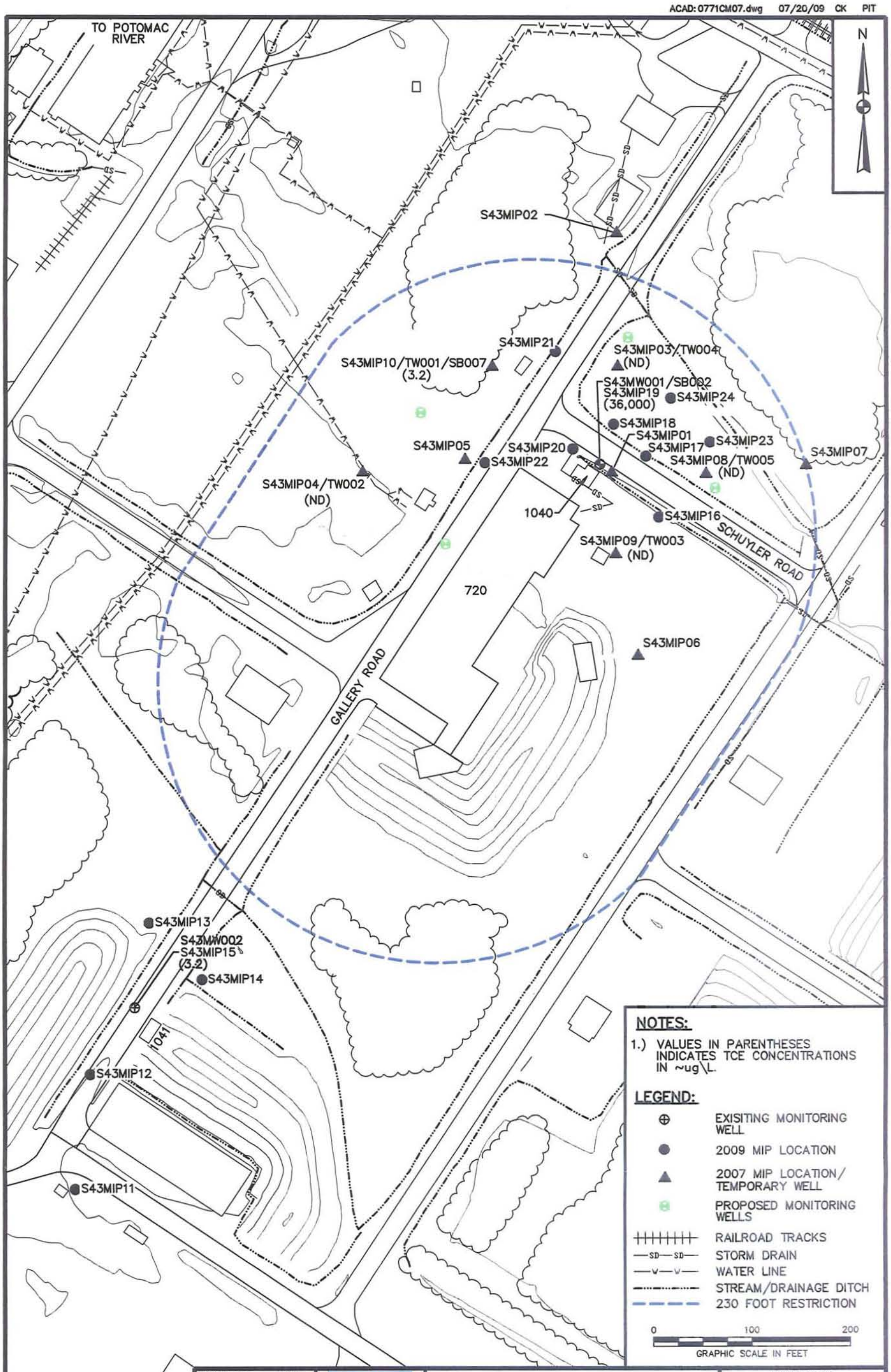
ACAD: 0771CM06.dwg 07/20/09 CK PIT



DRAWN BY CK DATE 7/20/09	2007/2009 SSP SAMPLE LOCATIONS SITE 43 – TOLUENE DISPOSAL NAVAL SUPPORT FACILITY, INIDIAN HEAD INDIAN HEAD, MARYLAND	CONTRACT NO. 0771
CHECKED BY DATE		OWNER NO.
REVISED BY DATE		APPROVED BY DATE
SCALE AS NOTED	NAVFAC	DRAWING NO. FIGURE 2–3 / REV. 0

FORM CADD NO. SDIV-BV.DWG - REV 1 - 9/10/98

ACAD: 0771CM07.dwg 07/20/09 CK PIT



DRAWN BY / DATE	CK 7/20/09
CHECKED BY / DATE	
REVISED BY / DATE	
SCALE	AS NOTED

NAVFAC

PROPOSED MONITORING WELL LOCATIONS
SITE 43 – TOLUENE DISPOSAL
NAVAL SUPPORT FACILITY, INIDIAN HEAD
INDIAN HEAD, MARYLAND

CONTRACT NO.	0771
OWNER NO.	
APPROVED BY / DATE	
DRAWING NO.	FIGURE 4–1
REV.	0

FORM CADD NO. SDIV-BV.DWG - REV 1 - 9/10/98

FIGURE 4-2 – SITE PHOTOGRAPHS

Site 43 (1040) – Looking toward southeast. (2004)

Site 43 (1040) – Looking at northwest side of Building 1040 and Schuyler Road. (2004)

FIGURE 4-2 – SITE PHOTOGRAPHS (CONT.)

Site 43 (1041) – Looking toward northeast along Gallery Road. (2004)

APPENDIX A

2005 FIELD LOG SHEETS AND CHAIN OF CUSTODY FORMS

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 43, CTO 006
PROJECT NUMBER: 2193
DRILLING COMPANY: Talon Drilling
DRILLING RIG: ACKER TRACK RIG

BORING No.: S43SB002 (1) KCT
DATE: 7/14/05
GEOLOGIST: CONTI
DRILLER: STEVE WEIGAND

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0		2/2	(1725)	V DENSE	GRAY ORANGE BRN	SILT TO SILTY SAND AND GRAVEL	SW	MOIST	0			
@ 1725	2			(1730)						0			
S-2 @			1.9/2		STIFF	MOTTLD YELLOW BRN GRAY	SILTY CLAY	CL	MOIST	0			
1735	4			4'±						0			
S-3 @			1.9/2		M STIFF		SANDY CLAY	CL	MOIST	0			
1740	6				TO STIFF	GRAY		/SC		0			
S-4 @			2/2		M STIFF		SANDY CLAY		MOIST → WET	0			
1745	8						CLAYEY SAND 6.2 → 6.4±			0			
				8' TD									
							BOTM @ 8'						
									☒ MS/MSD HERE				
									• ANALYTICAL SAMPLE				
									SEE SLS'				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks:

Converted to Well: Yes ____ No ✓ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page 1 of 1

PROJECT NAME: Indian Head SITE 43, CTO 006
PROJECT NUMBER: 2193
DRILLING COMPANY: Talon Drilling
DRILLING RIG: ACKER TRACK RIG.

BORING No.: S43B002 (2 KCT) / MW001
DATE: 7/14/05 & 7/15/05
GEOLOGIST: CONTI
DRILLER: STEVE WEIGAND

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
7/14 3" 2' Spoons													
S-1 e	0		1.8/2	(1715)	DENSE	BRN	SILT TO SILTY SAND AND GRAVEL	SW	DAMP → MOIST	0			
1715	2			(1720) 2		MOTTLD YELLOW BRN				0			
S-2 e			1.0/2		STIFF		SILTY CLAY - TR ROOTS	CL	MOIST	0			
1800	4					GRAY				0			
S-3 e			2/2		V STIFF	GRAY	CLAYEY SAND	SC	MOIST	0			
1808	6					YELLOW BRN				0			
S4 e			2/2		STIFF / M DENSE	GRAY	CLAYEY SAND	SC	MOIST → WET	0			
1815	8								FEW LENSES MORE GRANULAR CLASSIFICATION	0			
7/15				9 ▼									
	10												
S-5 e			2/2		M DENSE	GRAY TO ORANG BRN	CLAYEY SAND - TR F GRAVEL	SC	WET - SUB ROUND GRAVEL	0			
0730	12								Water ≈ 10' ± MAX GRAVEL SIZE 3/8" Φ	0			
	15												
												0	
						ORANG BRN	CLAYEY SAND TO SANDY CLAY @ 20' ±						
	20			19								0	
				TD HSA @ 20'									
							SET WELL 9-19						
							SAND 7-20						
							BENTONITE 4-7 CHIPS						

* When rock coring, enter rock brokeness.

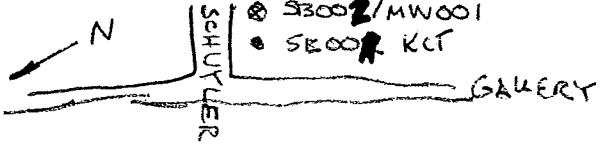
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

• ANALYTICAL SAMPLE

Drilling Area Background (ppm): 0

Remarks: 3" SPOONS - NO BLOWS - 4¼" ID HSA
NEAR BLDG 1040

Converted to Well: Yes ____ No ✓ Well I.D. #: S43MW001

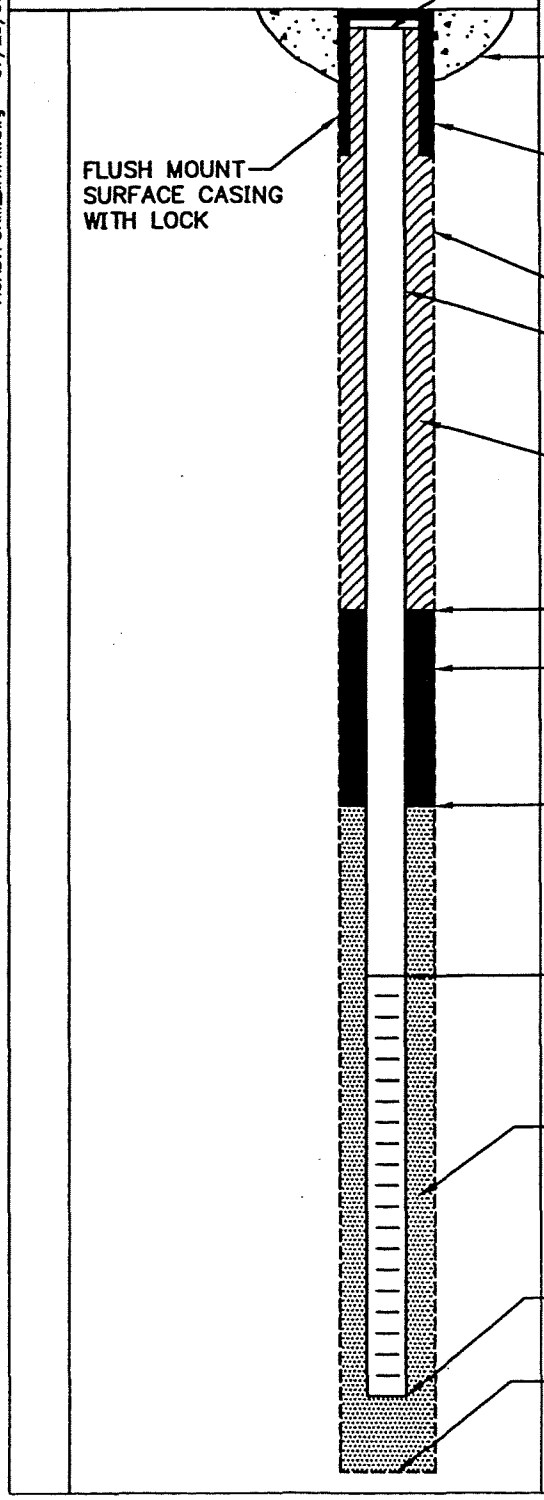


WELL NO.: S43MW0001

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT: INDIAN HEAD	LOCATION: SITE 43 KCF	DRILLER: STEVE WEIGAND	
PROJECT NO.: N2193	BORING: S43SB002	DRILLING METHOD: HSA 4¼ ID	
DATE BEGUN: 7-15-05	DATE COMPLETED: 7-15-05		
FIELD GEOLOGIST: CONTI		DEVELOPMENT METHOD: Surge + purge	
GROUND ELEVATION: 34.36'	DATUM: NGVD 1929		



ELEVATION TOP OF RISER: 33.58' / 0.78'

TYPE OF SURFACE SEAL: —

TYPE OF PROTECTIVE CASING: 2'x2'x6" PAD

I.D. OF PROTECTIVE CASING: FLUSH MOUNT

DIAMETER OF HOLE: 8½"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: CEMENT/BENTONITE GROUT

ELEVATION/DEPTH TOP OF SEAL: 30.36' / 4'

TYPE OF SEAL: DSI 3/8" SHUR PLUG

ELEVATION/DEPTH TOP OF SAND: 27.36' / 7'

ELEVATION/DEPTH TOP OF SCREEN: 25.36' / 9

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 SL x 10'

TYPE OF SAND PACK: FILPRO SAND WG #1

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 15.36' / 19

ELEVATION / DEPTH BOTTOM OF SAND: 14.36' / 20

ELEVATION/DEPTH BOTTOM OF HOLE: 14.36' / 20

BACKFILL MATERIAL BELOW SAND: NA

ACAD:FORM_MWFM.dwg 07/20/99 INL

C 1 | 5989 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 34667

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: MM 7 DD 15 YY 05

Depth of Well: 19 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH 94 660.

OWNER: Naval District Washington
STREET OR RFD: Gallery & Schuyler Road (last name / first name) TOWN: Indian Head, MD 20640
SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Fine sand silt	0	19	

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED: yes Y / no N

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MGD 097
Kathleen Jaworski
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: JGD 079
Joseph Northam
SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes Y / no N

TYPE OF GROUTING MATERIAL (Circle one): CEMENT CM / BENTONITE CLAY BC

NO. OF BAGS 4 NO. OF POUNDS 396

GALLONS OF WATER 32

DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. (TOP) to 9 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	9

OTHER CASING (if used) — EACH CASING

	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: ST STEEL, BR BRASS BRONZE, PL PLASTIC, HO OPEN HOLE, OT OTHER

C 2

DEPTH (nearest ft.) — EACH SCREEN

		from	to
1	PL	9	19
2			
3			

SLOT SIZE 1 010 2 3

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK: from 7 to 19

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour)

PUMPING RATE (gal. per min.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ft.

WHEN PUMPING ft.

TYPE OF PUMP USED (for test)
- A air
- P piston
- T turbine
- C centrifugal
- R rotary
- O other (describe below)
- J jet
- S submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

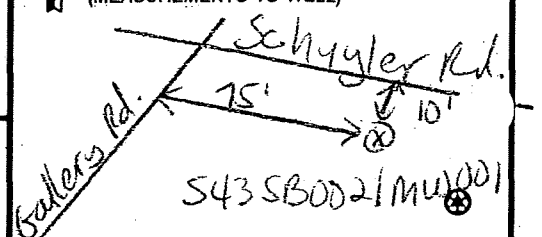
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height)
- + above LAND SURFACE
- – below

(nearest) foot

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV CP20 — SURVEY

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 43, CTO 006
PROJECT NUMBER: 2193
DRILLING COMPANY: Talon Drilling
DRILLING RIG: ACKER TRACK RIG

BORING No.: S43 SB003
DATE: 7-14-05
GEOLOGIST: CONTI
DRILLER: STEVE WEIGAND

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1 C	0		1.8/2	⊙ (1205)	STIFF	BRN GRAY	CLAYEY SILT/SILTY CLAY	ML/SC	MOIST	0			
1205	2			• (1210)			TR ROOTS		1PC 2" GRAVEL NEAR SURFACE	0			
S-2 C			2/2		V STIFF			ML/CL	MOIST	0			
1215	4			4						0			
S-3 C			1.6/2		M DENSE	BRN GRAY	CLAYEY SAND TO	SM	MOIST	0			
1225	6					TO BRN	SILTY SAND			0			
S-4 C			1.8/2	7'						0			
	8				M STIFF	GRAY	SANDY CLAY	SC	MOIST → WET	0			
				TD @ 8'									
									⊙ DUP AT THIS LOCATION				
									SB003 WAS DRILLED AT THE LOCATION PREVIOUSLY SET FOR THE WELL				
									DECIDED TO MOVE WELL TO THE ROAD, WHERE A FLUSH MOUNT WOULD WORK				
									• ANALYTICAL SAMPLE				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: 3" SPOONS - NO BLOW COUNTS (4¼" ID HSA)

Converted to Well: Yes ____ No ✓ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 43, CTO 006
PROJECT NUMBER: 2193
DRILLING COMPANY: Talon Drilling
DRILLING RIG: Acker Track Rig

BORING No.: S43SB004
DATE: 7/14/05
GEOLOGIST: CONTI
DRILLER: STEVE WIEGAND

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1 @ 1025	0		3/2	•(1025)	STIFF	YELLOW BRN	CLAYEY SILT - SILTY CLAY	CL/ML	MOIST	0			
	2			•(1030)		GRAY	TR ROOTS			0			
S-2 @ 1040	4		3/2	4	V STIFF	MOTTLD BRN GRAY	CLAYEY SILT - TR SAND	CL/ML	MOIST 1 PC 2" GRAVEL SUB ROUND	0			
S-3 @ 1050	6		1/2	6	M DENSE	ORANG BRN GRAY	SILTY SAND	SM	MOIST → WET @ 6'±	0			
S-4 @ 1055	8		3/2	7'	STIFF	MOTTLD BRN GRAY	SILTY SANDY CLAY	SC	MOIST	0			
					LOOSE	TAN BRN	SILTY SAND - TR GRAVEL		MOIST → WET	0			
				8' TD									
							BOTM @ 8'						
									WET, BUT NO WATER IS IN HOLE @ 8'				
									• ANALYTICAL SAMPLE				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 3" SPOONS - NO BLOW COUNTS (4¼" ID HSA)

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No ✓ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 43, CTO 006
PROJECT NUMBER: 2193
DRILLING COMPANY: Talon Drilling
DRILLING RIG: Acker Track Rig

BORING No.: S43SB005
DATE: 7-14-05
GEOLOGIST: CONTI
DRILLER: STEVE WEIGAND

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1 @	0		1/2		DENSE	BROWN	3" ASPHALT + ROAD GRAV. SILTY SAND - SOME GRAVEL		MOIST (PETROLEUM ODOR)	0			
1115	2			• (1115)					1½" Ø SUBROUND	0			
S-2			2/2	• (1120)	V STIFF	MOTLD GRAY BRN	SILTY CLAY - TR SAND NEAR 4'	CL	MOIST	0			
@ 1120	4			4						0			
S-3 @			2/2		DENSE	TAN TO		SM	MOIST	0			
1130	6					ORANGE BRN	SILTY SAND - TR CLAY	SC		0			
S-4 @			1.8/2	7'					MOIST → WET	0			
1135	8			8'	STIFF	MOTLD GRAY BRN	SILTY/SANDY CLAY	CL	MOIST	0			
				TD @ 8'									
							BOTTOM 8'						
									0001 - IS AQUEOUS FROM 1-2' DUE TO ASPHALT AT SURFACE				
									0101 - IS FROM	2'	3'		
									• ANALYTICAL SAMPLE.				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 3" SPOONS - NO BLOW COUNTS (4¼" ID HSA)

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No ✓ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head SITE 43, CTO 006
PROJECT NUMBER: 2193
DRILLING COMPANY: Talon Drilling
DRILLING RIG: ACKER TRACK MOUNT

BORING No.: S43MW002/SB006
DATE: 7-14-05
GEOLOGIST: CONTI
DRILLER: STEVE WEIGAND

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1 @ 1245	0		1/2		M DENSE	BRN	3" ASPHALT - ROAD GRAV SILTY SAND	SM	MOIST	0			
	2			• (1245)						0			
S-2 @ 1250			2/2	• (1250)	V STIFF	BRN GRAY	SILTY CLAY - TR SAND	CL	MOIST	0			
	4					MOTTLD				0			
S-3 @ 1315			2/2		V STIFF	ORANG GRAY	SANDY CLAY / CLAYEY SAND	CL / S/C	MOIST	0			
	6			6		BRN				0			
S-4 @ 1320			2/2		M DENSE	TAN BRN	SILTY SAND TO	SM	MOIST	0			
	8					ORANG BRN	- TR GRAVEL		2 → WET	0			
	10												
S-5 @ 1330			2/2		DENSE	TAN GRN				0			
	12					TO ORANG BRN	SILTY SAND - TR CLAY	SM	MOIST → WET	0			
				12									
				14' ±					CENTER PLUG WDT @ 15'				
	15												
S-6 @ 1340			1.5/2		DENSE	ORANG BRN	F/M SAND - TR GRAVEL		FOR SAMPLE NOS.	0			
	17								NOTE:	0			
									D001 = 1-2'				
									D101 = 2-3'				
	20												
				21±					ORIGINAL LOC OF SB003 - WAS MOVED TO ACCOMODATE A FLUSH MOUNT INSTALL.			0	
				22	STIFF	GRAY	SILTY CLAY (From Cuttings)						
	23											0	
				TD 23			Last 2' Augers Coated : Clay.						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

○ ANALYTICAL SAMPLE

Drilling Area Background (ppm): 0

Remarks: 3" SPOON1 NO BLOW COUNTS (4¼" ID HSA)
SET WELL 12 - 22, SAND 23 TO 10, PELLETS TO 7'

Converted to Well: Yes ✓ No _____ Well I.D. #: S43MW002

NEAR BLDG 1041

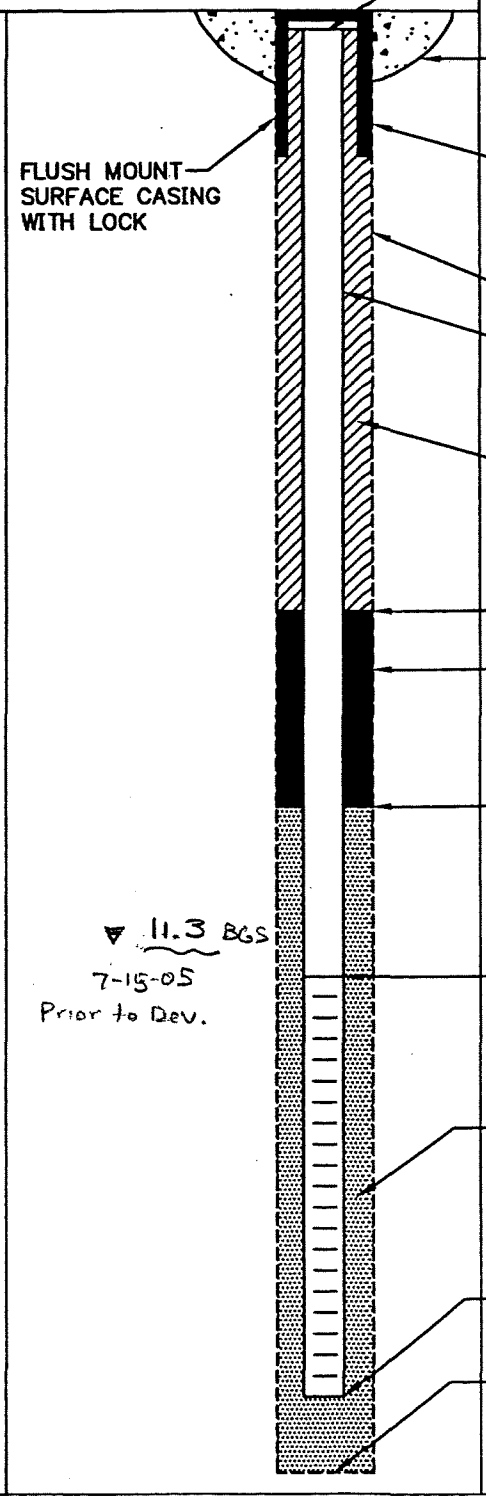
WELL NO.: S43MW002

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT Indian Head CTO 006	LOCATION Indian Head Site 43	DRILLER STEVE WEIGAND
PROJECT NO. N2193	BORING S43SB006	DRILLING METHOD HSA 4¼" ID
DATE BEGUN 7/14/05	DATE COMPLETED 7-14-05	
FIELD GEOLOGIST CONTI		DEVELOPMENT METHOD surge + purge
GROUND ELEVATION 35.10'	DATUM NGVD 1929	

ACAD:FORM_MWFM.dwg 07/20/99 INL



ELEVATION TOP OF RISER: 34.72'/0.38'

TYPE OF SURFACE SEAL: 2' x 2' x .5' concrete pad

TYPE OF PROTECTIVE CASING: flush mount

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.5"

TYPE OF RISER PIPE: 2" PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: ~~DSI 3/8" SHUR PLUG~~ ~~Bentonite pellets~~ cement / DSI bentonite mix (CO)

ELEVATION/DEPTH TOP OF SEAL: 28.10'/ 7'

TYPE OF SEAL: DSI 3/8" SHUR-PLUG Bentonite pellets

ELEVATION/DEPTH TOP OF SAND: 25.10'/ 10'

ELEVATION/DEPTH TOP OF SCREEN: 23.10'/ 12'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 sl x 10'

TYPE OF SAND PACK: FilPro Filtration Sand W.G. #1

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 13.10'/ 22'

ELEVATION / DEPTH BOTTOM OF SAND: 13.10'/ 23'

ELEVATION/DEPTH BOTTOM OF HOLE: 13.10'/ 23'

BACKFILL MATERIAL BELOW SAND: NA

C 1 | 5990 | SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 34667

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED MM DD YY: 7 14 05

Depth of Well: 22 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL W": CH - 94 - 6603

OWNER Naval District Washington
STREET OR RFD Gallery Road (last name / first name) TOWN Indian Head, MD 20640
SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Fine sand Silt	0	22	

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MGD 097
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: IGD 079
(SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS 5 NO. OF POUNDS 470
GALLONS OF WATER 40
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (TOP) to 10 ft. (BOTTOM)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below:
[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	12

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below:
[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

DEPTH (nearest ft.)

EACH SCREEN			
1	PL	12 to	22
2			
3			

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 10 to 22

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING ft.
WHEN PUMPING ft.

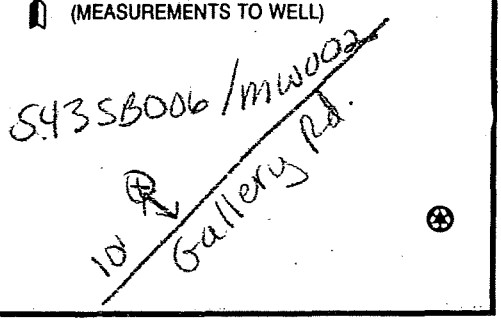
TYPE OF PUMP USED (for test)
[A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height)
[+] above [–] below LAND SURFACE (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

Sample ID No.: S43SS0010001
Sample Location: S43SB001 ~~MW001~~ KCT
Sampled By: CO, SC
C.O.C. No.: 4325

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1715	0'-1'	Brown	Silt to silty sand and gravel, damp to moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	3 x EnCore	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8oz	✓	
~~Explosives 8330 plus Nitroguanidine and Nitroglycerin~~	~~1 x 4oz glass~~		
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~	~~✓~~	
Explosives	1x4oz glass	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

[] Surface Soil
[x] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: **S43SB0010101**
Sample Location: **S43SB001** ~~MW001~~
Sampled By: CD, SC KS
C.O.C. No.: 4325

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1720	1'-2'	Brown to mottled yellow brown	Silt to silty sand and gravel, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	~~3 x EnCore~~ 1 x 4oz glass	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8oz	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S43SS0020001
Sample Location: S43SB002/~~MW001~~ (D)
Sampled By: CD, SC MWDM AC
C.O.C. No.: 4325

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1725	0'-1'	gray orange	silt to silty sand and gravel, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	3 x EnCore	✓	
Total ILMO4.0 TAL Metals +CN	1 x ~~4oz~~ glass 8oz	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Chris Jacobs

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

Sample ID No.: S43SB0020101
Sample Location: S43SB002/~~MW001~~ CD
Sampled By: CD, SC MWAA KT
C.O.C. No.: 4325

[] Surface Soil
[x] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1730	1'-2'	Brown	silt to silty sand and gravel, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	3 x EnCore	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8oz	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD: yes

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S43SS0030001
Sample Location: S43SB003
Sampled By: CO, SC
C.O.C. No.: 4325

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1205	0'-1'	brn. gray	clayey silt, trace roots, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	6 ~~3x~~ EnCore	✓	
Total ILMO4.0 TAL Metals + CN	2 ~~1x 4oz~~ glass 8 oz	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	2 ~~1~~ x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~2 1 x 4oz glass~~	~~✓~~	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S43SSDUP0001

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

Sample ID No.: S43SB0030101
Sample Location: S43SB003
Sampled By: CO, SC
C.O.C. No.: 4325

[] Surface Soil
[x] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1210	1'-2'	brn. gray	clayey silt, trace roots, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	6 ~~8~~ x EnCore	✓	
Total ILMO4.0 TAL Metals + CN	2 ~~1~~ x ~~4oz~~ glass 8 oz.	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	2 ~~1~~ x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~2 1 x 4oz glass~~	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: S43SBDUP0101

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S43SS0040001
Sample Location: S43SB004
Sampled By: CD, SC
C.O.C. No.: 4325

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1025	0'-1'	yellow brown	clayey silt, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	3 x EnCore	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8oz.	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~	~~✓~~	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

Sample ID No.: S43SB0040101
Sample Location: S43SB004
Sampled By: CO, SC
C.O.C. No.: 4325

[] Surface Soil
[x] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1030	1'-2'	brn. gray	clayey silt / silty clay, trace roots, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	3 x EnCore	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8 oz.	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Chris Dealer

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: S43SS0050001
Sample Location: S43SB005
Sampled By: ~~[redacted]~~ CD, SC
C.O.C. No.: 4325

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1115	1'-2'	brown	silty sand, some gravel, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	3 x EnCore	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8 oz	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~ →	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~	~~✓~~	

OBSERVATIONS / NOTES:

0'-1' is asphalt and road gravel. First sample at S43SB005 taken at 1'-2'.

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

Sample ID No.: S43SB0050101
Sample Location: S43SB005
Sampled By: CD, SC
C.O.C. No.: 4325

[] Surface Soil
[x] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1120	2'-3'	gray brn.	silty clay, trace sand, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	3 x EnCore	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8 oz.	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~	~~✓~~	

OBSERVATIONS / NOTES:

0'-1' is asphalt and road gravel. second sample at S43SB005 taken at 2'-3'

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Chris Jacobs

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

Sample ID No.: S43SS0060001
Sample Location: S43SB006/MW002
Sampled By: CD, SC
C.O.C. No.: 4325

[x] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1245	1'-2'	brown	road gravel and silty sand, moist
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	~~3 x EnCore~~ 1 x 4oz glass	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8 oz.	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~	~~✓~~	

OBSERVATIONS / NOTES:

0'-1' is asphalt and road gravel. first sample at S43SB006 taken at 1'-2'

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

Sample ID No.: S43SB0060101
Sample Location: S43SB006/MW002
Sampled By: CD, SC
C.O.C. No.: 4325

[] Surface Soil
[x] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[x] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 7/14/05	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1250	0 1' (D) 2'-3'	brn. gray	silty clay, trace sand, moist.
Method: disposable trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	~~3 x EnCore~~ 1 x 4oz. glass	✓	
Total ILMO4.0 TAL Metals + CN	1 x ~~4oz~~ glass 8 oz.	✓	
Explosives 8330 ~~plus Nitroguanidine and Nitroglycerin~~	1 x 4oz glass	✓	
~~Nitrocellulose 353.2~~	~~1 x 4oz glass~~	✓	

OBSERVATIONS / NOTES:

0'-1' is asphault and road gravel. Second sample at S43SB006 taken at 2-3'

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW001
Site: 43
Date Installed: 7/15/05
Date Developed: 7/21/05
Dev. Method: Surge + purge
Pump Type: whale 12v.

Depth to Bottom (ft.): 18.64
Static Water Level Before (ft.): 6.64
Static Water Level After (ft.): 7.10
Screen Length (ft.): 10
Specific Capacity: —
Casing ID (in.): 2" PVC

Responsible Personnel: Colin Doolan
Drilling Co.: Talon
Project Name: Indian Head Site 43, CTO 006
Project Number: 2193

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1625	—	—	—	—	—	—	—	start development, yellow brown
1635	0.1	~20	7.05	18.93	5.58	0.277	>999	brown
1645	0	~40	7.07	18.18	5.28	0.272	>999	pale brown
1655	0	~60	7.08	18.51	5.22	0.262	150	slightly cloudy
1705	0	~80	7.10	18.51	5.28	0.265	24	clear
1715	0	~100	7.10	18.49	5.34	0.266	8.1	clear, end development

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW002
Site: 43
Date Installed: 7/14/05
Date Developed: 7/21/05
Dev. Method: Surge + purge
Pump Type: whale 12 v.

Depth to Bottom (ft.): 21.42
Static Water Level Before (ft.): 10.87
Static Water Level After (ft.): —
Screen Length (ft.): 10
Specific Capacity: —
Casing ID (in.): 2"

Responsible Personnel: C. Doolan
Drilling Co.: Talon
Project Name: Indian Head SITE 43, CTO 006
Project Number: 2193

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1505	—	—	—	—	—	—	—	start development, orange, brn
1515	0.1	~10	12.43	21.88	4.96	0.425	>999	orange brown
1529	<0.1	~25	12.60	20.74	4.64	0.380	250	pale yellow
1535	0	~45	12.68	20.87	4.68	0.380	170	pale yellow slightly cloudy
1545	0	~65	12.79	20.42	4.69	0.379	55	v. slightly cloudy
1555	0	~85	12.83	20.60	4.71	0.381	24	clear
1605	0	~105	12.93	21.24	4.79	0.383	60	clear, end development

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

[] Domestic Well Data
[x] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43MW~~0020~~001 0101
Sample Location: S43MW~~004~~001
Sampled By: CD
C.O.C. No.: 4330
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Date: 7/25/05	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Time: 1820								
Method: peristaltic	clear	5.30	0.226	18.99	2.4	0.00	106	—

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Date: 7/25/05								
Method: peristaltic			see	purge	sheet			
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 18.64'								
Static Water Level (WL): 6.77'								
One Casing Volume(gal): 8.4								
Start Purge (hrs): 1700								
End Purge (hrs): 1815								
Total Purge Time (min): 75								
Total Vol. Purged (gal): 15.00								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs	HCl	4 ~~2~~ x 40 ml glass	✓
Total ILMO4.0 TAL Metals	HNO_3	2 ~~1~~ x 250 ml plastic	✓
Explosives 8330	None	6 ~~3~~ x 1000 ml glass	✓
~~Nitroguanidine Nitroglycerin and Nitrocellulose~~			
CN	NaOH	2 ~~1~~ x 250 ml plastic	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: ~~SB3MWFB~~ S43MWDUP0101

Signature(s):

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: SSP Investigation Site 43 WELL ID.: 543MW001
PROJECT NUMBER: CTO 006 JOB # N2193 DATE: 7/25/05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume(L)	Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments
1700	6.77		—	—	—	—	—	—	—	start purge, clear
1710	6.79	~2.00	200	4.77	0.208	25	0.00	19.70	165	clear
1720	6.79	4.00	200	4.90	0.205	14	0.62	19.50	151	clear
1730	6.79	6.00	200	4.99	0.208	11	1.21	19.34	140	clear
1740	6.79	8.00	200	5.08	0.214	6.3	0.97	19.19	130	clear
1750	6.79	10.00	200	5.17	0.219	4.5	0.55	19.03	120	clear
1800	6.79	12.00	200	5.23	0.222	3.7	0.20	19.04	113	clear
1805	6.79	13.00	200	5.26	0.224	3.0	0.00	18.91	111	clear
1810	6.79	14.00	200	5.27	0.225	2.5	0.00	18.92	108	clear
1815	6.79	15.00	200	5.30	0.226	2.4	0.00	18.99	106	clear, end purge
1820	←								—	start sample

SIGNATURE(S): Chris Dealan

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: SSP Investigation Site 43
Project No.: CTO 0006 JOB # N2193

[] Domestic Well Data
[x] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43MW~~0010~~002101
Sample Location: S43MW~~001~~002
Sampled By: CD
C.O.C. No.: 4327
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/27/05	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1235	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	
Method: peristaltic	Clear	4.57	0.368	21.00	0.10	0.30	352	—

PURGE DATA:

Date: 7/27/05	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: peristaltic			See	purge	sheet			
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 21.42'								
Static Water Level (WL): 11.00'								
One Casing Volume(gal): 6.5								
Start Purge (hrs): 1130								
End Purge (hrs): 1230								
Total Purge Time (min): 60								
Total Vol. Purged (gal): 14.80								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOCs	HCl	6 x 40 ml glass	✓
Total ILMO4.0 TAL Metals	HNO_3	3 x 250 ml plastic	✓
Explosives 8330	None	3 x 1000 ml glass	✓
~~Nitroguanidine Nitroglycerin and Nitrocellulose~~			
CN	NaOH	3 x 250 ml plastic	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	

Signature(s):

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: SSP Investigation Site 43
PROJECT NUMBER: CTO 006 JOB # N2193
WELL ID.: 543MW002
DATE: 7/27/05

Time (Hrs.)	Water Level (Ft. below TOC)	Volume(L)	Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments
1130	11.00									Start purge, clear
1140	11.04	2.30	200	4.31	0.365	5.5	1.81	21.09	365	clear
1150	11.05	4.80	250	4.34	0.362	19	1.07	20.89	365	clear
1200	11.04	7.30	250	4.42	0.365	5.6	0.68	20.95	357	clear
1210	11.04	9.80	250	4.49	0.367	1.8	0.43	21.08	355	clear
1220	11.04	12.30	250	4.54	0.368	0.55	0.32	21.00	354	clear
1225	11.04	13.55	250	4.56	0.368	0.05	0.31	21.06	352	clear
1230	11.04	14.80	250	4.57	0.368	0.10	0.30	21.00	352	clear, end purge
1235										start sample

SIGNATURE(S): Alison Scanlon

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head
Location: Site 43
Weather Conditions: Hot, Sunny mid 90s
Tidally Influenced: Yes ___ No ✓

Project No.: N2193 CTO 0006
Personnel: C. Doolan
Measuring Device: Dipper-T WL Indicator
Remarks:

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
MW001	7/21/05	1625	33.58	18.64	6.64	—	26.94	
MW002	7/21/05	1505	34.72	21.42	10.87	—	23.85	

* All measurements to the nearest 0.01 foot

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4325 | PAGE 1 OF 2

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO 0006 JOB#N2193	Indian Head	Kim Turnbull	412-921-7090	MITKEM Corp. Ben Dodge
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Colin Doolan		Colin Doolan	412-921-8868	175 Metro Central Blvd.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		Fed Ex 8492 7852 5286		Warwick RI 02886

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE (YEAR 2005)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)									PRESERVATIVE USED									COMMENTS
		TYPE OF ANALYSIS							G	G	G	G						none	none	none	none						
									TCL Volatiles	Explosives	~~Nitrocellulose~~	Total TAL Metals	CN														
7/14	1025	S43SS0040001	—	0	1	SO	G	~~6~~5	✓	✓	✓	✓	✓														
7/14	1030	S43SB00401 01	—	1	2	SO	G	~~6~~5	✓	✓	✓	✓	✓														
7/14	1115	S43SS0050001	—	1	2	SO	G	~~6~~5	✓	✓	✓	✓	✓														
7/14	1120	S43SB00501 01	—	2	3	SO	G	~~6~~5	✓	✓	✓	✓	✓														
7/14	1205	S43SS0030001	—	0	1	SO	G	~~6~~5	✓	✓	✓	✓	✓														
7/14	1210	S43SB0030101	—	1	2	SO	G	~~6~~5	✓	✓	✓	✓	✓														
7/14	1245	S43SB0060001	—	1	2	SO	G	~~4~~3	✓	✓	✓	✓	✓													used 4oz. glass	
7/14	1250	S43SB0060101	—	2	3	SO	G	~~4~~3	✓	✓	✓	✓	✓													instead of EnCores for VOCs	
7/14	1715	S43SS0010001	—	0	1	SO	G	5	✓	✓		✓	✓														
7/14	1720	S43SB0010101	—	1	2	SO	G	3	✓	✓		✓	✓													"	
7/14	1725	S43SS0020001	—	0	1	SO	G	5	✓	✓		✓	✓														
7/14	1730	S43SB0020101	—	1	2	SO	G	10	✓	✓		✓	✓													do MS/MSD	
7/14	0000	S43SSDUP0001	—	0	1	SO	G	5	✓	✓		✓	✓													DUP of SS0030001	

LM 7/8/05

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Colin Doolan	7/15/05	1100	Fed Ex		
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4326 | PAGE 2 OF --

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO 0006 JOB#N2193	Indian Head	Kim Turnbull	412-921-7090	MITKEM Corp. Ben Dodge
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Colin Doolan		Colin Doolan	412-921-8868	175 Metro Central Blvd.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		Fed Ex 8492 7852 5286		Warwick RI 02886

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE (YEAR 2005)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)									
									G									
									PRESERVATIVE USED									
									TYPE OF ANALYSIS									
									TCL Volatiles	Explosives	Total TAL Metals	CN						COMMENTS
									none*	none	none**	none***						
7/15	0910	S43RB0010001	—	—	—	QC	QC	7	✓	✓	✓	✓						
7/14	0000	S43SBDUP0101	—	1	2	SO	G	5	✓	✓	✓	✓						DUP of SB0030101
7/15	0930	S43TB0010001	—	—	—	QC	QC	1	✓									

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Colin Doolan	7/15/05	1100	1. RECEIVED BY Fed Ex		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS *HCl preservative for rinsate + trip blank ** HNO_3 preserv. for RB *** NaOH preserv. for RB

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 4330 | PAGE 1 OF 1

PROJECT NO: CTO 0006 JOB#N2193	FACILITY: Indian Head	PROJECT MANAGER: Kim Turnbull	PHONE NUMBER: 412-921-7090
LABORATORY NAME AND CONTACT: MITKEM Corp., Ben Dodge			
SAMPLERS (SIGNATURE): Colin Doolan	FIELD OPERATIONS LEADER: Colin Doolan	PHONE NUMBER: 412-921-7090	ADDRESS: 175 Metro Central Blvd.
CARRIER/WAYBILL NUMBER: Fed Ex 8455 4237 8448			CITY, STATE: Warwick, RI 02886

STANDARD TAT ☒
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE (YEAR 2005)	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: TCL VOCs	Total TAL Metals	Explosives	CN	CONTAINER TYPE PLASTIC (P) or GLASS (G): G	PRESERVATIVE USED: HCl	P	HNO3	G	None	P	NaOH	COMMENTS
7/25	1820	S43MW001O101	—	—	—	GW	G	7	2	1	3	1									
7/25	0000	S43MWDUP0101	—	—	—	GW	G	7	2	1	3	1									DUP of S43MW001O101

1. RELINQUISHED BY: Colin Doolan	DATE: 7/26/05	TIME: 1630	1. RECEIVED BY: Fed Ex	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS: Trip blank is on COC for site 38 3144 CTO 005

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

T. A TECH NUS, INC. CHAIN OF CUSTODY NUMBER 4327 PAGE 1 OF _ _

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
CTO 006 JOB#N2193	Indian Head	Kim Turnbull	412-921-7090	MITKEM Corp., Ben Dodge
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Colin Doolan		Colin Doolan	412-921-7090	175 Metro Central Blvd.
		CARRIER/WAYBILL NUMBER		CITY, STATE
		Fed Ex 8447 8135 6921		Warwick, RI 02886

STANDARD TAT ☑
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR 2005	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)								COMMENTS
									G	P	G	P					
									PRESERVATIVE USED								
									HCl	HNO3	None	NaOH					
									TYPE OF ANALYSIS								
									TCL Volatiles	Total TAL Metals	Explosives	CN					
7/27	1235	S43MW0020101	—	—	—	GW	G	21	6	3	9	3					run MS/MSD

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Colin Doolan	7/27/05	1830	Fed Ex		
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS Trip Blank is on COC # 4324, Site 38 JOB# 2144

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TtNUS-001

APPENDIX B

2007 MIP LOGS AND FIELD DATA

MITKEM CORPORATION
175 Metro Center Boulevard
Warwick, Rhode Island 02886-1755
(401) 732-3400 • Fax (401) 732-3499
email: mitkem@mitkem.com

CHAIN-OF-CUSTODY RECORD #1

REPORT TO			INVOICE TO		
COMPANY TETRA TECH NUS	PHONE 4129217090		COMPANY SAME AS REPORT TO.	PHONE	LAB PROJECT #:
NAME KIM TURNBULL	FAX 4129214090		NAME	FAX	
ADDRESS 661 ANDERSEN DR			ADDRESS		TURNAROUND TIME: STD
CITY/ST/ZIP PITTSBURGH PA 15220			CITY/ST/ZIP		

CLIENT PROJECT NAME: SITE 43 INDIANHEAD Md.
CLIENT PROJECT #: 112600771
CLIENT P.O.#:

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS	REQUESTED ANALYSES: TCL VOA	COMMENTS
S43TB0010102	11-10-07 1335			X				2	✓	FROM LAB
S43TW0010102	11-10-07 1405			X				3	✓	
S43TW0020102	11-10-07 1515			X				3	✓	
S43TW0030102	11-11-07 0710			X				3	✓	
S43TW0040102	11-10-07 1625			X				3	✓	
S43TW0050102	11-10-07 1710			X				3	✓	
S43MW0010102	11-11-07 0850			X				9	✓	* RUN MS/MSD @ HI CONC. SAMPLE
S43MWDUP0102	11-11-07 0000			X				3	✓	* COLLECTED @ MW001
S43MW0020102	11-11-07 1030			X				3	✓	
S43FB0010102	11-11-07 0900			X				3	✓	
S43RB0010102	11-11-07 0905			X				2	✓	
	/									

TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME	ADDITIONAL REMARKS:	COOLER TEMP:
	Fred W Ramsey	11/12/07 1800	FED EX	/	LAB CONTACT ED LAWLER	
		/		/	FEDEX AB# 863125262658	
		/		/		

WHITE: LABORATORY COPY YELLOW: REPORT COPY PINK: CLIENT'S COPY

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSF Indian Head, Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43TW001010702
Sample Location: S43TW001
Sampled By: FRED WILLIAMS
C.O.C. No.: MITREM TP1
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 11/10/07 Time: 1405 Method: Low flow	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP mV	Sal %
	GREY	5.44	39	15.8	>999	—	—	0.0

PURGE DATA:

Date: 11/10/07 Method: Peristaltic Pump	~~Time~~ Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Monitor Reading (ppm): 0.0	1355	5.46	42	15.9	>999	—	0.0	0.27
Well Casing Diameter & Material Type: S.S. ~1" GEOPROBE W. POINT	1400	5.42	39	16.2	7999	—	0.0	0.26
	1405	5.42	39	15.9	7999	—	0.0	0.25
	SPL	5.44	39	15.8	7999	—	0.0	0.25
Total Well Depth (TD): 25' BGS								
Static Water Level (WL): —								
One Casing Volume(gal/L): —								
Start Purge (hrs): 1340								
End Purge (hrs): 1405								
Total Purge Time (min): 25								
Total Vol. Purged (gal/L): 9.5L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC (~~TCE, cis-1,2-DCE, VC~~) TCL	HCL	3 X 40 ml Vials	YES
Total Metals As, Cr, Fe, Pb, V	HNO_3	HDPE	NO
Dissolved Metal As, Cr, Fe, Pb, V	HNO_3	HDPE	NO

OBSERVATIONS / NOTES:

PURGED ~ 2 CASES (~7.6L) FOR DEVELOPMENT, LOWER Q TO ~200ml/MIN FOR PARAMETER
SCREEN 21'-25' LOCATED @ S43MIP10 (Node NW1)
Added OIL RED "O" DYE DOES NOT DISSOLVE IN WATER (NEGATIVE)

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred Williams

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSF Indian Head, Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43TW002020107
Sample Location: S43TW002
Sampled By: PWR
C.O.C. No.: MITKEM #1
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 11/10/07	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
Time: 1515	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	%
Method: Low flow	GRAY	6.46	33	15.7	>999	—	—	0.0

PURGE DATA:

Date: 11/10/07	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: Peristaltic Pump	1505	6.35	32	15.7	>999	—	0.0	0.21
Monitor Reading (ppm): 0.0	1510	6.44	33	15.8	7999	—	0.0	0.21
Well Casing Diameter & Material	1515	6.46	33	15.7	>999	—	0.0	0.21
Type: S.S GROUNDFOS W.P.								
Total Well Depth (TD): 27'								
Static Water Level (WL): —								
One Casing Volume(gal/L): —								
Start Purge (hrs): 1455								
End Purge (hrs): 1515								
Total Purge Time (min): 20								
Total Vol. Purged (gal/L): 2gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC ~~(TCE, cis-1,2-DCE, VC)~~ TCL	HCL	3 X 40 ml Vials	✓
Total Metals As, Cr, Fe, Pb, V	HNO_3	HDPE	— NO
Dissolved Metal As, Cr, Fe, Pb, V	HNO_3	HDPE	do

OBSERVATIONS / NOTES:

@ S43MIP04 START DEV/PURGE @ 1455 Q = 500ml/min

RED DYE "O" NEG.

NODE "W2"

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSF Indian Head, Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43TW00301107
Sample Location: S43TW003
Sampled By: FWR
C.O.C. No.: MITKEM #1
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 11/11/07	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
Time: 0710	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	%
Method: Low flow	GREY	5.50	14	16.8	>999	—	—	0.0

PURGE DATA:

Date: 11/11/07	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: Peristaltic Pump	0700	6.05	22	14.6	7999	—	0.0	0.14
Monitor Reading (ppm): 0.0	0705	5.52	15	16.9	7999	—	0.0	0.10
Well Casing Diameter & Material	0710	5.50	14	16.8	7999	—	0.0	0.09
Type: 1" PVC SCREEN								
Total Well Depth (TD): 20' BGS								
Static Water Level (WL): 8.5'								
One Casing Volume(gal/L): 2 L								
Start Purge (hrs): 0700								
End Purge (hrs): 0710								
Total Purge Time (min): 10								
Total Vol. Purged (gal/L): 2 L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC (~~TCE, cis 1,2 DCE, VC~~) TCL	HCL	3 X 40 ml Vials	✓
Total Metals As, Cr, Fe, Pb, V	HNO_3	HDPE	NO
Dissolved Metal As, Cr, Fe, Pb, V	HNO_3	HDPE	NO

OBSERVATIONS / NOTES:

LOCATED @ S43MIP09 NODE N4

NEG RESPONSE TO RED DYE

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramer

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSF Indian Head, Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43TW0040102
Sample Location: S43TW004
Sampled By: FRED W RAMSEY
C.O.C. No.: MITKEM #1
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 11/10/07	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
Time: 1625	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	%
Method: Low flow	GREY	5.40	22	16.2	>999	—	—	0.0

PURGE DATA:

Date: 11/10/07	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: Peristaltic Pump	1610	5.50	21	14.5	>999	—	0.0	0.14
Monitor Reading (ppm): 0.0	1615	5.38	8	16.3	>999	—	0.0	0.14
Well Casing Diameter & Material Type: S.S GEOPROBE	1620	5.38	22	16.1	>999	—	0.0	0.14
	1625	5.40	22	16.2	>999	—	0.0	0.15
Total Well Depth (TD): 24'								
Static Water Level (WL): —								
One Casing Volume(gal/L): —								
Start Purge (hrs): 1555								
End Purge (hrs): 1625								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): ~2gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC ~~(TCE, cis-1,2-DCE, VC)~~ TCL	HCL	3 X 40 ml Vials	YES
Total Metals As, Cr, Fe, Pb, V	HNO_3	HDPE	NO
Dissolved Metal As, Cr, Fe, Pb, V	HNO_3	HDPE	NO

OBSERVATIONS / NOTES:

@ S43MIP03 LOCATION (NODE N3)

SCREEN 20'-24'

NEG. RESPONSE TO RED DYE "O".

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramsey

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSF Indian Head, Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43TW005 0102
Sample Location: S43TW005
Sampled By: PVRAMSFR
C.O.C. No.: MITKEM#1
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 10/17 11/16/07	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
Time: 1710	Visual	Standard	mS/cm	°C	NTU	mg/l	mV	%
Method: Low flow	GREY	6.10	20	16.1	> 999	—	—	0.0

PURGE DATA:

Date: 11/16/07	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: Peristaltic Pump	1700	6.02	21	15.7	> 999	—	0.0	0.13
Monitor Reading (ppm): 0.0	1705	6.09	20	16.1	7999	—	0.0	0.13
Well Casing Diameter & Material	1710	6.10	20	16.1	7999	—	0.0	0.13
Type: ~1" S.S GEOPROBE								
Total Well Depth (TD): 24'								
Static Water Level (WL): —								
One Casing Volume(gal/L): —								
Start Purge (hrs): 1650								
End Purge (hrs): 1710								
Total Purge Time (min): 20								
Total Vol. Purged (gal/L): ~2gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC (~~TCE, cis-1,2-DCE, VC~~) TCL	HCL	3 X 40 ml Vials	YES
Total Metals As, Cr, Fe, Pb, V	HNO_3	HDPE	NO
Dissolved Metal As, Cr, Fe, Pb, V	HNO_3	HDPE	NO

OBSERVATIONS / NOTES:

SCREEN 20-24, LOCATION @ S43M1P08
NODE "W4"

RED "O" DYE NEG.

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	
—	—	Fred W Ramsey

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSF Indian Head, Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43MW0010102
Sample Location: S43MW0001
Sampled By: Fred W. Ramsey
C.O.C. No.: MITKEM
Type of Sample:
[] Low Concentration
[X] High Concentration

SAMPLING DATA:

Date: 11-11-07 / Time: 0850 / Method: Low flow	Color Visual	pH Standard	S.C. mS/~~cm~~ m	Temp. °C	Turbidity NTU	DO mg/l	ORP mV	Sal %
	CLR	5.40	22	18.1	0	1.60	—	0.0

PURGE DATA:

Date: 11-11-07	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: Peristaltic Pump								
Monitor Reading (ppm): 15 ppm								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 18.66								
Static Water Level (WL): 8.20								
One Casing Volume(gal/L): SEE BELOW								
Start Purge (hrs): ~~8.26~~ 7940								
End Purge (hrs): 0850								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L): 14 L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC (~~TCE, cis-1,2-DCE, VC~~) TCL	HCL	3 X 40 ml Vials	YES
Total Metals As, Cr, Fe, Pb, V	HNO_3	HDPE	—
Dissolved Metal As, Cr, Fe, Pb, V	HNO_3	HDPE	—

OBSERVATIONS / NOTES:

NEG RESPONSE TO RED DYE, 10' SATURATED SCREEN ? 6.2 L X 2 = MIN PURGE VOL 12.4 L

Circle if Applicable:

MS/MSD ✓

Duplicate ID No.: S43MW DUP0102

Signature(s): Fred W Ramsey

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF Indian Head, Site 43
PROJECT NUMBER: 112G00771

WELL ID.: S43MW001
DATE: 11/11/07

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	Sal. (%)	Comments
0755	8.28	200	5.25	21	300	0.33	16.7	0.0	7 L VOL
0805	8.29	200	5.32	21	100	1.48	17.7	0.0	8 L S
0815	8.29	200	5.34	22	50	2.48	17.9	0.0	8 L 7
0825	8.29	200	5.34	22	20	2.43	17.9	0.0	7 L 9
0835	8.29	200	5.36	23	2	1.77	17.9	0.0	9 L 11
0845	8.29	200	5.39	23	0	1.68	18.0	0.0	8 L 13 L
0850	8.29	200	5.40	22	0	1.60	18.1	0.0	12 L WELL FINISH
									PURGE BEGIN
									TO FILL CONT.

SIGNATURE(S): Eric M Ramsey

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Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSF Indian Head, Site 43
Project No.: 112G00771

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: S43MW002O102
Sample Location: S43MW002
Sampled By: FRED W RAMSEY
C.O.C. No.: MITKEM
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 11-11-07	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Sal
Time: 1030	Visual	Standard	mS/~~cm~~ µm	°C	NTU	mg/l	mV	%
Method: Low flow	CLR	4.39	40	19.6	0	0.00	—	0.0

PURGE DATA:

Date: 11-11-07	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	TDS
Method: Peristaltic Pump								
Monitor Reading (ppm): 0 ppm								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 21.20								
Static Water Level (WL): 12.22								
One Casing Volume(gal/L): SEE BELOW								
Start Purge (hrs): 0930								
End Purge (hrs): 1030								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 11.75L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOC ~~(TCE, cis-1,2-DCE, VC)~~ TCL	HCL	3 X 40 ml Vials	✓
Total Metals As, Cr, Fe, Pb, V	HNO_3	HDPE	NO
Dissolved Metal As, Cr, Fe, Pb, V	HNO_3	HDPE	NO

OBSERVATIONS / NOTES:

9' SATURATED SCREEN ⇒ 5.6 L x 2 = 11.2 L MIN PURGE VOL

NO RESPONSE TO RED DYE

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Fred W Ramsey

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSF Indian Head, Site 43 **WELL ID.:** S43MW002

PROJECT NUMBER: 112G00771 **DATE:** 11/11/07

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	Sal. (%)	Comments
0935	12.22	150	4.83	40 mS/cm	19	1.77	17.3	0.0	0.75 l
0945	12.24	200	4.59	40	0	0.00	19.4	0.0	SUM 2.75
0955	12.24	200	4.43	40	0	0.00	19.5	0.0	4.75
1005	12.24	200	4.39	40	0	0.00	19.6	0.0	6.75
1015	12.24	200	4.38	40	0	0.00	19.5	0.0	8.75
1025	12.24	200	4.39	40	0	0.00	19.6	0.0	10.75
1030	12.24	200	4.39	40	0	0.00	19.6	0.0	11.75
									COMPLETED PURGE
									BEGIN TO FILL CONT.

SIGNATURE(S): Fred C Wanner

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project Number: 112G00771
Sample Location: —
QA Sample Type:

Sample ID Number: S43TB0010102
Sampled By: FRED W RAMSER
C.O.C. Number: MITKEM CORP. #1

[X] Trip Blank
[] Source Water Blank
[] Rinsate Blank
[] Other Blank ____

SAMPLING DATA:

Date: 11-10-07
Time: 1335
Method: FROM LAB

WATER SOURCE:

[X] Laboratory Prepared
[] Purchased
[] Other ____
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: ____
Supplier: ____
Manufacturer: NA
Order Number: ____
Lot Number: ____
Expiration Date: ____

RINSATE INFORMATION (If Applicable):

Media Type: ____
Equipment Used: ____
Equipment Type: NA
[] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis		Preservative	Container Requirements	Collected
~~Selected VOCs~~ TCL VOCs		Cool 4°C & HCl	3 X 40 ml Vials	(YES) / NO
Total Metals	As, Cr, Fe, Pb, V	HNO_3	HDPE	YES / (NO)
Dissolved Metals	As, Cr, Fe, Pb, V	HNO_3	HDPE	YES / (NO)
				YES / (NO)
				YES / (NO)

OBSERVATIONS / NOTES:

Signature(s):

Fred W Ramser

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Indian Head, Site 43
Project Number: 112G00771
Sample Location: SITE 43
QA Sample Type:

Sample ID Number: S43RB0010102
Sampled By: FRED W. RAMSER
C.O.C. Number: MITKEMCORP#1

[] Trip Blank
[] Source Water Blank
[X] Rinsate Blank
[] Other Blank ____

SAMPLING DATA:

Date: 11-11-07
Time: 0905
Method: DIRECT FILL

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other ____
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: REAGENT GRADE H_2O
Supplier: VWR INTERNATIONAL
Manufacturer: NERL
Order Number: —
Lot Number: 0916247
Expiration Date: 09-2008

RINSATE INFORMATION (If Applicable):

Media Type: GROUNDWATER
Equipment Used: PE TUBING/SILICLASTIC TUBIN
Equipment Type:
[X] Dedicated
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis		Preservative	Container Requirements	Collected
~~Selected~~ VOCs	TCL	Cool 4°C & HCl	3 X 40 ml Vials	(YES) / NO
Total Metals	As, Cr, Fe, Pb, V	HNO_3	HDPE	YES / (NO)
Dissolved Metals	As, Cr, Fe, Pb, V	HNO_3	HDPE	YES / (NO)
				YES / (NO)
				YES / (NO)

OBSERVATIONS / NOTES:

Signature(s):

Fred W. Ramser

Tetra Tech NUS, Inc.

QA SAMPLE LOG SHEET

Project Site Name: Indian Head, Site 43
Project Number: 112G00771
Sample Location: SITE 43
QA Sample Type:

Sample ID Number: S43FB0010102
Sampled By: FRED W. RAMSER
C.O.C. Number: MITKEM #1

[] Trip Blank
[X] Source Water Blank
[] Rinsate Blank
[] Other Blank _____

SAMPLING DATA:

Date: 11-11-07
Time: 0900
Method: DIRECT FILL

WATER SOURCE:

[] Laboratory Prepared
[X] Purchased
[] Other _____
[] Tap
[] Fire Hydrant

PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):

Product Name: REAGENT GRADE H_2O
Supplier: VWR INTERNATIONAL
Manufacturer: NERL
Order Number: ——
Lot Number: 0916247
Expiration Date: 09-2008

RINSATE INFORMATION (If Applicable):

Media Type: _____
Equipment Used: _____
Equipment Type:
[] ~~Dedicated~~
[] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis		Preservative	Container Requirements	Collected
~~Selected~~ VOCs	TCL	Cool 4°C & HCl	3 X 40 ml Vials	(YES) / NO
Total Metals	As, Cr, Fe, Pb, V	HNO_3	HDPE	YES / (NO)
Dissolved Metals	As, Cr, Fe, Pb, V	HNO_3	HDPE	YES / (NO)
				YES / (NO)
				YES / (NO)

OBSERVATIONS / NOTES:

Signature(s): Fred W. Ramser

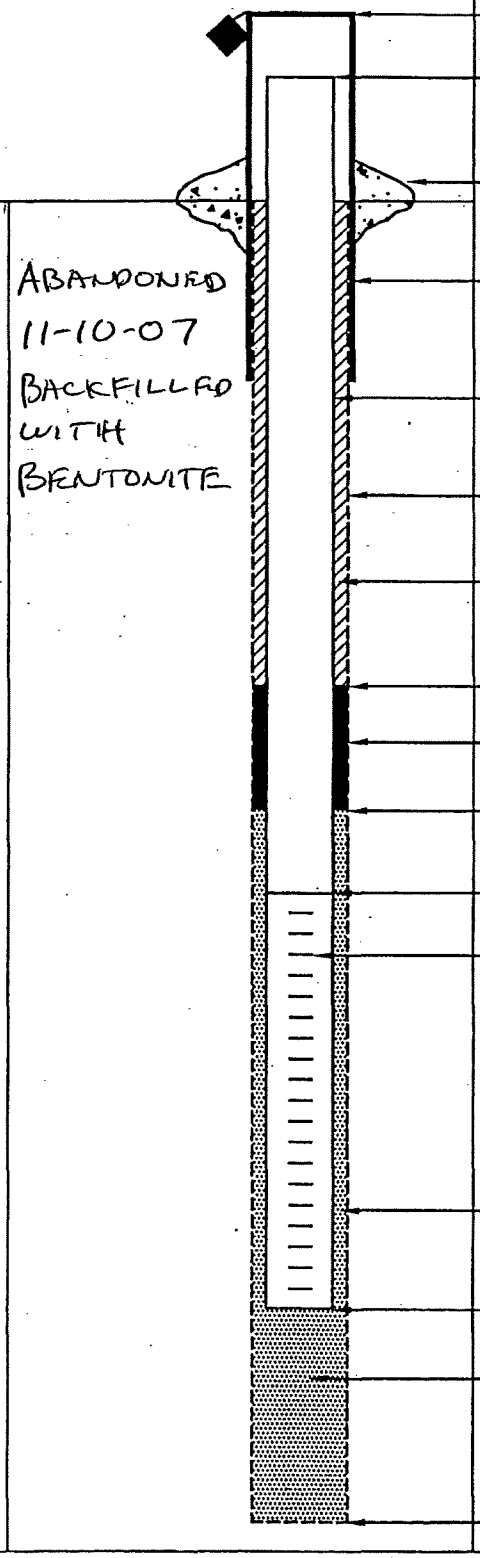
WELL NO.: S43TW001

Tetra Tech NUS, Inc.

TEMPORARY MONITORING WELL SHEET STICK-UP

PROJECT SITE 43 SSP	LOCATION NSF INDIANHEAD	DRILLER MIKE LIBERTO	
PROJECT NO. 112G00771	BORING S43MIP10	DRILLING METHOD TIDEWATER INC. DPT	
DATE BEGUN 11-10-07	DATE COMPLETED 11-10-07		
FIELD GEOLOGIST FRED W. RAMSER		DEVELOPMENT METHOD PERISTALTIC PUMP	
GROUND ELEVATION	DATUM		

ACAD:FORM_MWSU.dwg 07/20/99 INL



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: NA / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: NA /

TYPE OF SURFACE SEAL: NA

I.D. OF SURFACE CASING: NA

TYPE OF SURFACE CASING:

RISER PIPE I.D.: STEEL ~1.5"

TYPE OF RISER PIPE:

BOREHOLE DIAMETER: ~2.5"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / NA

TYPE OF SEAL: NA

DEPTH TOP OF SAND PACK: NA

ELEVATION/DEPTH TOP OF SCREEN: / 21'

TYPE OF SCREEN: STAINLESS STEEL

SLOT SIZE x LENGTH: 4 SLOT x 4'

I.D. OF SCREEN: 0.65"

TYPE OF SAND PACK: NA

ELEVATION/DEPTH BOTTOM OF SCREEN: / 25'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / NA

BACKFILL MATERIAL BELOW SAND:

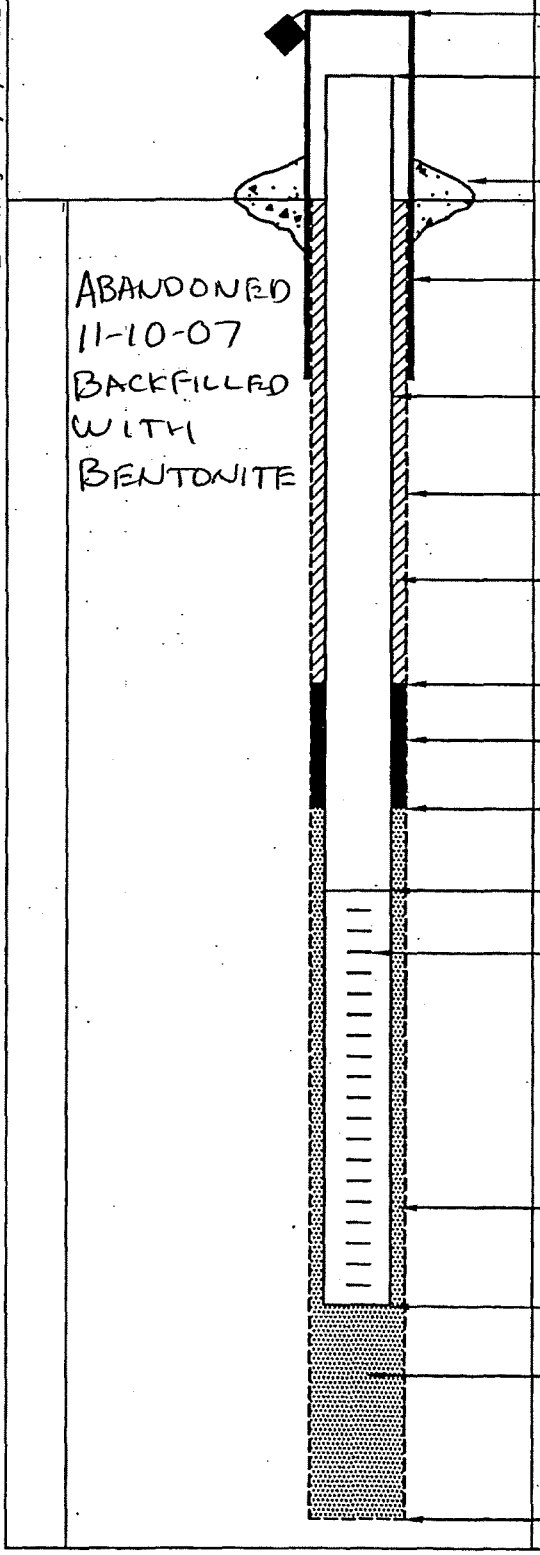
ELEVATION/DEPTH OF HOLE: / NA

WELL NO.: S43TW002

Tetra Tech NUS, Inc.

TEMPORARY MONITORING WELL SHEET STICK-UP

PROJECT SITE 43 SSP	LOCATION NSF INDIAN HEAD	DRILLER MIKE LIBERTO
PROJECT NO. 112G00771	BORING S43MIP04	DRILLING TIDEWATER INC.
DATE BEGUN 11-10-07	DATE COMPLETED 11-10-07	METHOD DPT
FIELD GEOLOGIST FRED W. RAMSER		DEVELOPMENT METHOD PERISTALTIC PUMP
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: NA / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: NA /

TYPE OF SURFACE SEAL: NA

I.D. OF SURFACE CASING: NA

TYPE OF SURFACE CASING:

RISER PIPE I.D.: STEEL ~1.5"

TYPE OF RISER PIPE:

BOREHOLE DIAMETER: ~2.5"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / NA

TYPE OF SEAL: NA

DEPTH TOP OF SAND PACK: NA

ELEVATION/DEPTH TOP OF SCREEN: / 23'

TYPE OF SCREEN: STAINLESS STEEL

SLOT SIZE x LENGTH: 4 SLOT x 4'

I.D. OF SCREEN: 0.65"

TYPE OF SAND PACK: NA

ELEVATION/DEPTH BOTTOM OF SCREEN: / 27'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / NA

BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: / NA

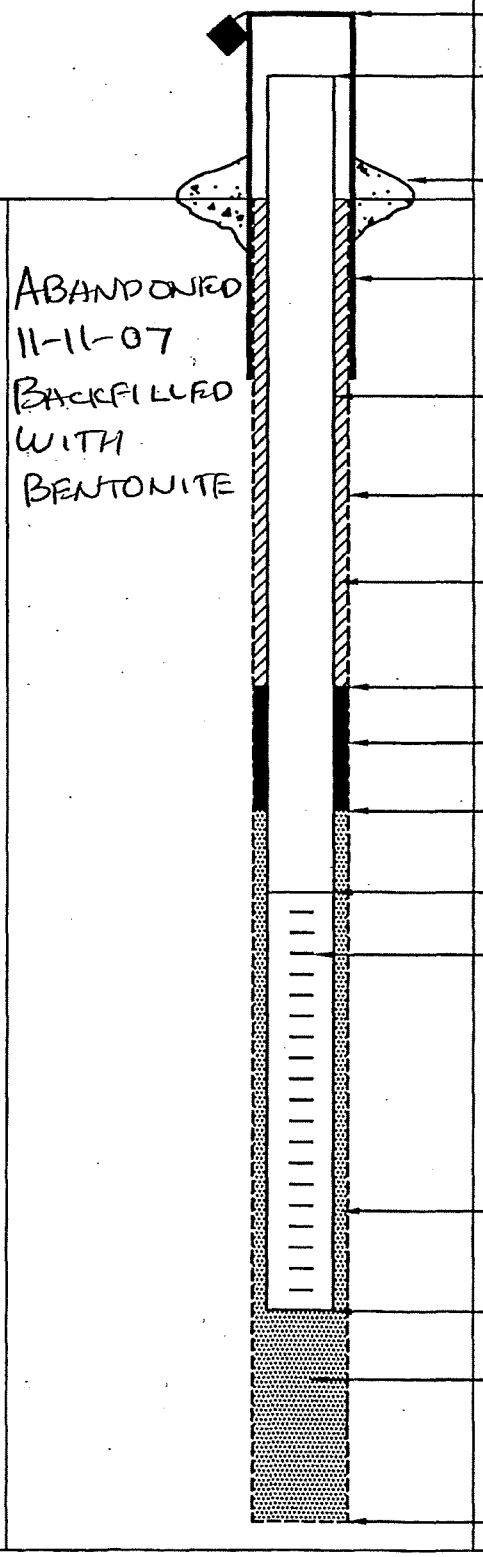
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S43TW003

Tetra Tech NUS, Inc.

TEMPORARY MONITORING WELL SHEET STICK-UP

PROJECT SITE 43 SSP	LOCATION NSF INDIAN HEAD	DRILLER MIKE LIBERTO	
PROJECT NO. 112G00771	BORING S43M1P09	DRILLING METHOD TIDEWATER, INC DPT	
DATE BEGUN 11-10-07	DATE COMPLETED 11-11-07		
FIELD GEOLOGIST FRED W RAMSER		DEVELOPMENT METHOD PERISTALTIC PUMP	
GROUND ELEVATION	DATUM		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: NA / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: NA /

TYPE OF SURFACE SEAL: NA

I.D. OF SURFACE CASING: NA

TYPE OF SURFACE CASING:

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: ~2.5"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / NA

TYPE OF SEAL: NA

DEPTH TOP OF SAND PACK: NA

ELEVATION/DEPTH TOP OF SCREEN: / 10'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 SLOT x 10'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: NA

ELEVATION/DEPTH BOTTOM OF SCREEN: / 20'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / NA

BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: / NA

ACAD:FORM_MWSU.dwg 07/20/99 INL

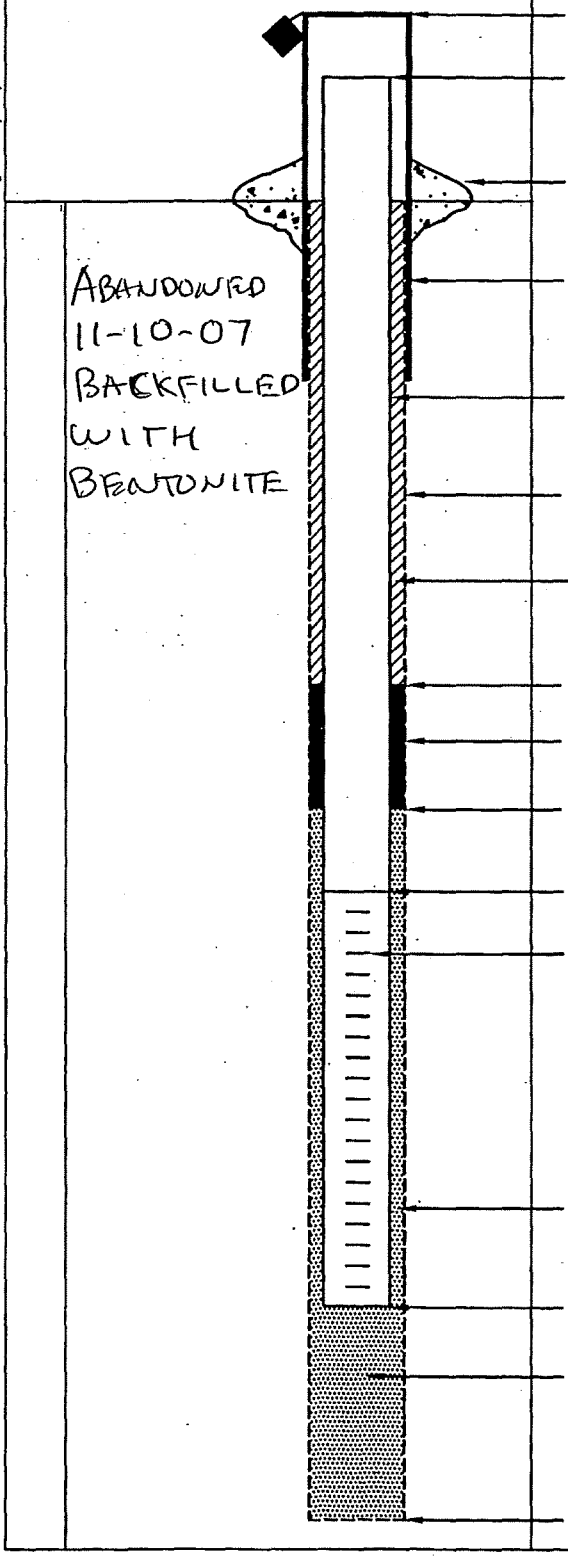
WELL NO.: S43TW004

Tetra Tech NUS, Inc.

TEMPORARY MONITORING WELL SHEET STICK-UP

PROJECT SITE 43 SSP	LOCATION NSF INDIAN HEAD	DRILLER MIKE LIBERTO
PROJECT NO. 112G00771	BORING S43M1P03	DRILLING METHOD TIDEWATER INC. DPT
DATE BEGUN 11-10-07	DATE COMPLETED 11-10-07	
FIELD GEOLOGIST FRED W. RAMSER		DEVELOPMENT METHOD PERISTALTIC PUMP
GROUND ELEVATION	DATUM	

ACAD:FORM_MWSU.dwg 07/20/99 INL



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: NA / NA

ELEVATION/HEIGHT OF TOP OF RISER PIPE: NA /

TYPE OF SURFACE SEAL: NA

I.D. OF SURFACE CASING: NA

TYPE OF SURFACE CASING:

RISER PIPE I.D.: STEEL ~1.5"

TYPE OF RISER PIPE:

BOREHOLE DIAMETER: ~2.5"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: / NA

TYPE OF SEAL: NA

DEPTH TOP OF SAND PACK: NA

ELEVATION/DEPTH TOP OF SCREEN: / 20'

TYPE OF SCREEN: STAINLESS STEEL

SLOT SIZE x LENGTH: 4 SLOT x 4'

I.D. OF SCREEN: 0.65"

TYPE OF SAND PACK: NA

ELEVATION/DEPTH BOTTOM OF SCREEN: / 24'

ELEVATION/DEPTH BOTTOM OF SAND PACK: / NA

BACKFILL MATERIAL BELOW SAND:

ELEVATION/DEPTH OF HOLE: / NA

WELL NO.: S43TW005

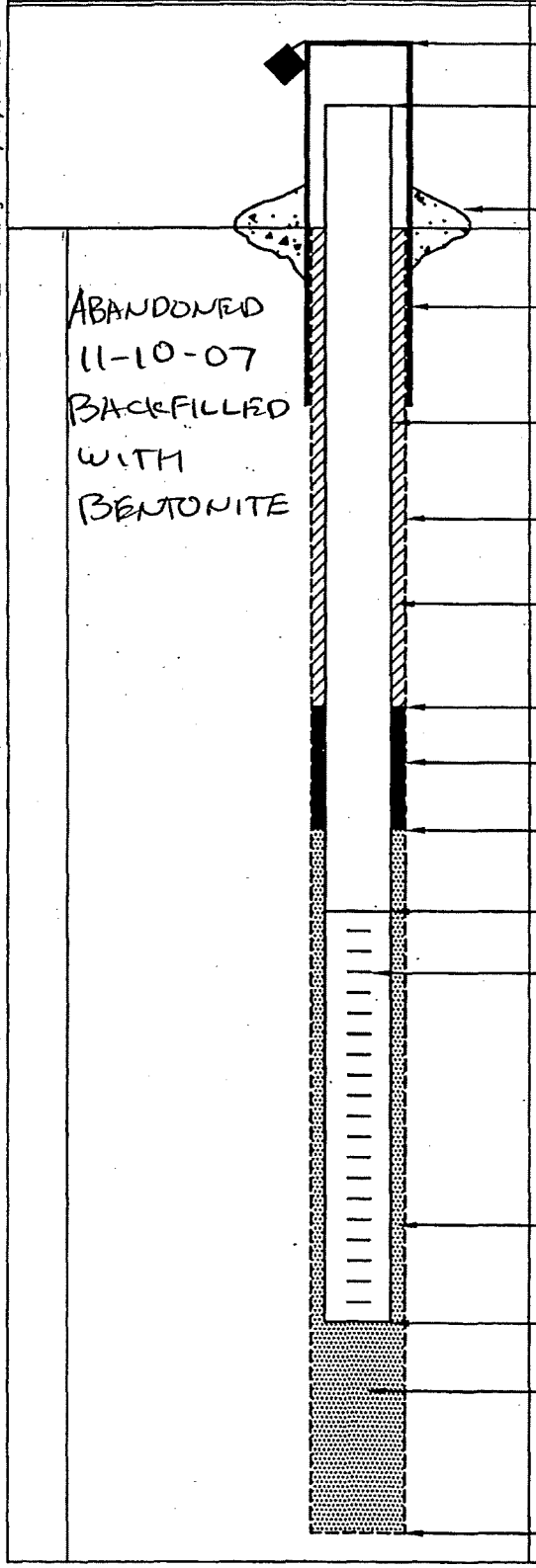
Tetra Tech NUS, Inc.

TEMPORARY MONITORING WELL SHEET STICK-UP

PROJECT SITE 43 SSP
PROJECT NO. 112G00771
DATE BEGUN 11-10-07
FIELD GEOLOGIST FRED W. RAMSER
GROUND ELEVATION _____

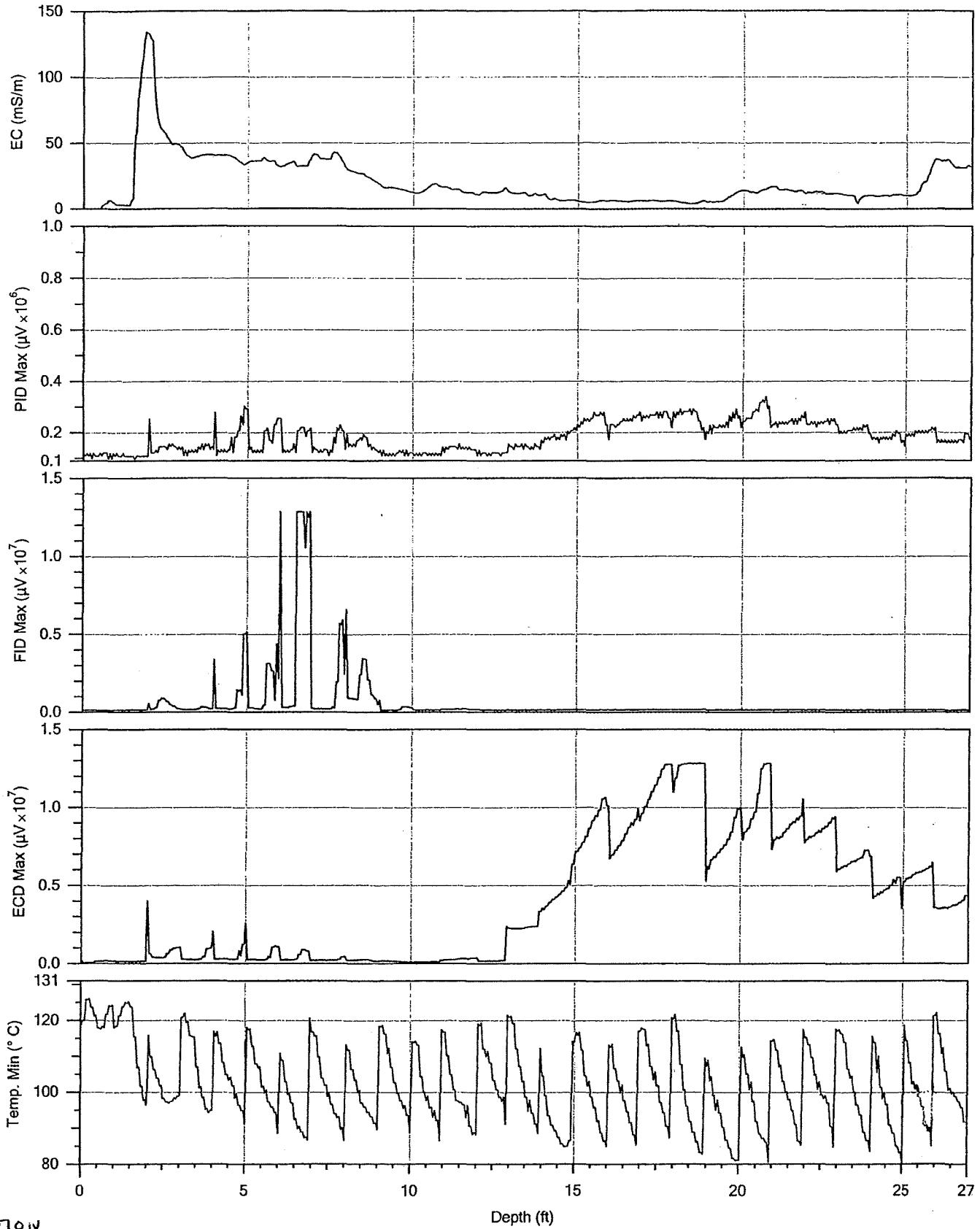
LOCATION NSF INDIAN HEAD
BORING S43MIP08
DATE COMPLETED 11-10-07
DATUM _____

DRILLER MIKE LIBERTO
DRILLING METHOD TIDEWATER INC. DPT
DEVELOPMENT METHOD PERISTALTIC PUMP



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: NA / NA
ELEVATION/HEIGHT OF TOP OF RISER PIPE: NA /
TYPE OF SURFACE SEAL: NA
I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: _____
RISER PIPE I.D.: STEEL ~1.5"
TYPE OF RISER PIPE: _____
BOREHOLE DIAMETER: ~2.5"
TYPE OF BACKFILL: NA
ELEVATION/DEPTH TOP OF SEAL: / NA
TYPE OF SEAL: NA
DEPTH TOP OF SAND PACK: NA
ELEVATION/DEPTH TOP OF SCREEN: / 20'
TYPE OF SCREEN: STAINLESS STEEL
SLOT SIZE x LENGTH: 4 SLOT x 4'
I.D. OF SCREEN: 0.65"
TYPE OF SAND PACK: NA
ELEVATION/DEPTH BOTTOM OF SCREEN: / 24'
ELEVATION/DEPTH BOTTOM OF SAND PACK: / NA
BACKFILL MATERIAL BELOW SAND: _____
ELEVATION/DEPTH OF HOLE: / NA

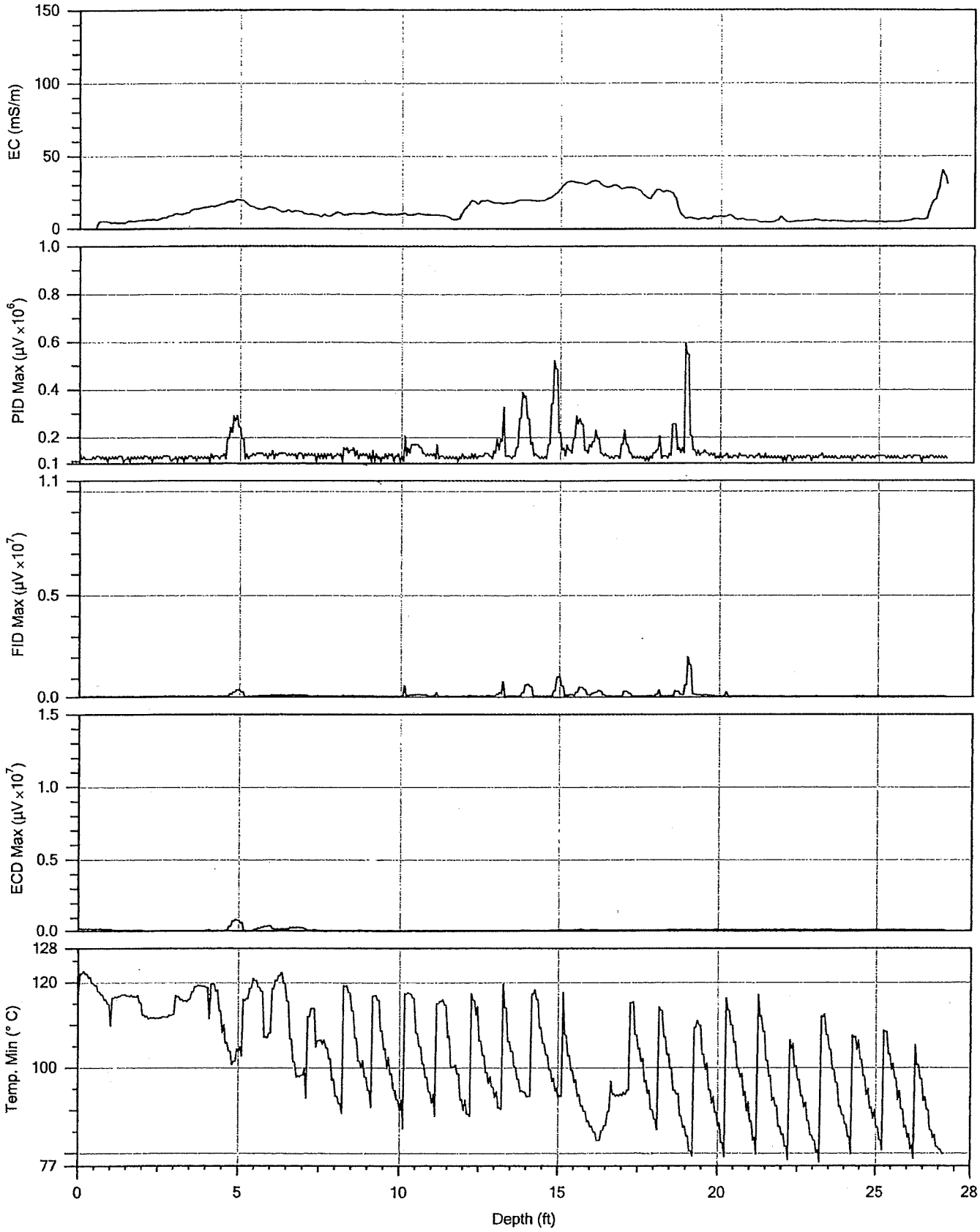
ACAD:FORM_MWSU.dwg 07/20/99 INL



LOCATION
S43MW01
HOT SPOT"

Direct Image
By Geoprobe Systems

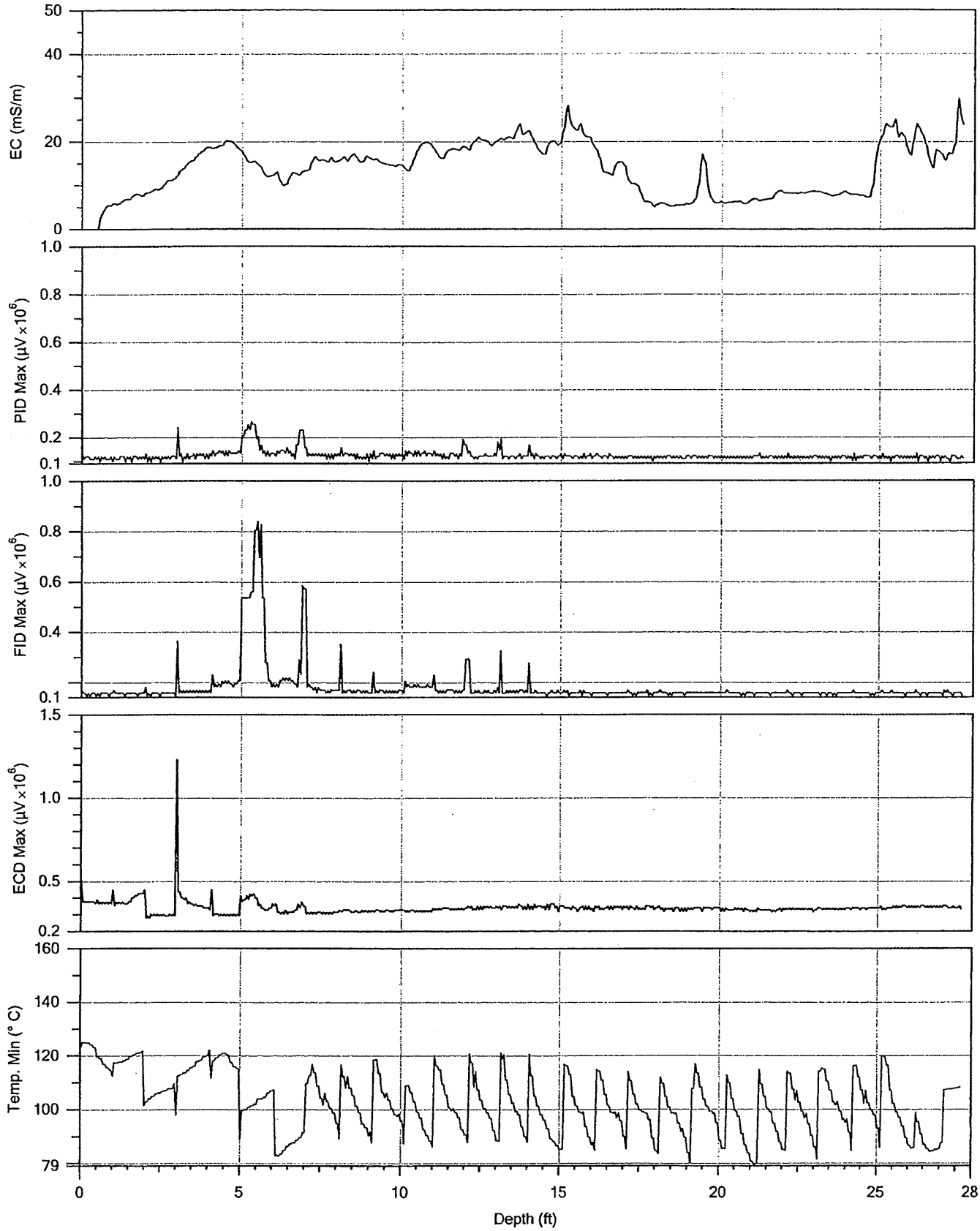
Company: Columbia Technologies	Operator: Lauren Steely	File: S43MIP01.DAT
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/9/2007
		Location:



LOCATION NODE "N2"

Direct Image By Geoprobe Systems

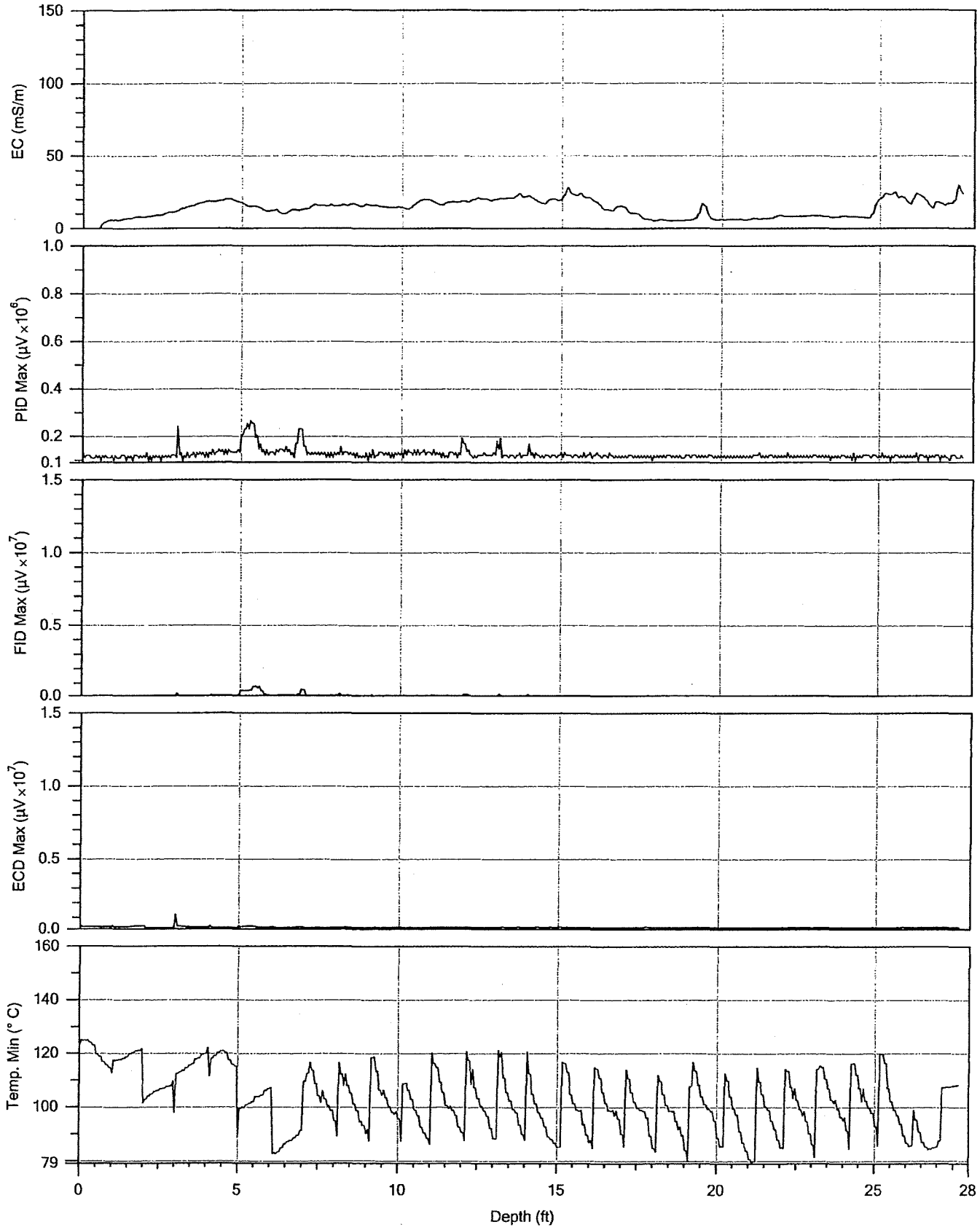
Company: Columbia Technologies	Operator: Lauren Steely	File: S43MIP02.DAT	
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/9/2007	
		Location:	



LOCATED @ NODE N3

Direct Image By Geoprobe Systems®

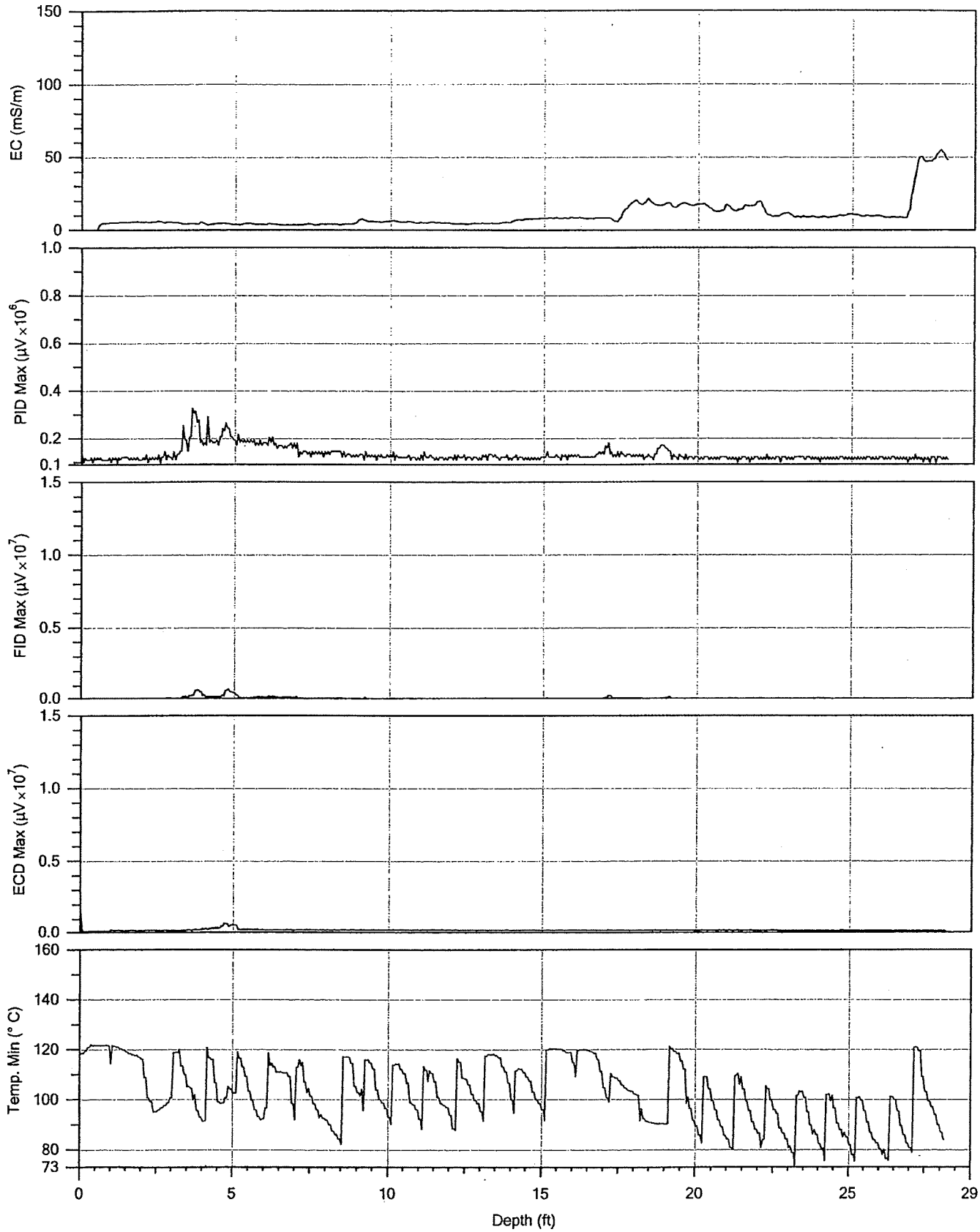
Company: Columbia Technologies	Operator: Lauren Steely	File: S43MIP03.DAT	
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/9/2007	
		Location:	



LOCATED @ NODE N3

Direct Image By Geoprobe Systems

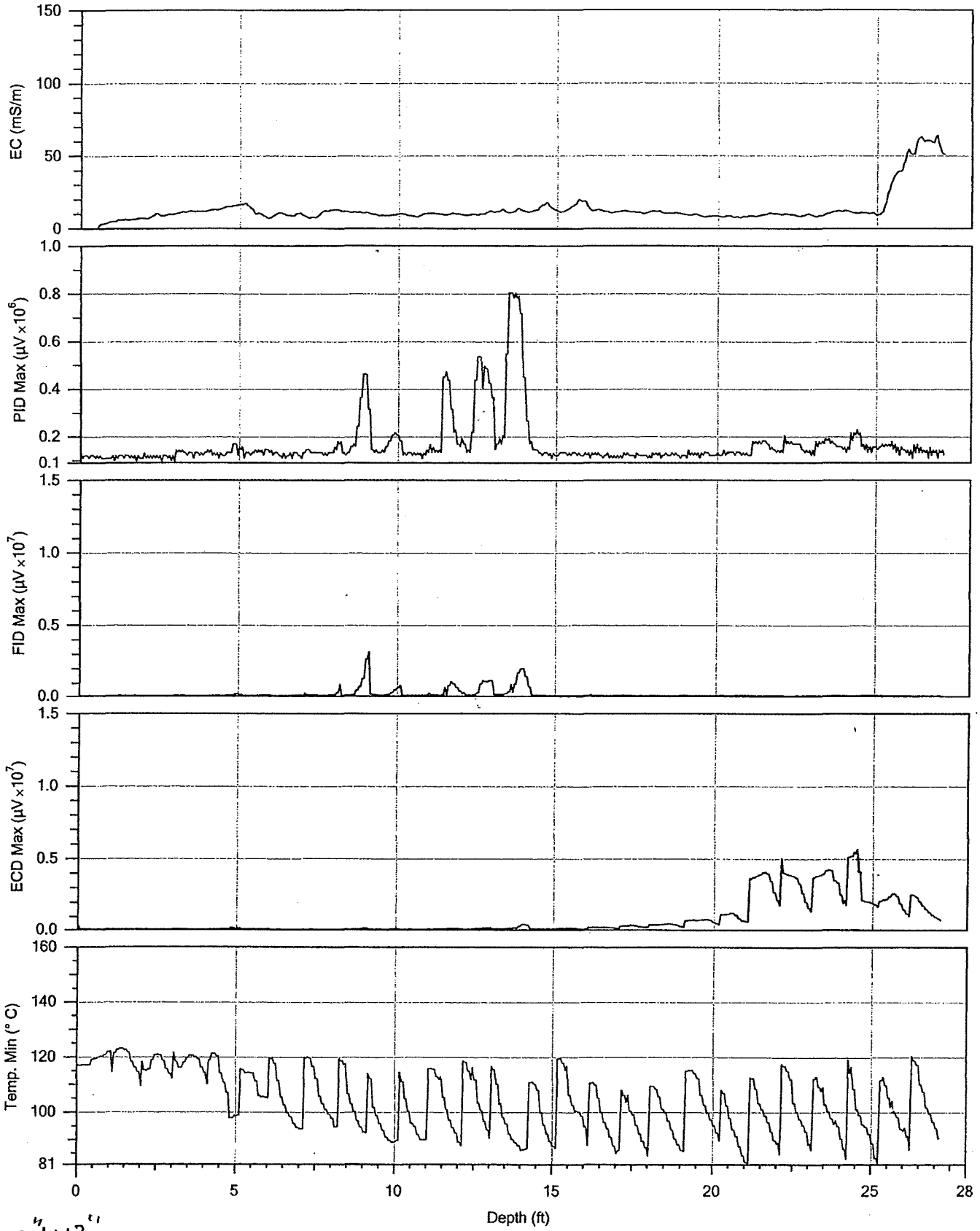
Company: Columbia Technologies	Operator: Lauren Steely	File: S43MIP03.DAT	
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/9/2007	Location:



LOCATION NODE "W2"

Direct Image By Geoprobe Systems

Company: Columbia Technologies	Operator: Lauren Steely	File: SA3MIP04.DAT	
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/9/2007	
		Location:	



NODE "W3"

Direct Image By Geoprobe Systems

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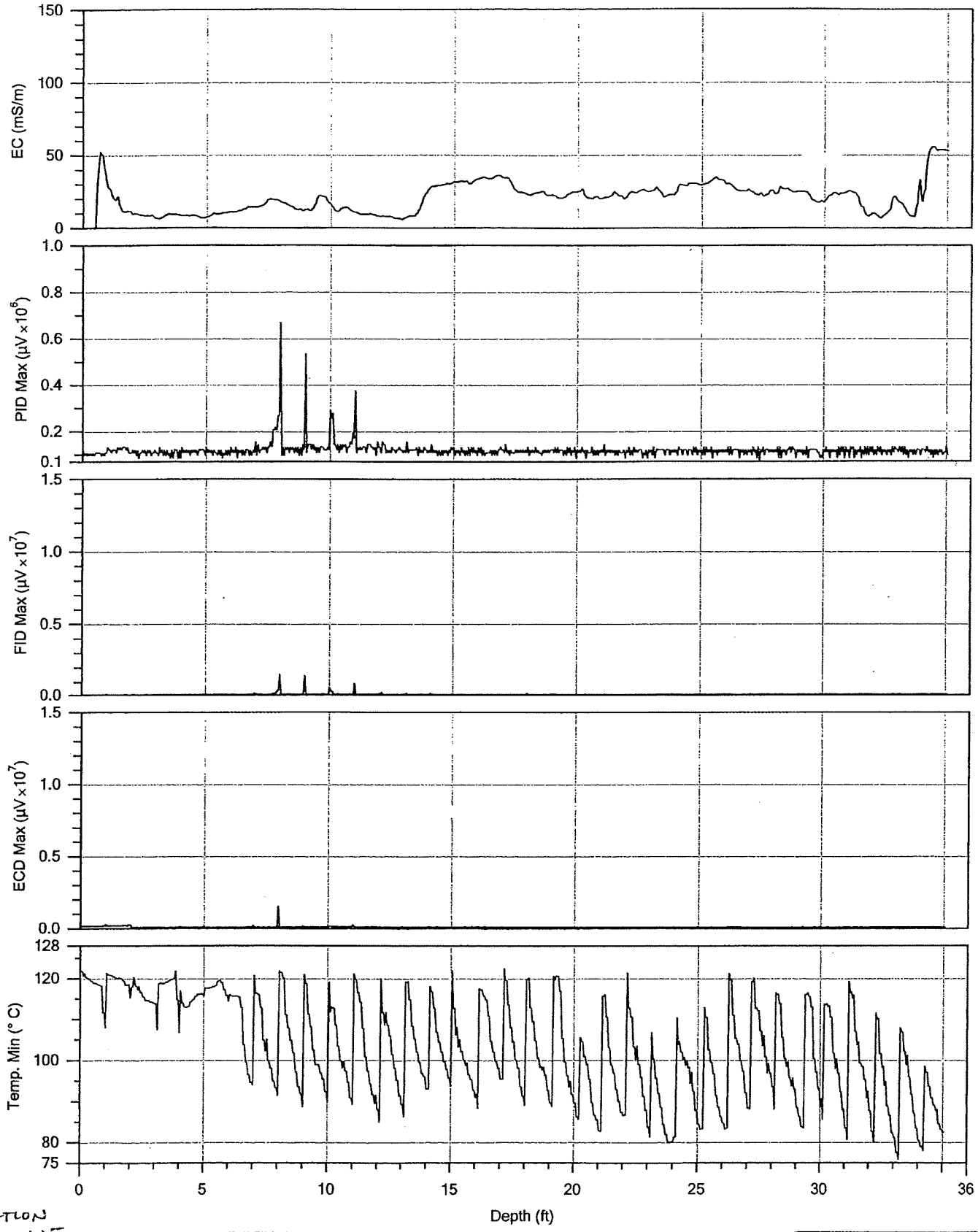
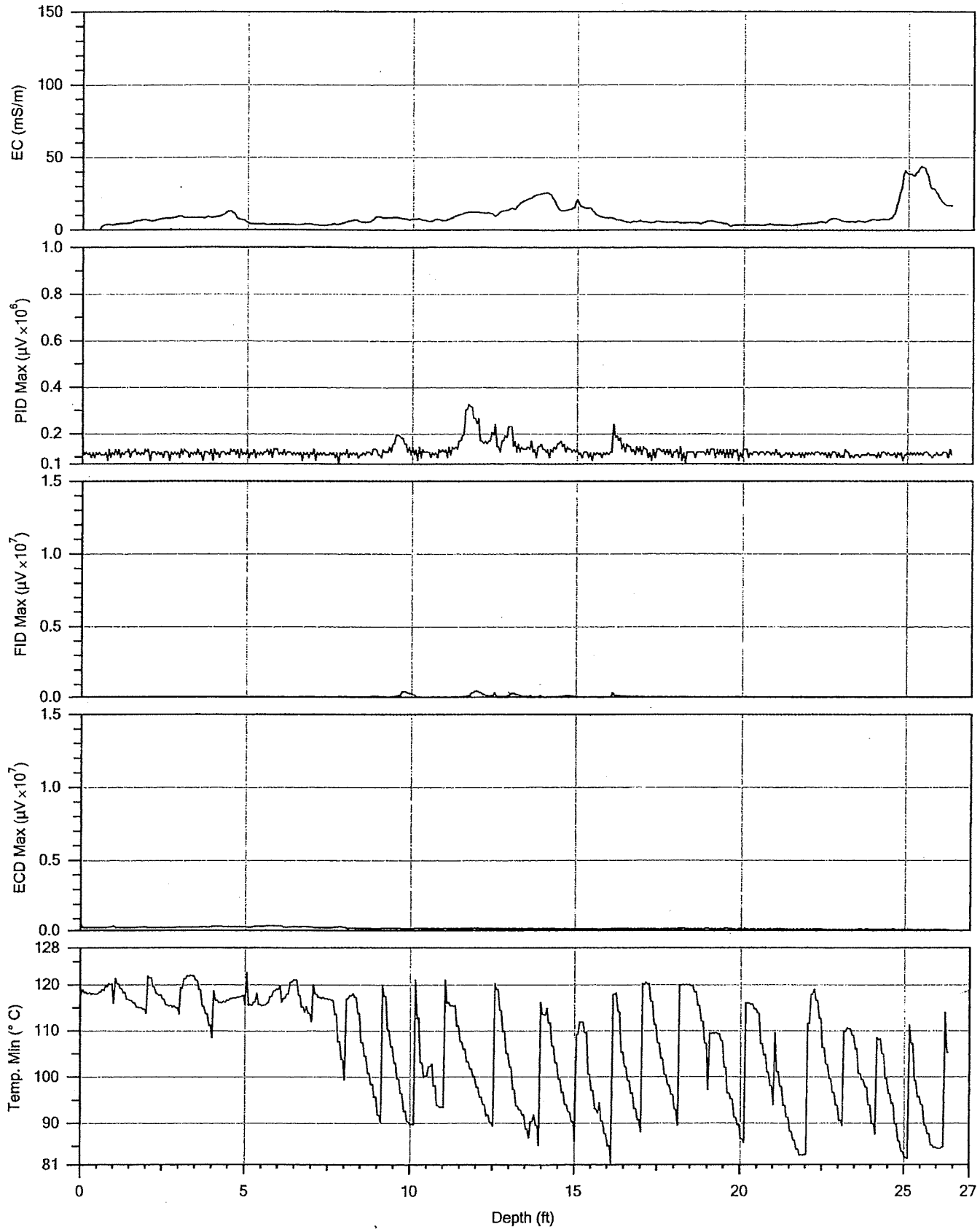
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/9/2007
		Location:



LOCATION
NODE N5

Direct Image
By Geoprobe Systems

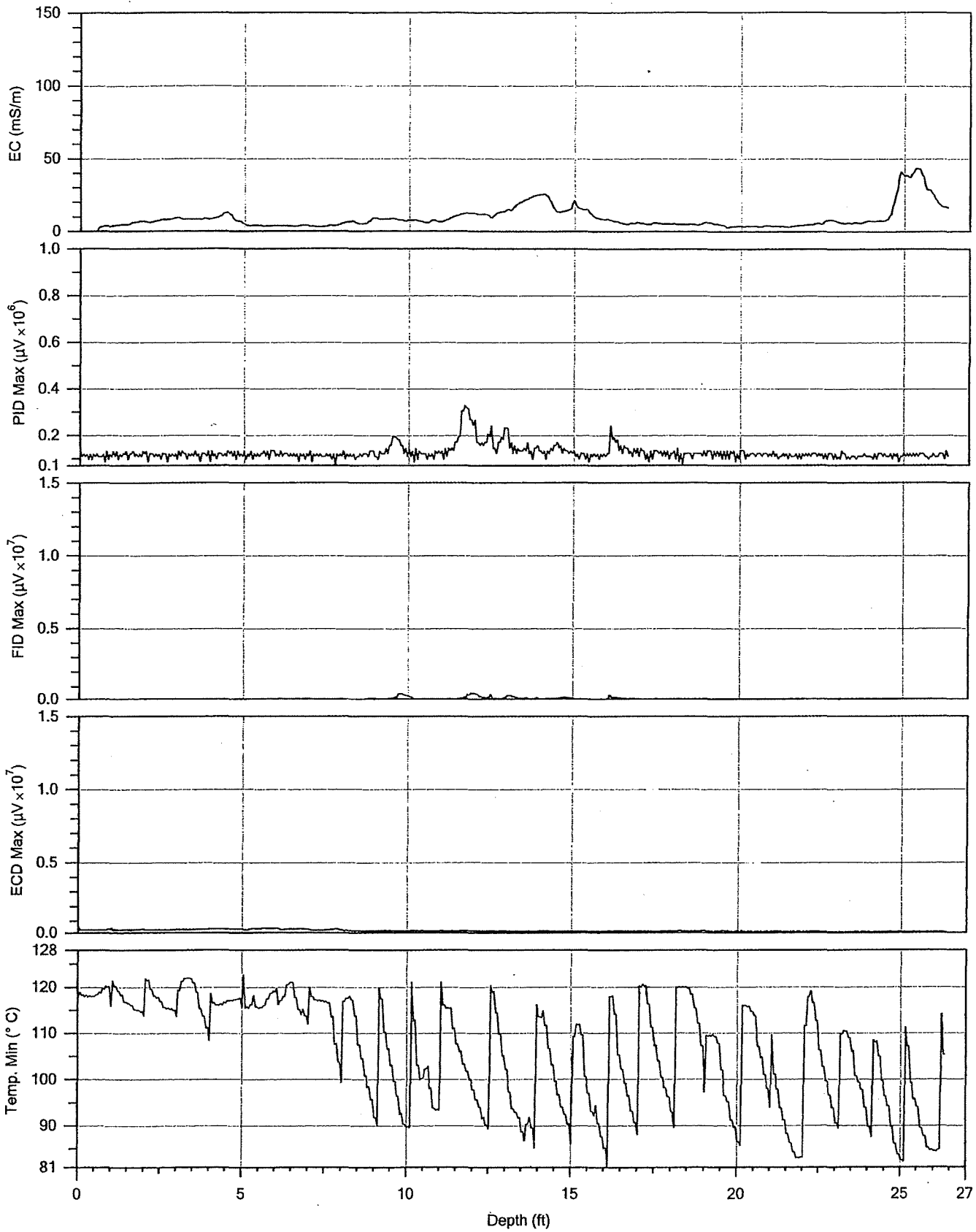
		File: S43MIP06.DAT
Company: Columbia Technologies	Operator: Lauren Steely	Date: 11/9/2007
Project ID: Indian Head	Client: TetraTech NUS	Location:



NODE "W5"

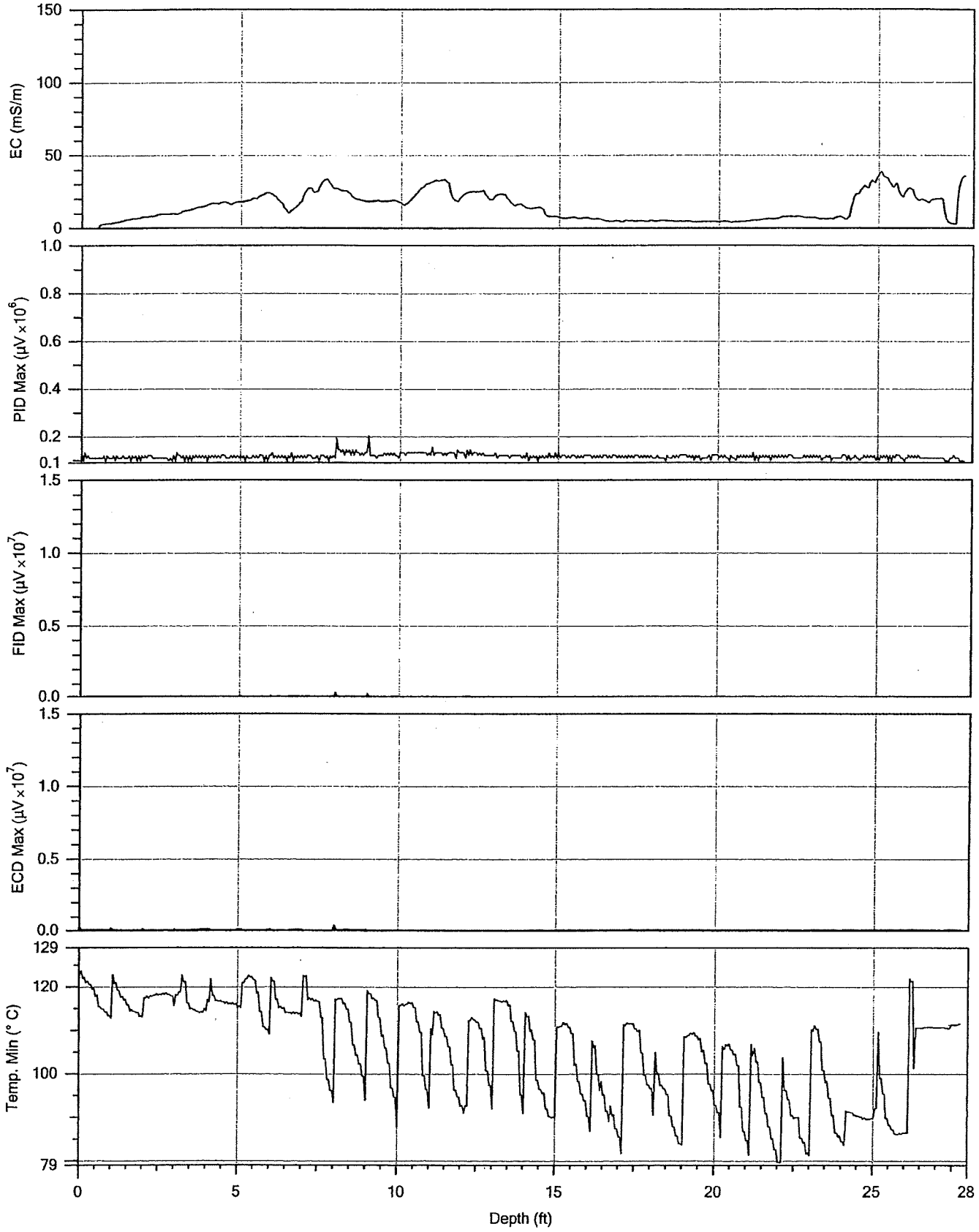
Direct Image By Geoprobe Systems

Company: Columbia Technologies	Operator: Lauren Steely		File: S43MIP07.DAT
Project ID: Indian Head	Client: TetraTech NUS		Date: 11/9/2007
			Location:



Direct Image
By Geoprobe Systems®

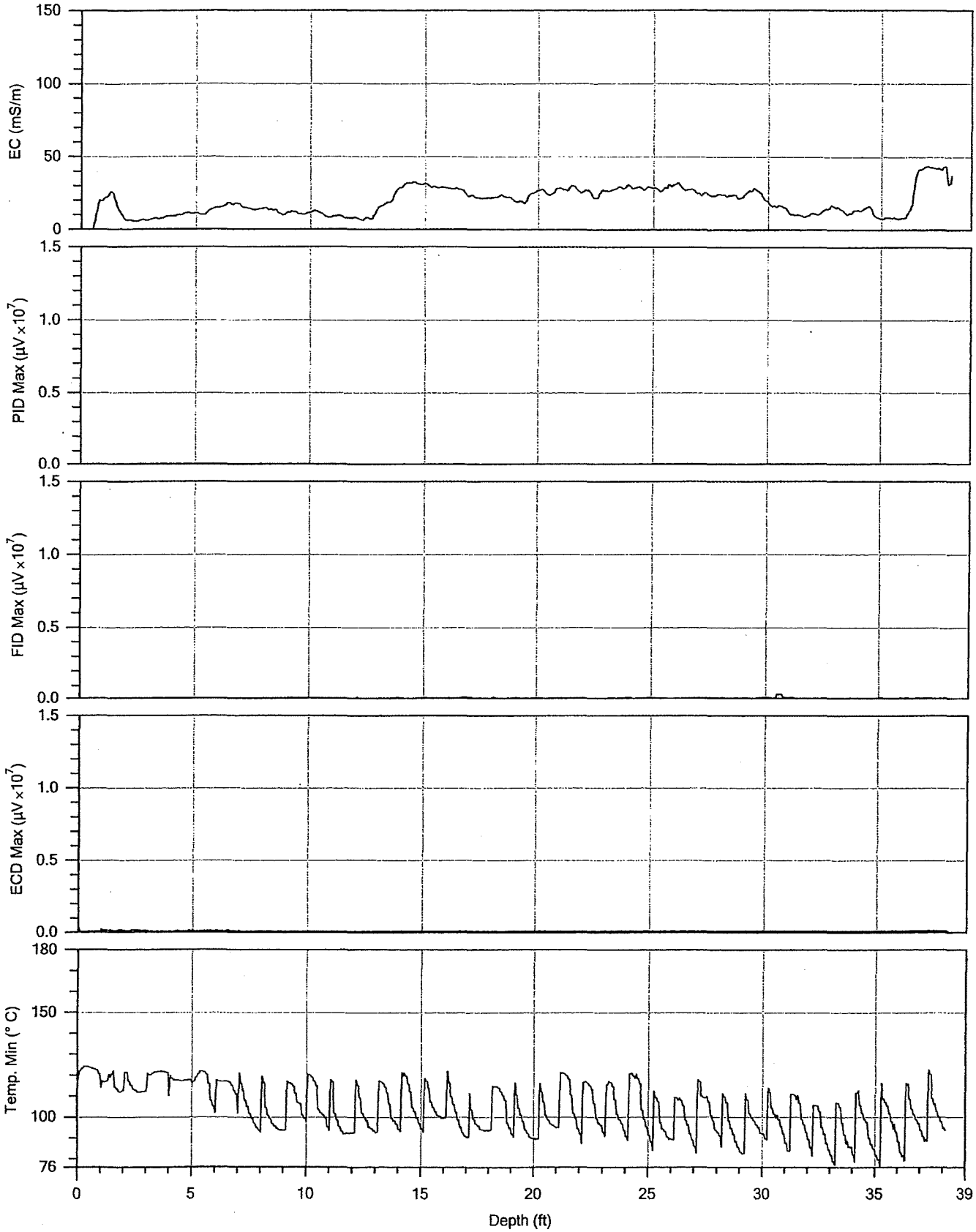
Company: Columbia Technologies	Operator: Lauren Steely	File: S43MIP07.DAT
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/9/2007
		Location:



Direct Image
By Geoprobe Systems®

		File: S43MIP08.DAT
Company: Columbia Technologies	Operator: Lauren Steely	Date: 11/10/2007
Project ID: Indian Head	Client: TetraTech NUS	Location:

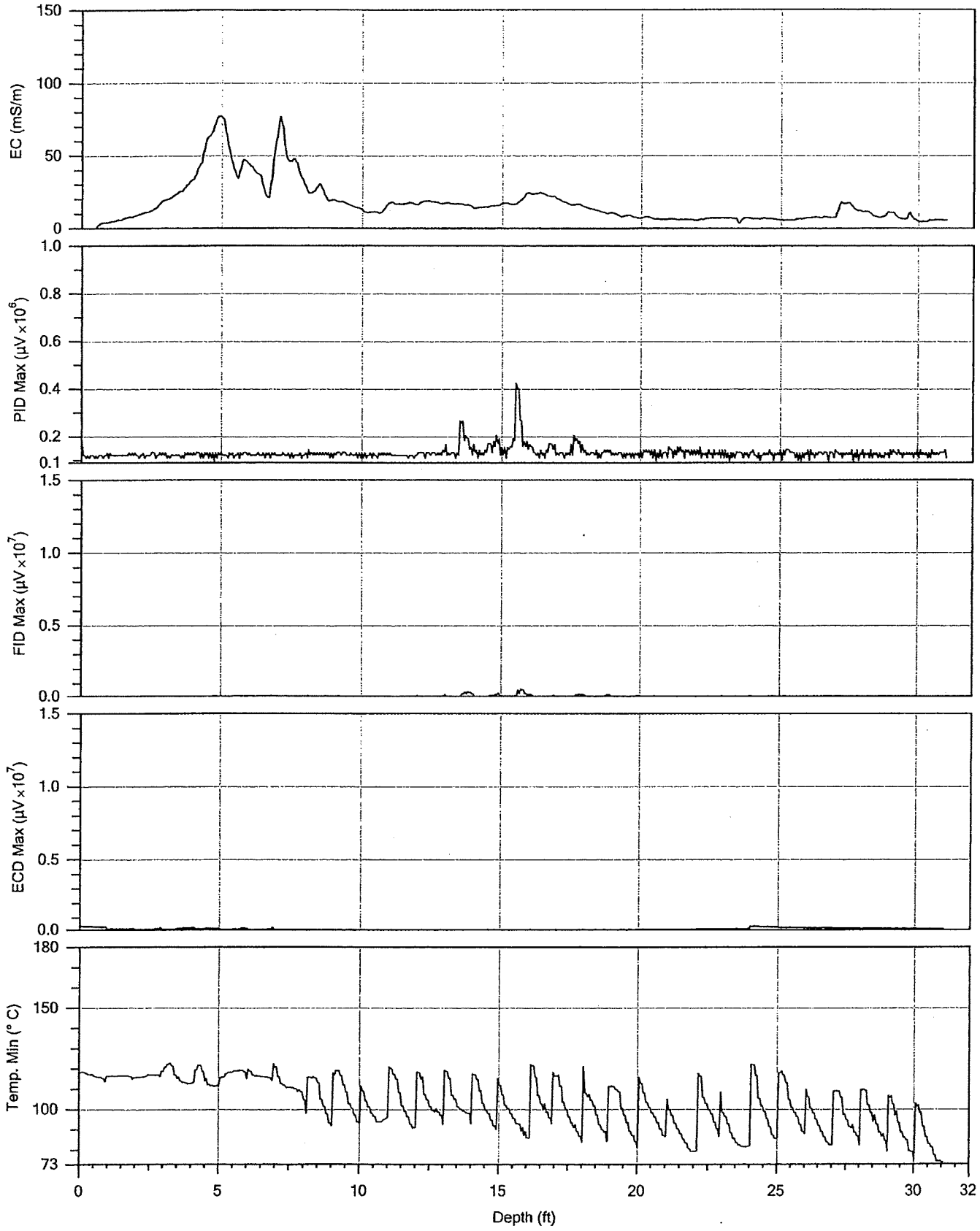
NODE
W4



(N4)

Direct Image By Geoprobe Systems

Company: Columbia Technologies	Operator: Lauren Steely	File: S43MIP09.DAT
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/10/2007
		Location:



Direct Image By Geoprobe Systems®

Company: Columbia Technologies	Operator: Lauren Steely	File: S43MIP10.DAT	
Project ID: Indian Head	Client: TetraTech NUS	Date: 11/10/2007	
		Location:	

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: SITE 43 SSP SUPP
PROJECT NUMBER: 112G00771
DRILLING COMPANY: TIDEWATER
DRILLING RIG: GEOPROBE 6620 DT
BORING No.: S43SB007
DATE: 11-10-07
GEOLOGIST: FRED W RAMSER
DRILLER: MIKE LIBERTO

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1						YEL	SILTY CLAY						
						BRN	TR F-J SAND						
					MED STIFF	LT GREY	CLAY + SILT	CL		0			
							CLAY INC						
	5		5/5				TR SILT Fg SA		DRY	0			
S-2													
					MED LOOSE	YEL	F-J SAND	SP	MOTTLED	0			
						BRN	TR SILT		GREY				
							TR CLAY			0			
	10		5/5						WET				
S-3					LOOSE		F-J SAND		WET				
										0			
					GRAY MOTTLED	GRAY	CLAY		MOTTLE				
							TR SIL	CL	BRN + YEL	0			
	15				STIFF				ORG				
S-4							CLAY CONTENT		APPEARS	0			
							DEC. W/ DEPTH		DRY				
			4/4		MED DENSE	GREEN GRAY	MED SAND	SP	WET	0			
S-5	20							GW/SW	DRAINS WELL				
					LOOSE	GREY	GRAVELLY			0			
							SAND		WET				
										0			
	24		5/5							0			
S-6	25						AS ABOVE						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: LOCATED @ S43MIP10
INSTALLED TEMP WELL S43TW001

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: SITE 43 SSP
PROJECT NUMBER: 112G00771
DRILLING COMPANY: TIDE WATER
DRILLING RIG: GEOPROBE 6620 DT
BORING No.: S43SB007
DATE: 11-10-07
GEOLOGIST: FRED W. RAMSEY
DRILLER: MIKE LIBERTO

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
					MED DENSE	GREY	SAND			0			
					MED STIFF	GRAY	CLAY LAYER	CL		0			
						GREY	SAND			0			
					MED STIFF		CLAY LAYER	CL					
	30												
							TD @ 29'						
							21'-25'						
							SCREEN						
							GEO PROBE						
							WELL POINT						
							STAINLESS						
							STEEL						
							~1" DIA						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: _____

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : Indian Head Site 43

SITE NAME: Indian Head Md

PROJECT No.: 112G00771

INSTRUMENT NAME/MODEL: PID PHOTOVAC 2020

MANUFACTURER: PHOTO VAC

SERIAL NUMBER: ED HN 306

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Zero Reading		Span Reading		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		
11-8-07	—	FWR	0.0	0.0	102	100	07-3264 Exp 1-27-09	
11-9-07	—	FWR	0.0	0.0	101	100	↓	
11-10-07	—	FWR	0.0	0.0	99	100	↓	
11-11-07	—	FWR	0.0	0.0	98	100	↓	

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : Site 43

SITE NAME: NSF Indian Head

PROJECT No.: 112G00771

INSTRUMENT NAME/MODEL: Turbidity Meter LaMotte 2020

MANUFACTURER: LaMotte

SERIAL NUMBER: 3665-4022

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	0 - NTU Readings		10 - NTU Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		
11/11/07	U009847	FWR	0.0	0.0	10.0	10.0	GFS8184	P677870 (10 NTU) DI H2O (0 NTU)

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : Site 43

SITE NAME: NSF Indian Head

PROJECT No.: 112G00771

INSTRUMENT NAME/MODEL: Water Quality Meter U-2000

MANUFACTURER: HORIBA

SERIAL NUMBER: 509004

Date of Calibration	Person Performing Calibration	PRE-CALIBRATION READINGS			POST-CALIBRATION READINGS			Calibration Standard (Lot No.)	Remarks and Comments
		pH (Standard)	Cond (mS/cm)	DO (mg/L)	pH (Standard)	Cond (mS/cm)	DO (mg/L)		
~~11/9~~ 11/10/07	FWR	3.78	0.43	11.45	4.00	0.46	11.47	7130-07	5-15-09
11/11/07	FWR	4.03	0.49 mS/cm	12.08	4.00	0.46	12.18	"	"

APPENDIX C

2009 MIP INVESTIGATION REPORT

Report
Membrane Interface Probe Services
Site 43 and Site 57
Naval Support Facility
Indian Head, MD



Prepared By:

Vironex, Inc.
Frank Stolfi - National Director of MIP Services
1225 East McFadden Ave.
Santa Ana, CA 92705
Email: fstolfi@vironex.com
Website: www.vironex.com
P: 714-647-6290
F: 714-647-6291
C: 714-863-0988

Prepared For:

Tetra Tech, NUS
Scott Nesbitt
661 Anderson Drive
Pittsburgh, PA 15220

Table of Contents

1. Project Background

a. Background

Site 43 - Site 43 lies within the western portion of the NSF-IH at Indian Head peninsula and is primarily an industrial area around Buildings 1040 and 740. The drilling locations consisted of concrete, asphalt, grass, grass swale areas adjacent to roadways, and wooded areas. It is estimated that, for a period of more than 2 years during parts-cleaning operations, unknown quantities of spent solvents were improperly disposed in the drainage ditch outside the door (northeast) of Building1040. VOCs were detected at elevated concentrations in the two wells previously installed at the site.

The groundwater ranges from about 7 to 11 feet below ground surface. At nearby wells, the subsurface materials encountered were interlayered silty sand and clayey sand with trace amounts of gravel. A confining unit has been encountered at about 21 feet below ground surface and consists of grey silty clay.

Site 57 – Building 292 lies within a small stream valley running to the south toward Mattawoman Creek in the eastern portion of the NSF-IH. The drilling was done around or near Building 292 on a crushed rock surface, grass surface, asphalt or concrete. VOCs were detected at elevated concentrations in the groundwater during previous investigations at the site.

The groundwater ranges from about 6 to 9 feet below ground surface, and the subsurface materials generally consist of sand with gravel, silt, and clay. A gravel lens at about 10 feet below the ground surface has been encountered and may slow the drilling progress. A confining unit has been encountered at about 25 feet below ground surface and consists of grey silty clay.

b. Proposed Scope of Work

	Site 43	Site 57
Number of Proposed Locations	21	30
Target Interval (ft-ft)	0-25	0-25
Target Interval Lithology	Silty sand, Clayey Sand, Trace Gravel	Sand with Gravel, Silts and clays
Depth to Groundwater (ft bgs)	7-11	6-9
Contaminants of Concern	Solvents	VOCs (Not Specified)

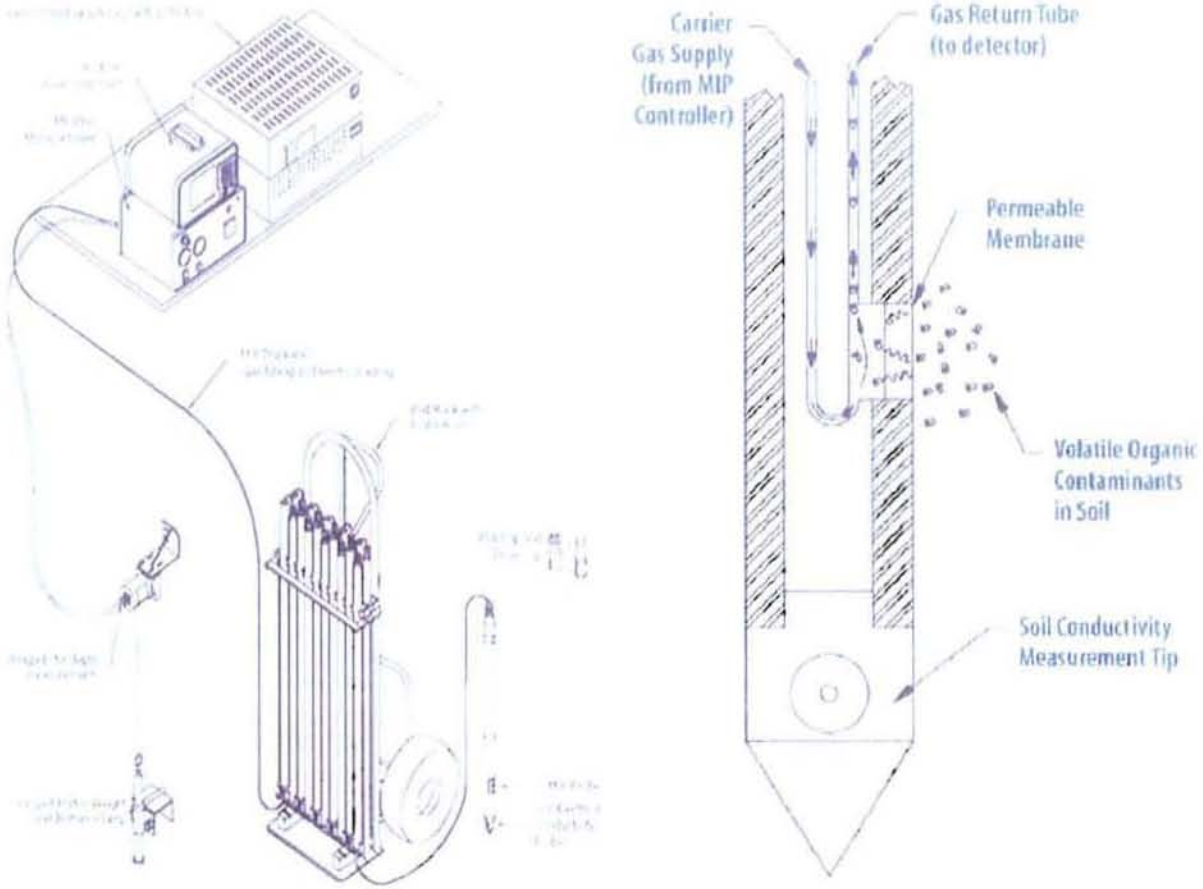
c. Objectives - The purpose of the work is to estimate the horizontal and vertical extent of soil and groundwater contaminated with VOCs.

d. MIP Scope – Collect MIP data from 35 locations ranging from 7' bgs to 28' bgs.

2. MIP System Overview

The MIP is a direct push tool that produces continuous chemical and physical logs of the vadose and saturated zones. It locates VOCs in-situ and shows you where they occur relative to the geologic and hydrologic units. Vertical profiles, transects, 3D pictures and maps can all be made from the electronic data generated by the MIP logs. Its unique capability of providing reliable, real-time information allows you to make better and timely decisions while your team is still in the field.

The MIP is a down hole tool that heats the soils and groundwater adjacent to the probe to 120 degrees C. This increases volatility and the vapor phase diffuses across a membrane into a closed, inert gas loop that carries these vapors to a series of detectors housed at the surface. Continuous chemical logs or profiles are generated from each hole. Soil conductivity is also measured and these logs can be compared to the chemical logs to better understand where the VOCs occur. The MIP technology is only appropriate for volatile organic compounds (VOCs). The gas stream can be analyzed with multiple detectors, for example an electron capture detector is used to detect chlorinated solvents, a photo-ionization detector is used to detect petroleum hydrocarbons, and a flame ionization detector is used to detect methane.



2.a Equipment Used:

- Geoprobe 66DT
- MIP Controller (Nitrogen Flow and Heater)
- Geoprobe EC 5000 Computer
- HP 5890 Gas Chromatograph
- ECD (Electron Capture Detector)
- PID (Photo Ionization Detector) 10.2 eV Lamp
- FID (Photo Ionization Detector)
- 150' Geoprobe Trunkline
- 1.75" O.D. 6510 MIP Probe
- 1.5" O.D. Drive Rods

2.b Detector Overview

- ECD – Electron Capture Detector uses a radioactive Beta emitter (electrons) to ionize some of the carrier gas and produce a current between a biased pair of electrodes. When organic molecules contain electronegative functional groups, such as halogens, phosphorous, and nitro groups pass by the detector, they capture some of the electrons and reduce the current measured between the electrodes.

- PID – Photo Ionization Detector sample stream flows through the detector's reaction chamber where it is continuously irradiated with high energy ultraviolet light. When compounds are present that have a lower ionization potential than that of the irradiation energy (10.2 electron volts with standard lamp) they are ionized. The ions formed are collected in an electrical field, producing an ion current that is proportional to compound concentration. The ion current is amplified and output by the gas chromatograph's electrometer.

- FID – Flame Ionization Detector consists of a hydrogen / air flame and a collector plate. The effluent from the GC (trunkline) passes through the flame, which breaks down organic molecules and produces ions. The ions are collected on a biased electrode and produce an electric signal.

2.c MIP Data Collected

- Depth - Data is collected from twenty data points per foot. 0.05', 0.10', 0.15', etc…

- Electrical Conductivity - Electrical Conductivity data is measured/collected in milli-siemens per Meter (ms/M). The conductivity of soils is different for each type of media. Finer grained sediments, such as silts or clays, will have a higher EC signal. While coarser grained sediments, sands and gravel, will have a lower EC signal. The coarser grained sediments will allow the migration of contaminants and the finer grained sediments will trap the contaminant.

- Speed / Advancement Rate - Speed data is measured/collected in feet per minute (ft/min). Speed is an indication of the physical advancement rate of the MIP probe. Speed of the MIP probe can vary due to operator advancement and dense soil types. Speed log can provide soil type information which can be

correlated with electrical conductivity. Lower advancement speed, correlated with lower conductivity or larger grained soils would more than likely be associated with dense or compacted sands.

- Temperature - Temperature data is measured/collected in Degrees Celsius. Temperature is an indication of the physical temperature of the MIP block. Minimum and Maximum temperature is collected at each vertical interval. Vironex's temperature protocol indicates that the MIP probe temperature shall maintain a minimum temperature of 75 Degrees Celsius.

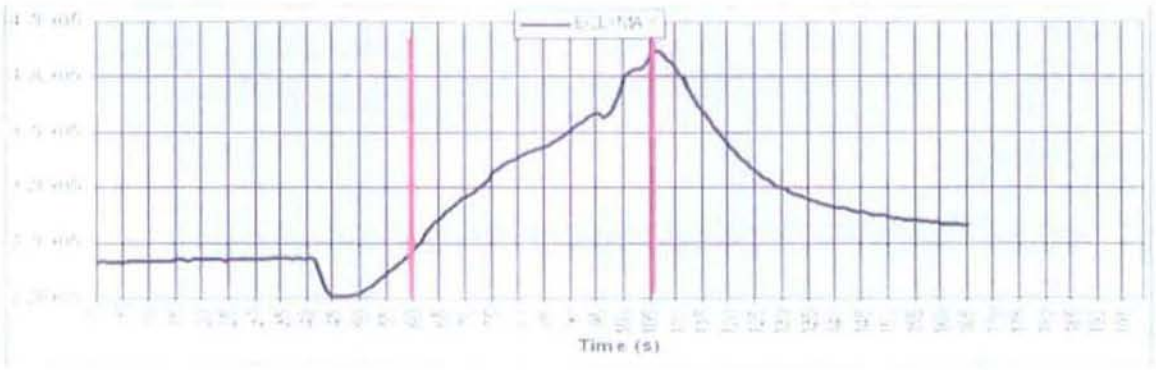
- Pressure - Pressure data is measured/collected in PSI. Pressure is an indication of the internal pressure of the nitrogen lines located within the trunkline and the pressure behind the membrane. Minimum and Maximum temperature is collected at each vertical interval. Geoprobes temperature protocol indicates that the MIP probe pressure shall not exceed 1.5 PSI difference from baseline.

- Detector (ECD, PID, FID) - Detector responses are measured/collected in micro Volts (uV). Detector responses are an indication of relative contaminant responses. Minimum and Maximum detector responses are collected at each vertical interval.

3. MIP QA/QC

Vironex adheres to Geoprobes Standard Operating Procedure, technical Bulletin No. MK3010, prepared: May, 2003. The response testing is a necessary part of the MIP logging process because it ensures that the system is working correctly and also enables the operator to measure the response time. Response time is the time it takes for the contaminant to go from the probe, through the trunk line, and to the detectors. This time is entered into the FC5000 computer for depth calculations. A response test is completed at the beginning of the day, between each boring, and at the end of each day. The response time will vary due to weather temperatures and length of the trunkline.

Per Geoprobe's SOP, a pass response is indicated as double the noise above the baseline.



APPENDIX A

Physical Properties Chart

Compound	Formula	Density	Flashpoint* (°C)	Molecular Weight	Melting Point (°C)	Boiling Point (°C)	Water Solubility**	ECD	PID	FID
1,1,1,2-Tetrachloroethane	$C_2H_2Cl_4$	1.5532	6	167.8498	-70.2	130.5	<0.1 g/100 mL at 20.5 C	*		
1,1,1-Trichloroethane	$C_2H_3Cl_3$	1.3376	N/A	133.4047	-32.6	74.1	Slightly soluble. 0.1495 g/100 mL	*		
1,1,2,2-Tetrachloroethane	$C_2H_2Cl_4$	1.595	N/A	167.8498	-43	146.3	Soluble. 0.2962 g/100 mL	*		
1,1,2-Trichloroethane	$C_2H_3Cl_3$	1.4411	N/A	133.4047	-36.5	113.8	Insoluble. 0.442 g/100 mL	*		
1,1-Dichloroethane	$C_2H_4Cl_2$	1.176	-5	98.9596	-97.4	57.3	Slightly soluble. 0.506 g/100 mL	*		
1,1-Dichloroethene	$C_2H_2Cl_2$	1.213	-28	96.9438	-122.1	31.7	Insoluble. 0.225 g/100 mL	*	*	
2,3-Dichloropropene	$C_3H_4Cl_2$	1.204	10	110.9706	10	94	<0.1 g/100 mL at 22 C	*	*	
1,2,3-Trichlorobenzene	$C_6H_3Cl_3$	1.69	126	181.4487	52.6	219	Insoluble	*	*	
1,2,3-Trichloropropane	$C_3H_5Cl_3$	1.389	82	147.4315	-14.7	156	insoluble. 0.18 g/100 mL	*		
1,2,4-Trichlorobenzene	$C_6H_3Cl_3$	1.4634	110	181.4487	16.95	214.4	Insoluble. 0.0049 g/100 mL	*	*	
1,2-Dichlorobenzene	$C_6H_4Cl_2$	1.306	67	147.0036	-15	180.5	slightly soluble. 0.008396 g/100 mL	*	*	
1,2-Dichloroethane	$C_2H_4Cl_2$	1.253	13	98.9596	-35.3	83.5	Slightly soluble. 0.8608 g/100 mL	*		
1,2-Dichloropropane	$C_3H_6Cl_2$	1.1558	15	112.9864	-100.4	96.8	Slightly soluble. 0.27 g/100 mL	*		
1,3-Dichlorobenzene	$C_6H_4Cl_2$	1.288	67	147.0036	-24.76	173	insoluble. 0.0125 g/100 mL	*	*	
1,4-Dichlorobenzene	$C_6H_4Cl_2$	1.2417	67	147.0036	53.1	173.4	Insoluble. 0.00813 g/100 mL	*	*	
1,2-Dichloropropane	$C_3H_6Cl_2$	1.1558	15	112.9864	-100.4	96.8	Slightly soluble. 0.27 g/100 mL	*		
2-Chloropropane	C_3H_7Cl	0.862	-32	78.5413	-117.18	35.74	0.31 g/100 mL at 20 C	*		
2-Chlorotoluene	C_7H_7Cl	1.082	47	126.5853	-35.1	158.97	Slightly soluble	*	*	
3-Chloropropene	C_3H_5Cl	0.938	-29	76.5255	-134.5	44 - 46	Slightly soluble. 0.337 g/100 mL	*	*	
4-Chlorotoluene	C_7H_7Cl	1.07	49	126.5853	7.5	161.9	<0.1 g/100 mL at 20 C	*	*	
Carbon tetrachloride	CCl_4	1.594	N/A	153.823	-22.9	76.7	Slightly sol. 0.08048 g/100 mL	*		
Chlorobenzene	C_6H_5Cl	1.1066	29	112.5585	-45.6	130	Slightly soluble. 0.0497 g/100 mL	*	*	
Chloroethane	C_2H_5Cl	0.92	-50	64.5145	-136.4	12.3	Soluble. 0.574 g/100 mL at 20 C	*		
Chloroform	$CHCl_3$	1.49845	N/A	119.3779	-63.7	61.7	Slightly sol. 0.795 g/100 mL	*		
Chloromethane	CH_3Cl	0.991	N/A	50.4877	-97.1	-24.2	Insoluble. 0.5325 g/100 mL	*		
cis-1,2-Dichloroethene	$C_2H_2Cl_2$	1.284	6	96.9438	-80.5	60	0.08 g/100 mL	*	*	
cis-1,3-Dichloropropene	$C_3H_4Cl_2$	1.22	N/A	110.9706	-50	104.3	<0.1 g/100 mL at 20.5 C	*	*	
cis-1,4-Dichloro-2-butene	$C_4H_6Cl_2$	1.188	56	124.9974	-48	152	0.058 g/100 mL	*	*	
Methylene Chloride	CH_2Cl_2	1.3255	N/A	84.9328	-96.7	39.8	Slightly sol. 1.32 g/100 mL	*		
Tetrachloroethene	C_2Cl_4	1.623	N/A	165.834	-22.3	121.1	Almost insoluble 0.015 g/100 mL	*	*	
Trans-1,2-Dichloroethene	$C_2H_2Cl_2$	1.257	6	96.9438	-50	47.5	Slightly. 0.63 g/100 mL	*	*	

Compound	Formula	Density	Flashpoint* (°C)	Molecular Weight	Melting Point (°C)	Boiling Point (°C)	Water Solubility**	ECD	PID	FID
trans-1,3-Dichloropropene	$C_3H_4Cl_2$	1.217	27	110.9706	N/A	112	<0.1 g/100 mL at 20.5 C	*	*	
trans-1,4-Dichloro-2-butene	$C_4H_6Cl_2$	1.183	N/A	124.9974	2	155.5	0.085 g/100 mL at 25 C	*	*	
Trichloroethene	C_2HCl_3	1.462	N/A	131.3889	-86	86.7	Slightly soluble. 0.11 g/100 mL	*	*	
Vinyl Chloride	C_2H_3Cl	0.9106	42	62.4987	-153.7	-13.9	Slightly soluble 0.11 g/100 mL	*	*	
Benzene	C_6H_6	0.8786	-11	78.1134	5.5	80.1	Slightly sol. 0.18 g/100 mL		*	*
Hexane	C_6H_{14}	0.6548	-22	86.1766	-95	69	Slightly sol. .000947 g/100 mL		*	*
n-Butylbenzene	$C_{10}H_{14}$	0.86	59	134.2206	-88	183	insoluble		*	*
n-Propylbenzene	C_9H_{12}	0.876	48	120.1938	-43.8	169	Slightly soluble		*	*
p-Cymene	C_9H_{12}	0.865	44	120.1938	-44.7	165	insoluble		*	*
o-Xylene	C_8H_{10}	0.867	15	106.167	-94.9	136.2	0.0206 g/100 mL		*	*
p-Xylene	C_8H_{10}	0.862	25	106.167	-50	140	Insoluble. 0.0175 g/100 mL		*	*
Naphthalene	$C_{10}H_8$	0.997	78	128.1732	80.6	218	Slightly soluble. 0.0031 g/100 mL		*	*
m-Xylene	C_8H_{10}	0.897	32	106.167	-25.2	144	0.00 g/100 mL. Insoluble		*	*
Isopropylbenzene	C_9H_{12}	0.862	47	120.1938	-101.6	159	insoluble		*	*
Toluene	C_7H_8	0.867	4	92.1402	-93	110.6	Slightly sol. 0.0526 g/100 mL		*	*
1,2-Dibromo-3-chloropropane	$C_3H_5Br_2Cl$	2.05	N/A	236.3335	6	195	0.123 g/100 mL	*		
1,2-Dibromoethane	$C_2H_4Br_2$	2.17	1	187.8616	9.97	131.7	Slightly sol. 0.4152 g/100 mL	*		
1,3-Dichloropropane	$C_3H_6Cl_2$	1.188	20	112.9864	-99	120.4	insoluble	*		
Acrylonitrile	C_3H_3N	0.8075	-5	53.0634	-83.55	77.3	Soluble. 7.45 g/100 mL		*	
Bromobenzene	C_6H_5Br	1.495	51	157.0095	-30.8	155	insoluble. <0.1 g/100 mL at 20.5 C	*	*	
Bromochloromethane	CH_2BrCl	1.991	N/A	129.3838	-88	67.8	Slightly soluble. 0.1-0.5 g/100 mL at 20 C	*		
Bromodichloromethane	$CHBrCl_2$	1.971	N/A	163.8289	-57.1	90.1	Slightly soluble. 0.6735 g/100 mL	*		
Bromoform	$CHBr_3$	2.894	N/A	252.7309	8.3	149.5	Slightly soluble. 0.301 g/100 mL	*		
Bromomethane	CH_3Br	1.732	N/A	94.9387	-93.7	3.56	Very slightly soluble. 1.522 g/100 mL	*		
Carbon disulfide	CS_2	1.2632	-30	76.131	-110	46.2	Slightly sol. 0.1185 g/100 mL		*	
Cumene	C_9H_{12}	0.862	31	120.1938	-96	151	insoluble. 0.00499 g/100 mL		*	
Dibromochloromethane	$CHBr_2Cl$	2.451	N/A	208.2799	-22	120	0.4 g/100 mL	*		
Dibromomethane	CH_2Br_2	2.497	N/A	173.8348	-53	97	Soluble. 1.193 g/100 mL	*		
Freon 11	CCl_3F	1.494	N/A	137.3684	-111	23.8	insoluble. 0.124 g/100 mL	*		
Freon 113	$C_2Cl_3F_3$	1.575	N/A	187.3762	-36.4	47.6	0.02 g/100 mL. Slightly soluble. Insoluble	*		

Compound	Formula	Density	Flashpoint* (°C)	Molecular Weight	Melting Point (°C)	Boiling Point (°C)	Water Solubility**	ECD	PID	FID
Hexachlorobutadiene	C_4Cl_6	1.68	N/A	260.762	-21	210	Insoluble. 0.00032 g/100 mL	*	*	
p-Cymene	$C_{10}H_{14}$	0.86	47	134.2206	-67	176 - 178	insolubie		*	
sec-Butylbenzene	$C_{10}H_{14}$	0.862	45	134.2206	-75	173	0.00176 g/100mL		*	
Styrene	C_8H_8	0.9045	32	104.1512	-30.6	145.2	0.032 g/100 mL		*	*
tert-Butylbenzene	$C_{10}H_{14}$	0.867	44	134.2206	-58	169	0.00295 g/100 mL		*	

Compound with no flashpoint are not ignitable.

* If temperature is not otherwise noted, assume 25° C.

* indicates a possible response on specific detector

Associated Parent Compound

APPENDIX B

MIP BORINGS

4961 Telsa Drive
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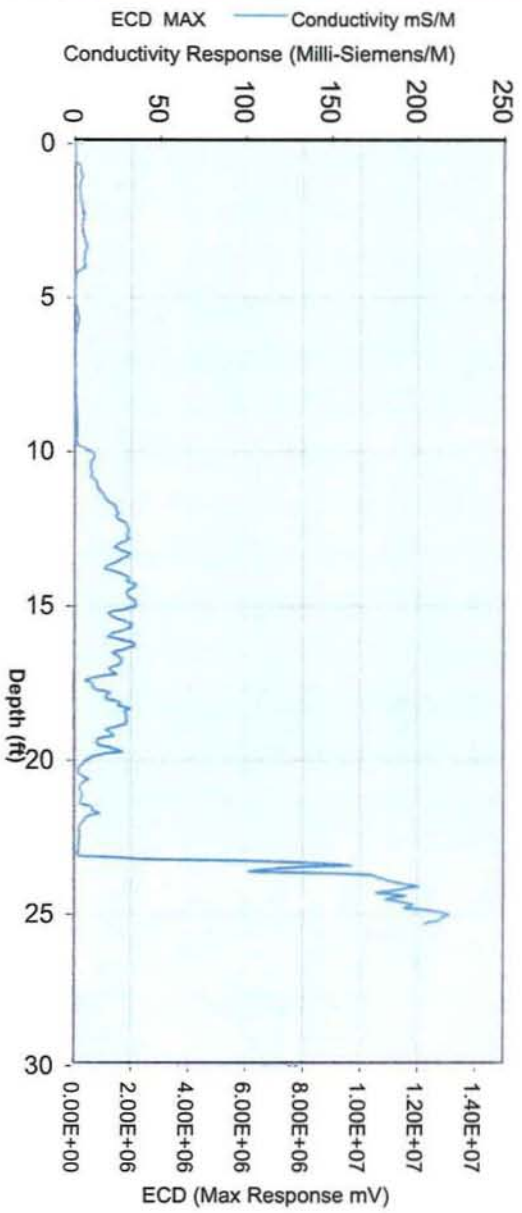
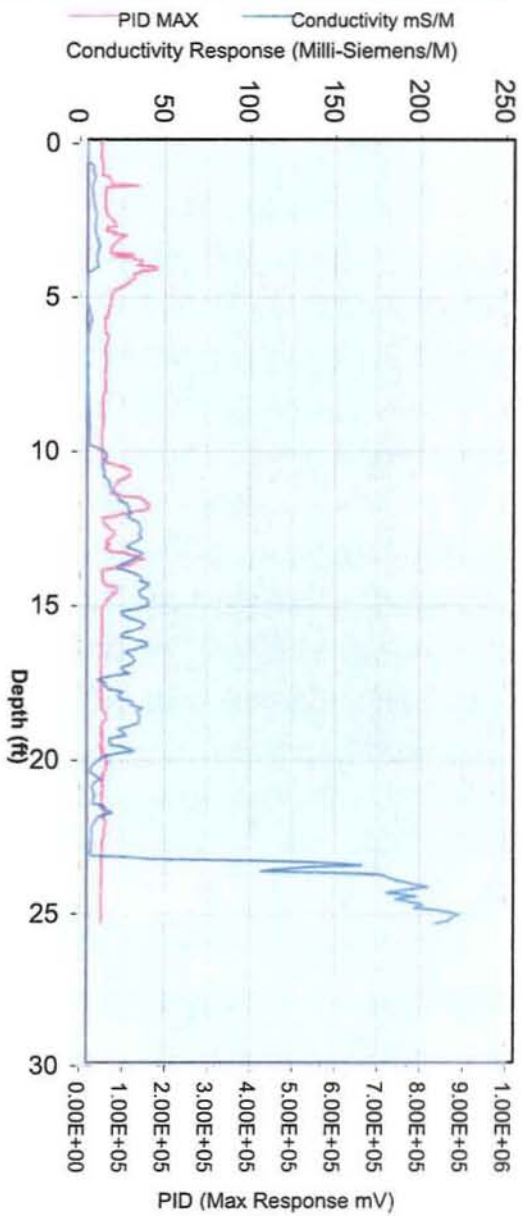
Boring Name: 43MIP11

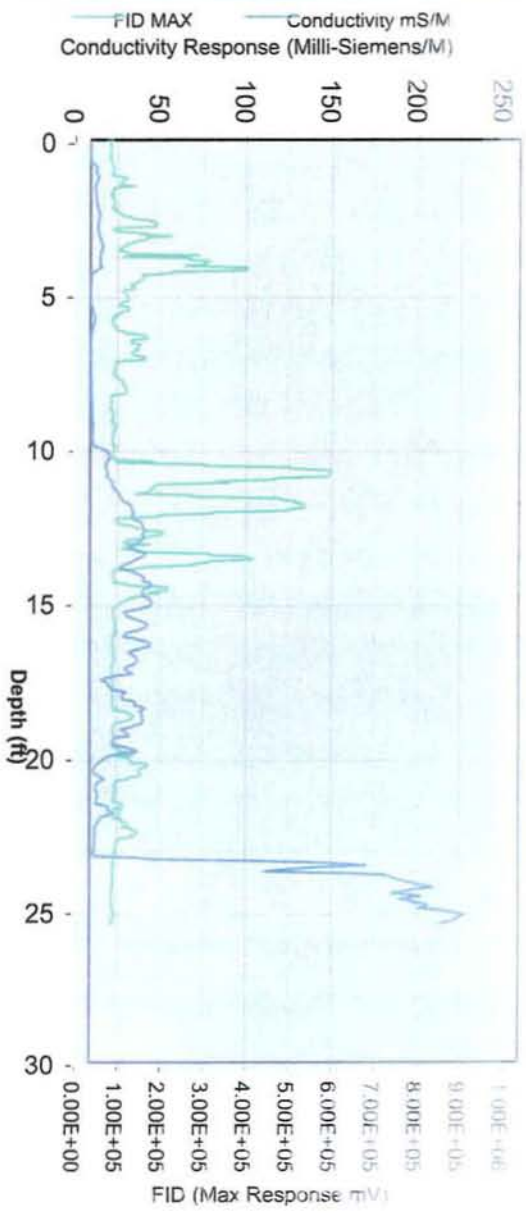
Total Depth (ft): 45

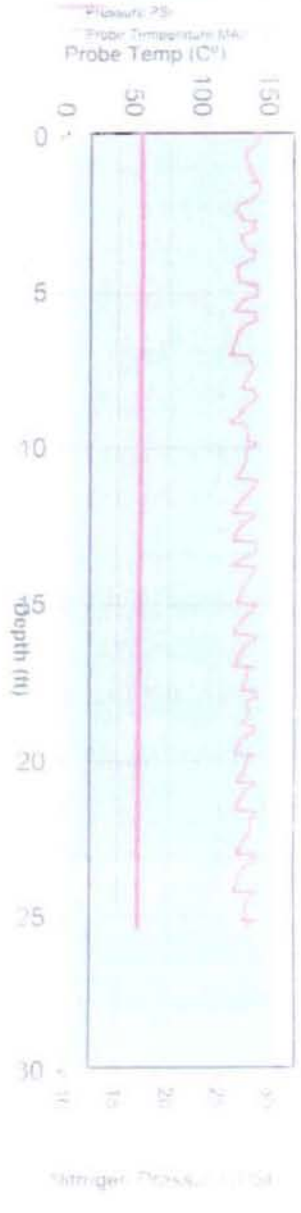
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Wed Feb 18 2009 13:49
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Wed Feb 18 2009 14:17
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









Vironex
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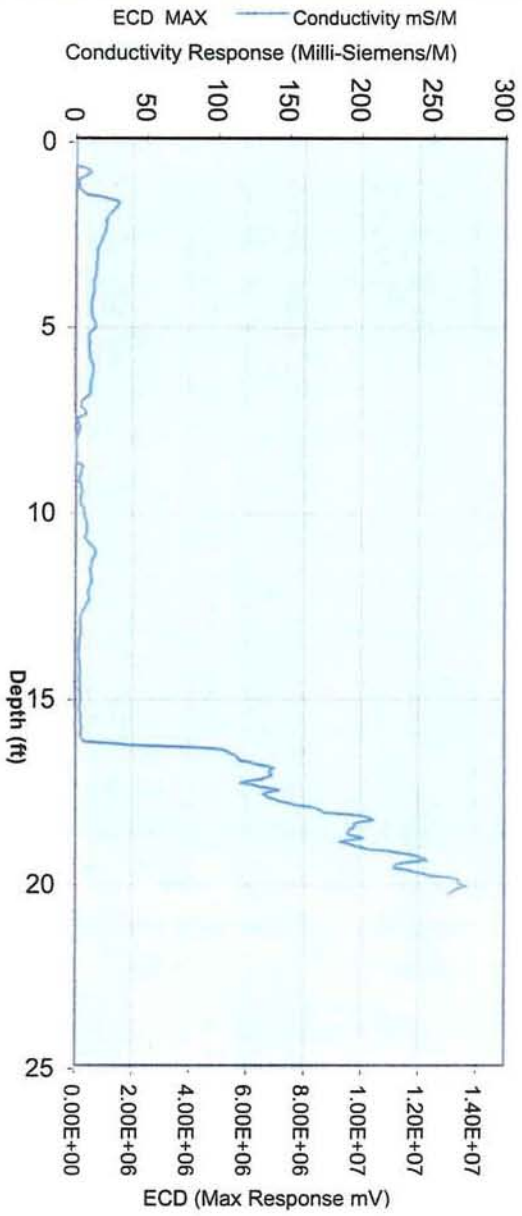
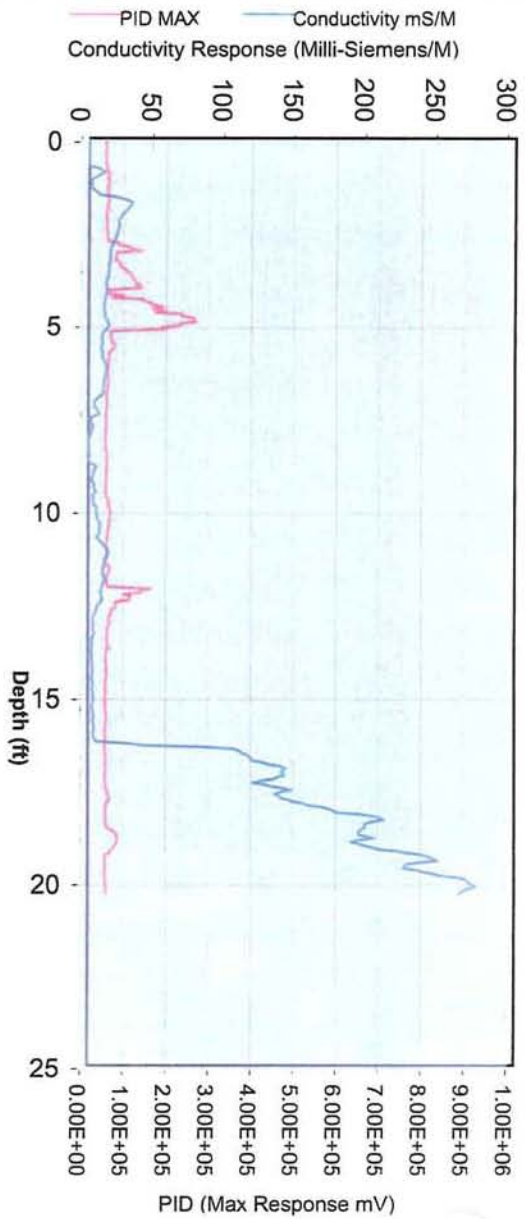
Boring Name: S43MIP12

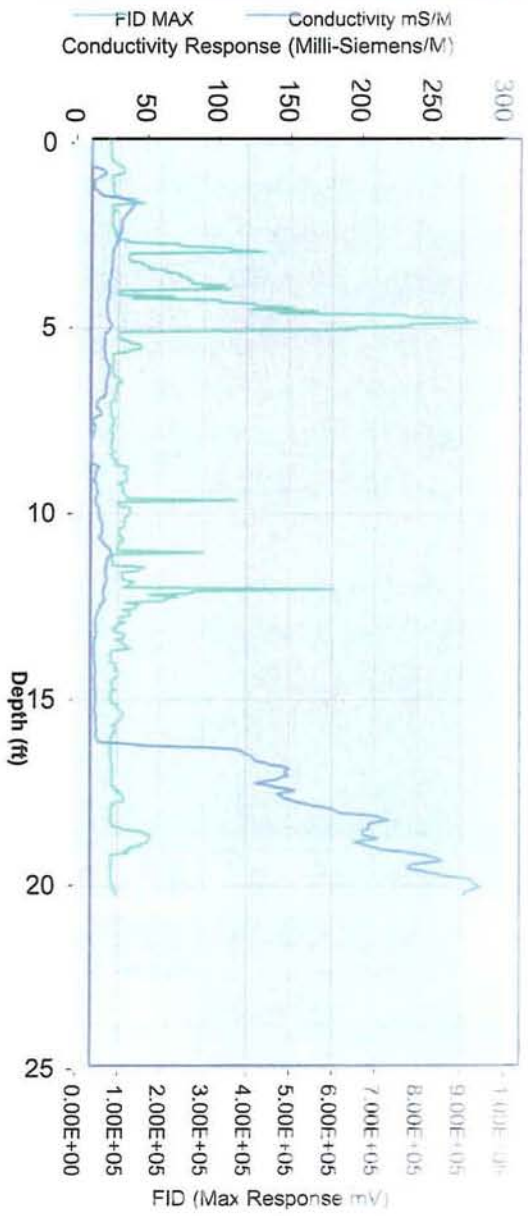
Total Depth (ft): 20.35

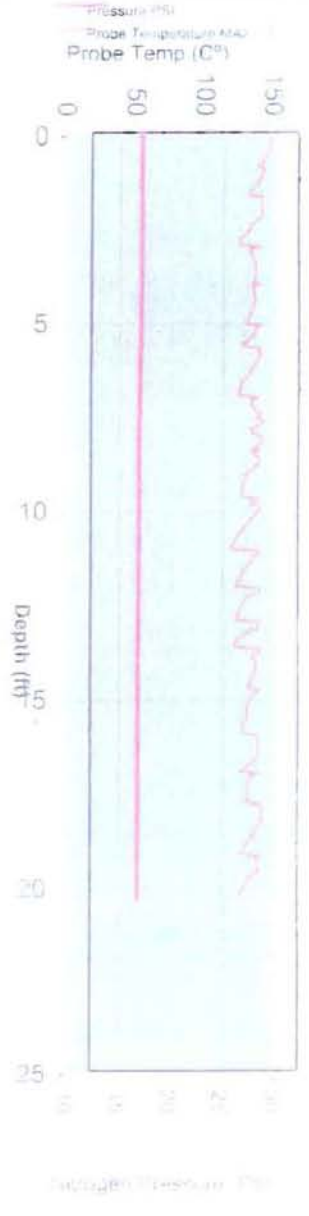
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Wed Feb 18 2009 15:02
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Wed Feb 18 2009 15:24
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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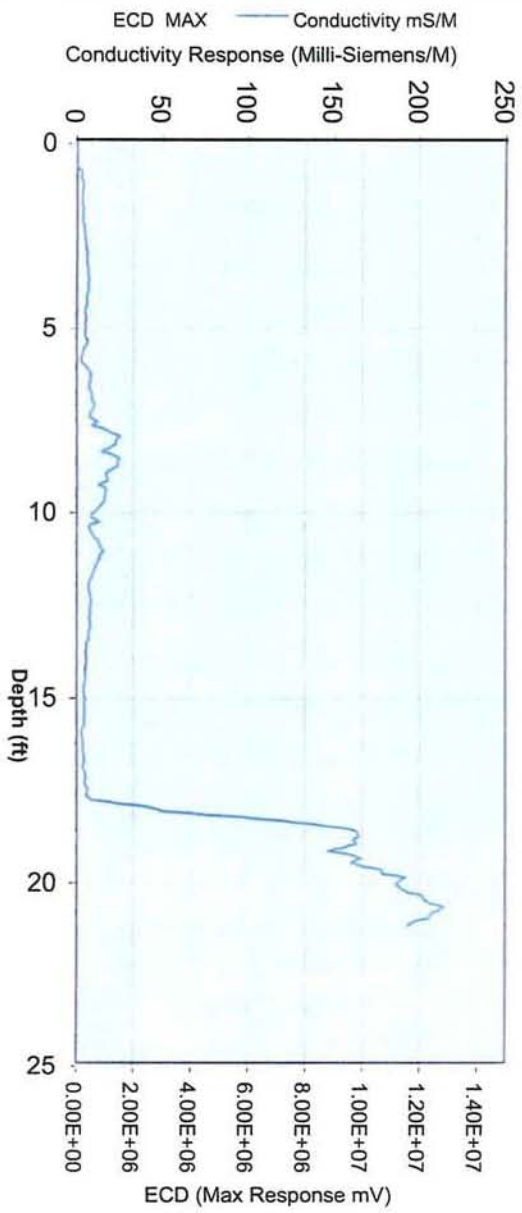
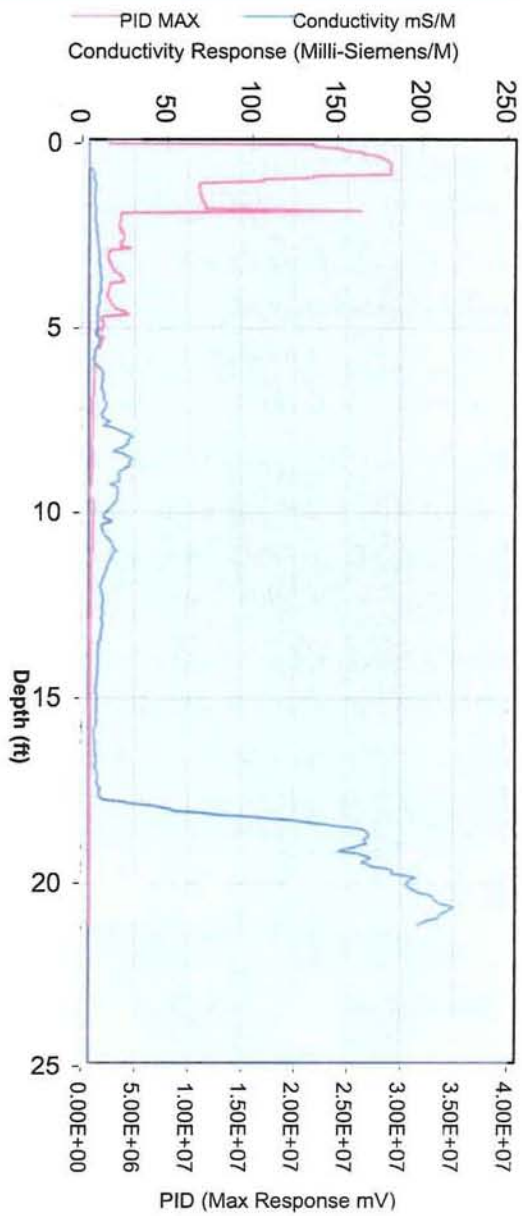
Boring Name: 43MIP13

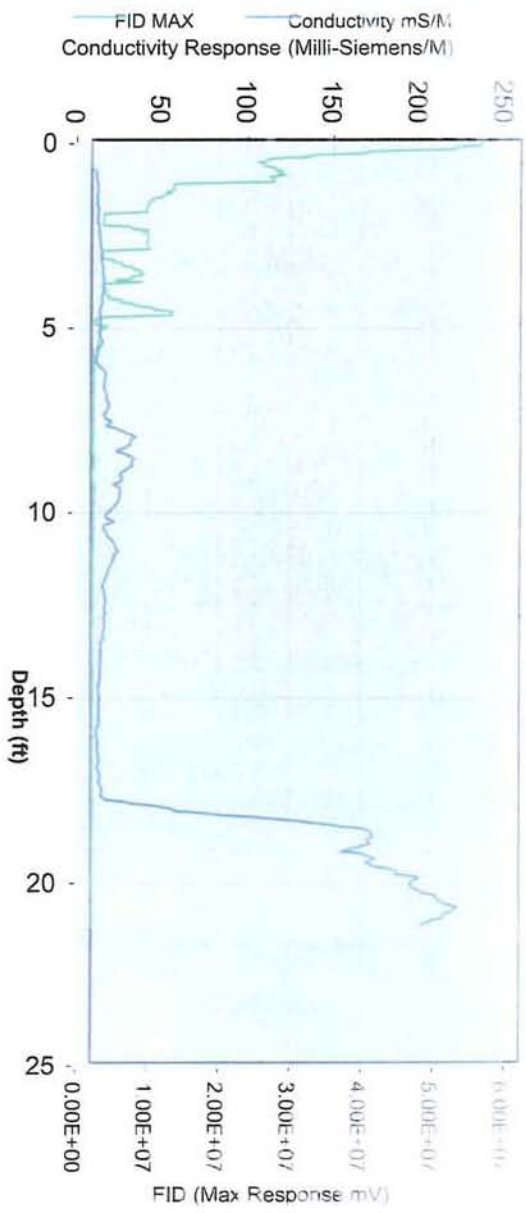
Total Depth (ft): 25

Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Wed Feb 18 2009 15:58
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Wed Feb 18 2009 16:28
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry







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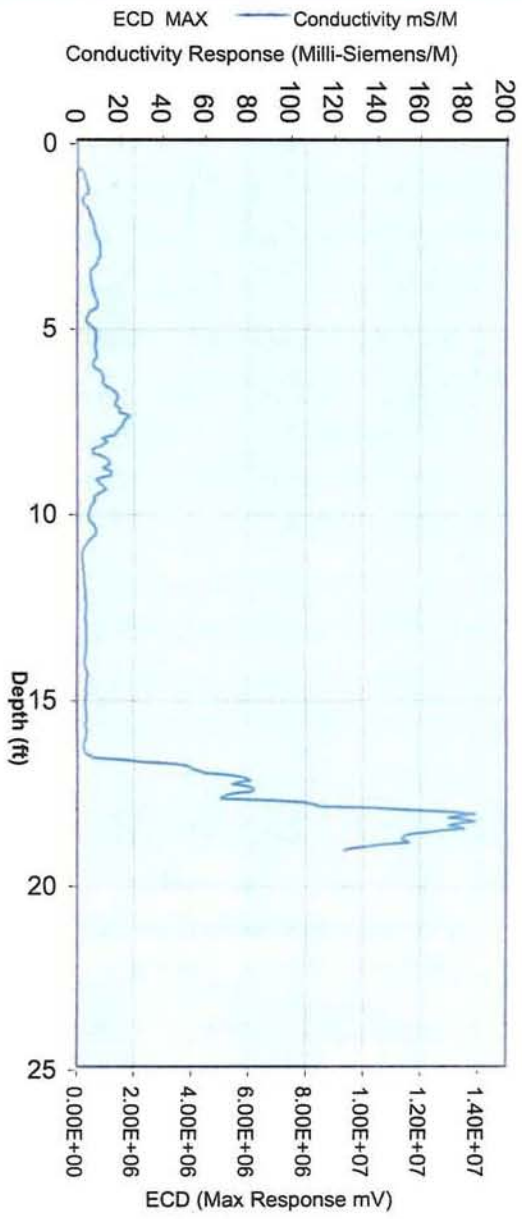
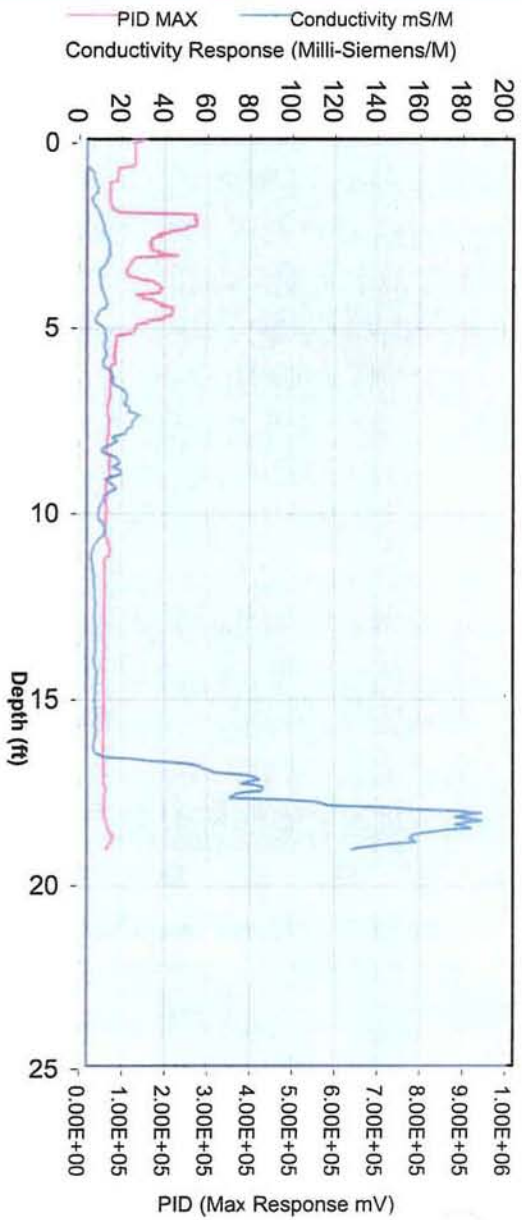
Boring Name: S43MIP14

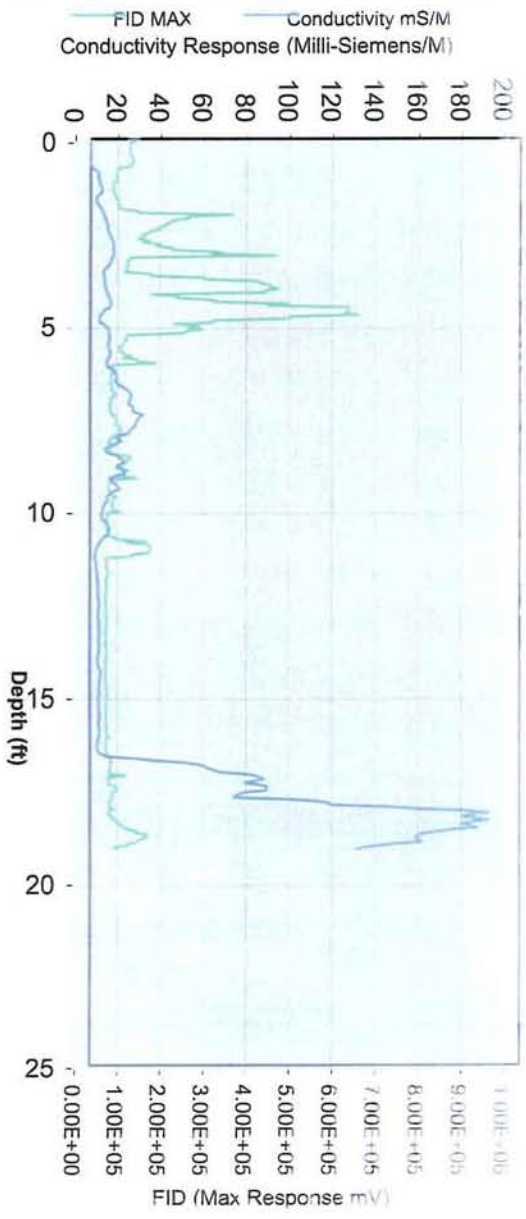
Total Depth (ft): 19.15

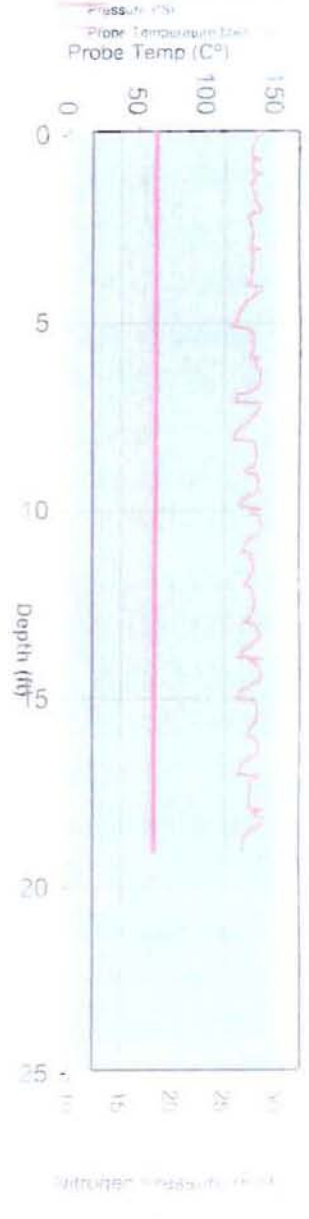
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Thu Feb 19 2009 08:13
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Thu Feb 19 2009 08:35
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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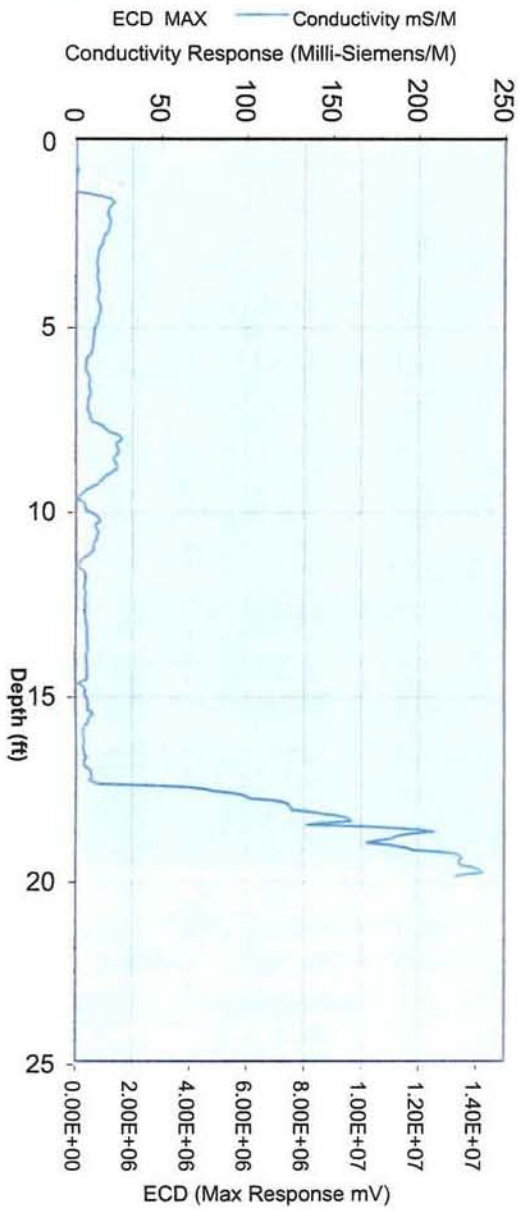
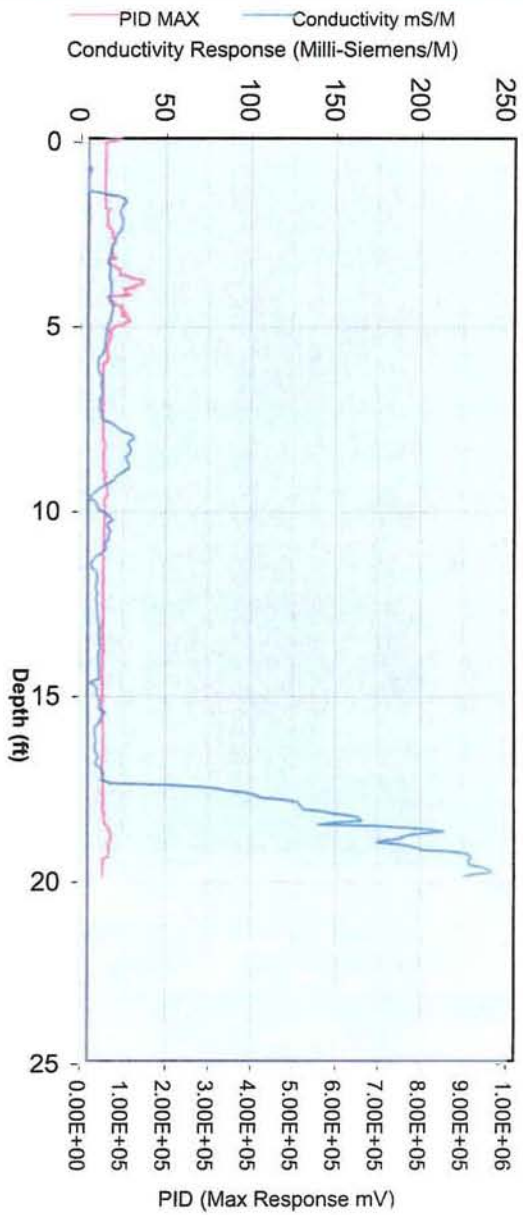
Boring Name `43MIP15

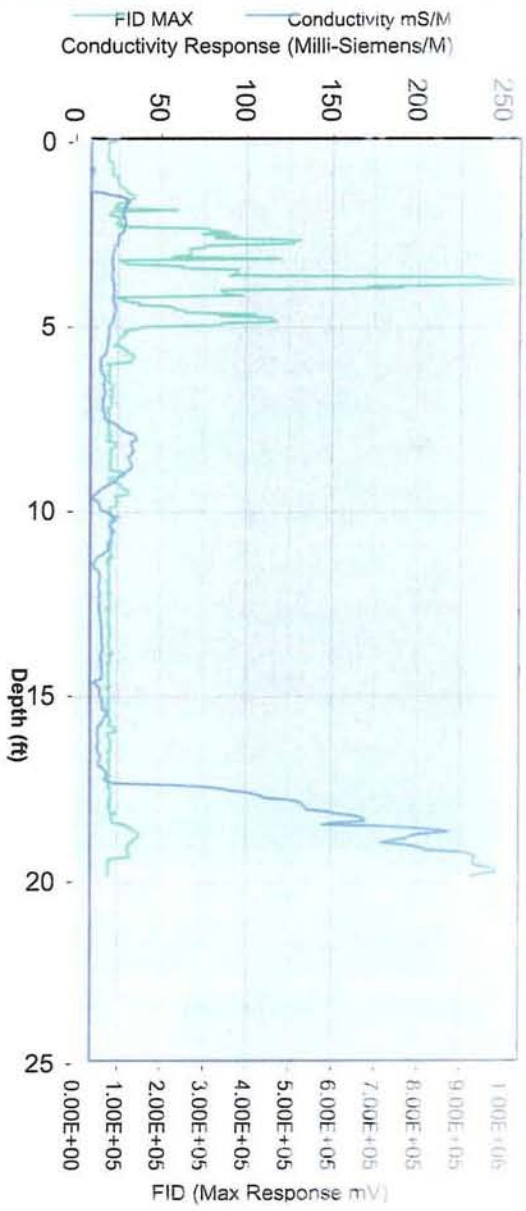
Total Depth (ft): 95

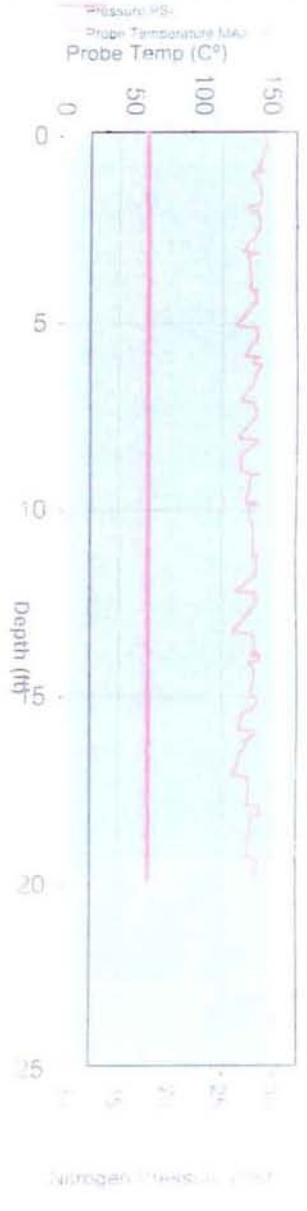
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Thu Feb 19 2009 09:16
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Thu Feb 19 2009 09:45
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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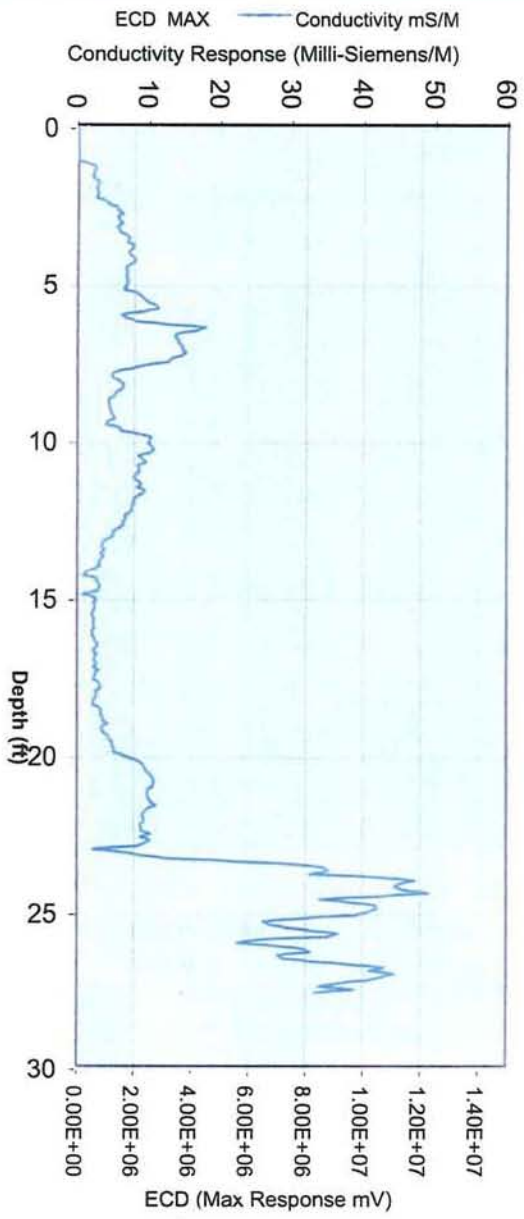
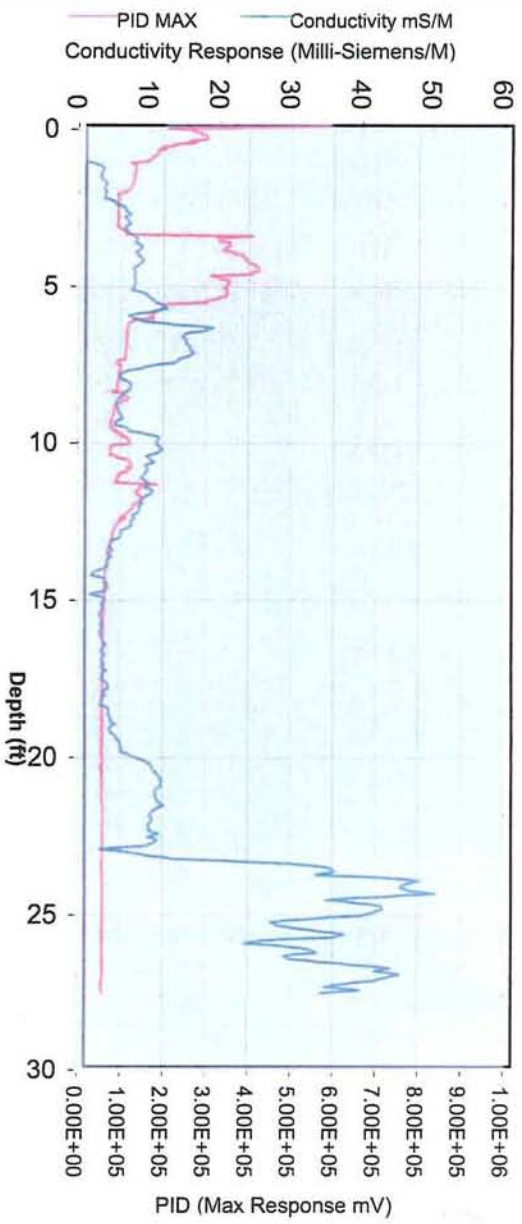
Boring Name: S43MIP16

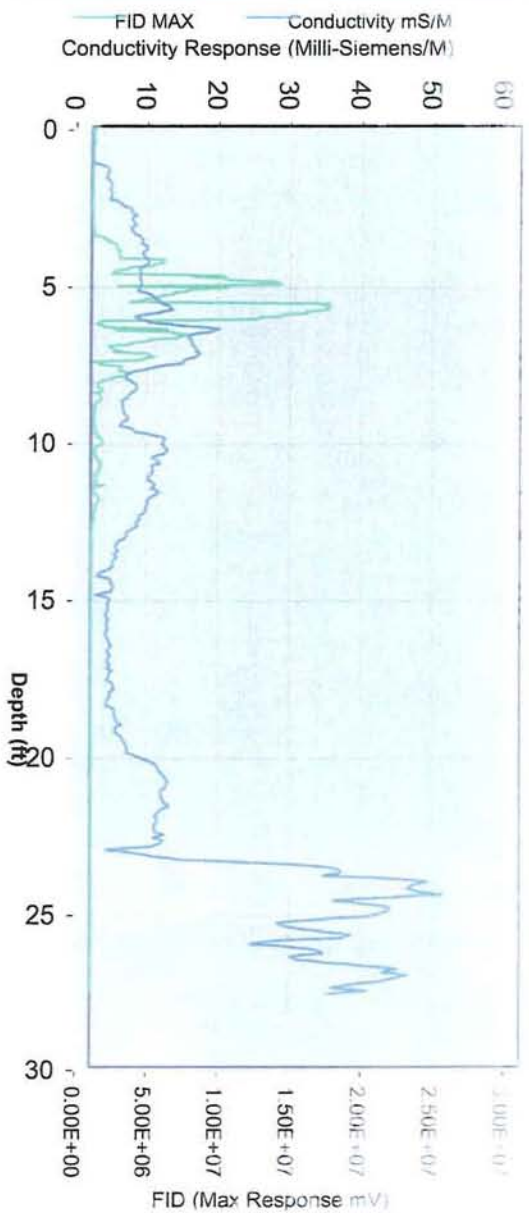
Total Depth (ft): 27.65

Notes:
ECD attenuation error at 5.25'. Already corrected on graph.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Thu Feb 19 2009 10:32
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Thu Feb 19 2009 10:59
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry







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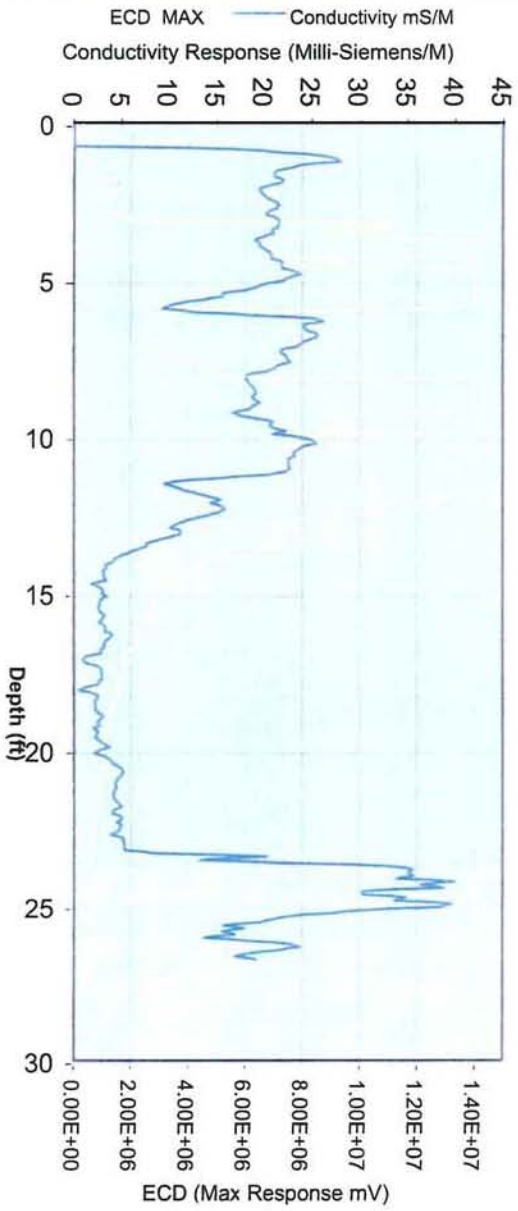
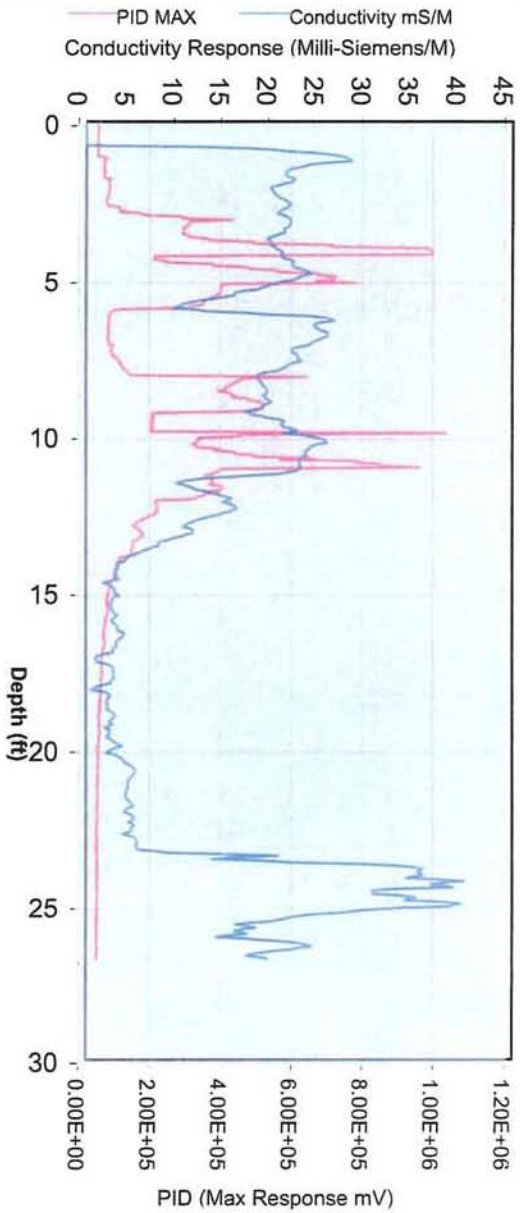
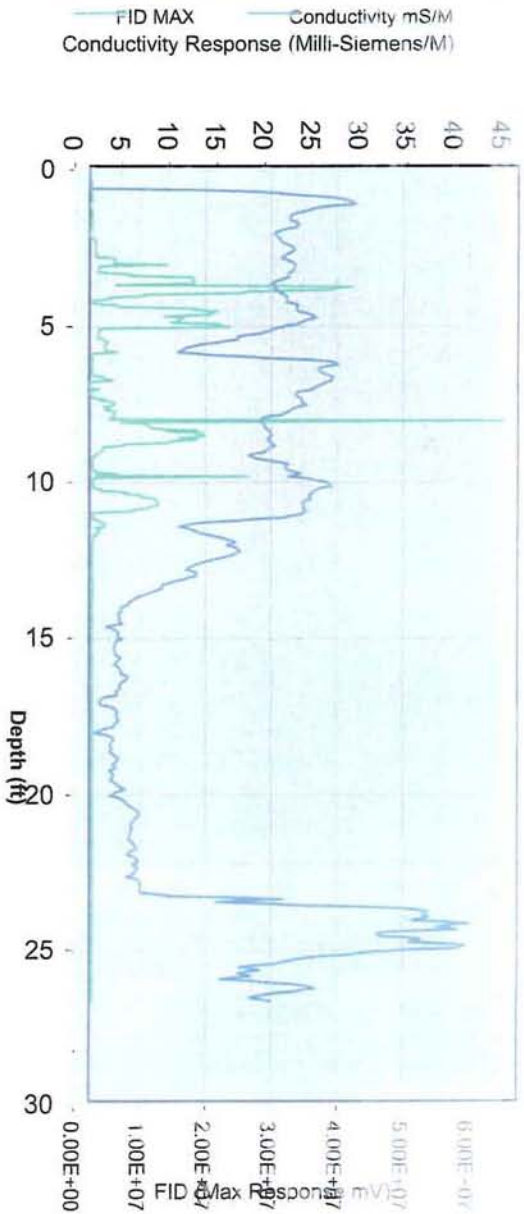
Boring Name: 43MIP17 **Total Depth (ft):** 75

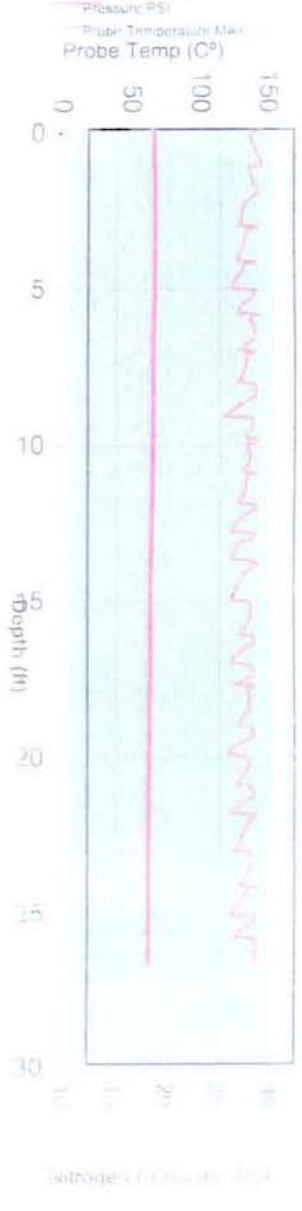
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Thu Feb 19 2009 12:34
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Thu Feb 19 2009 13:01
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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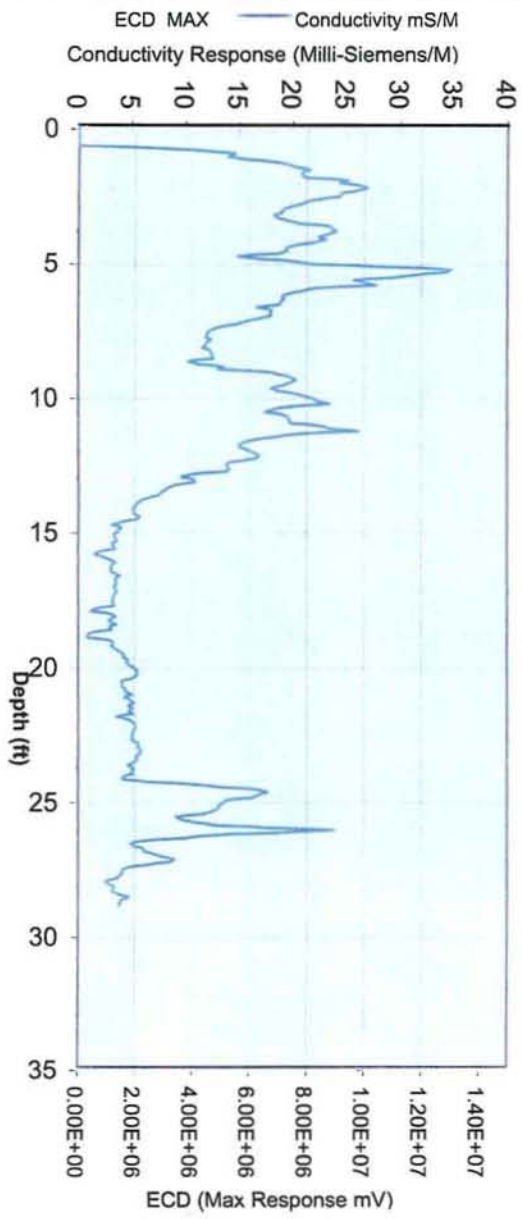
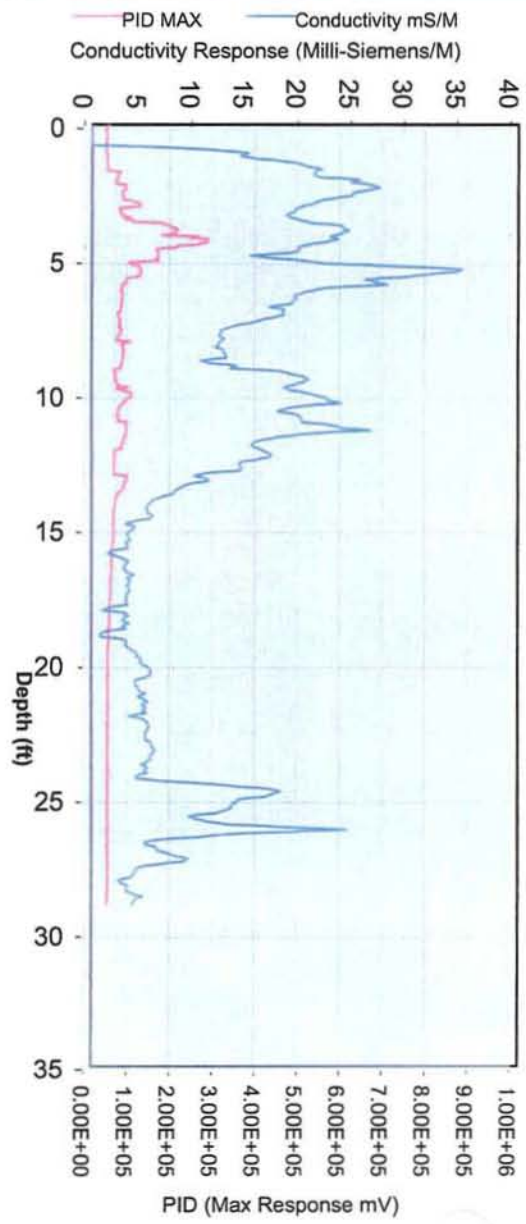
Boring Name: S43MIP18

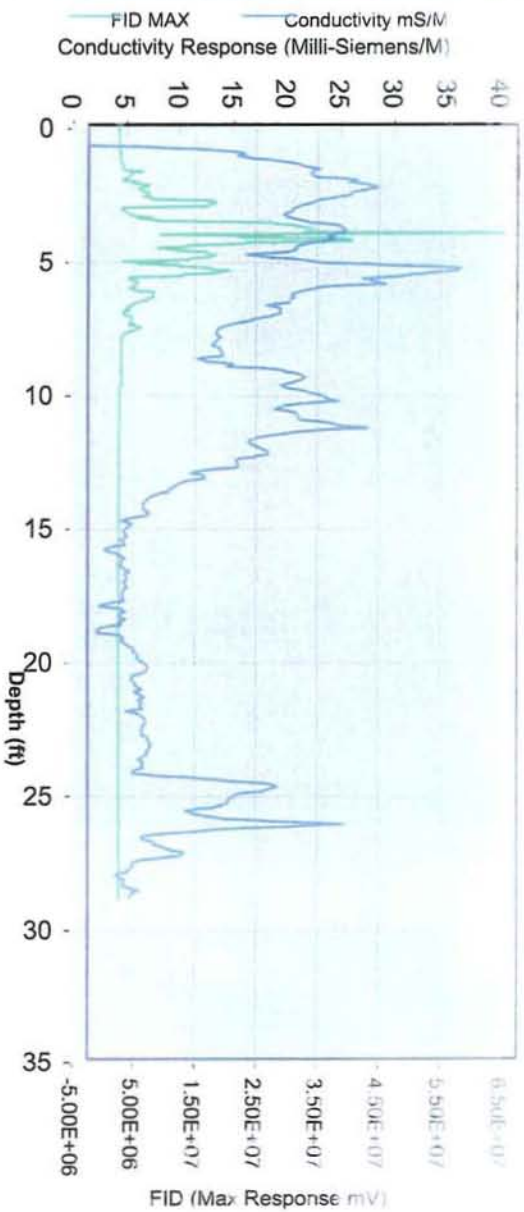
Total Depth (ft): 28.95

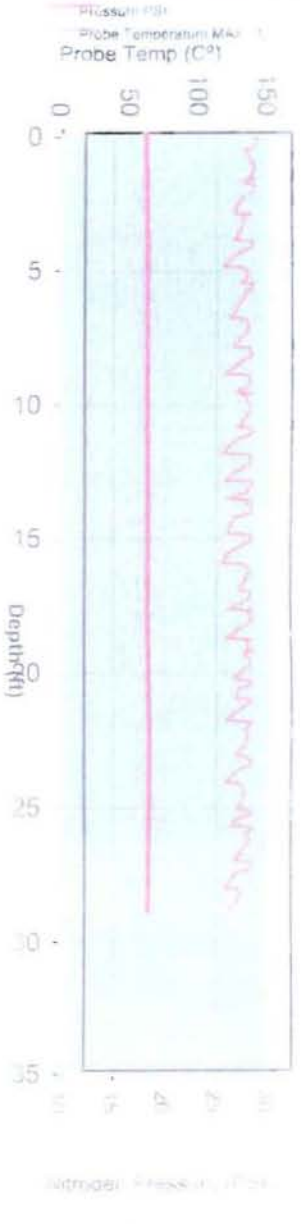
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Thu Feb 19 2009 13:41
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Thu Feb 19 2009 14:16
Site Address:	Indian Head.MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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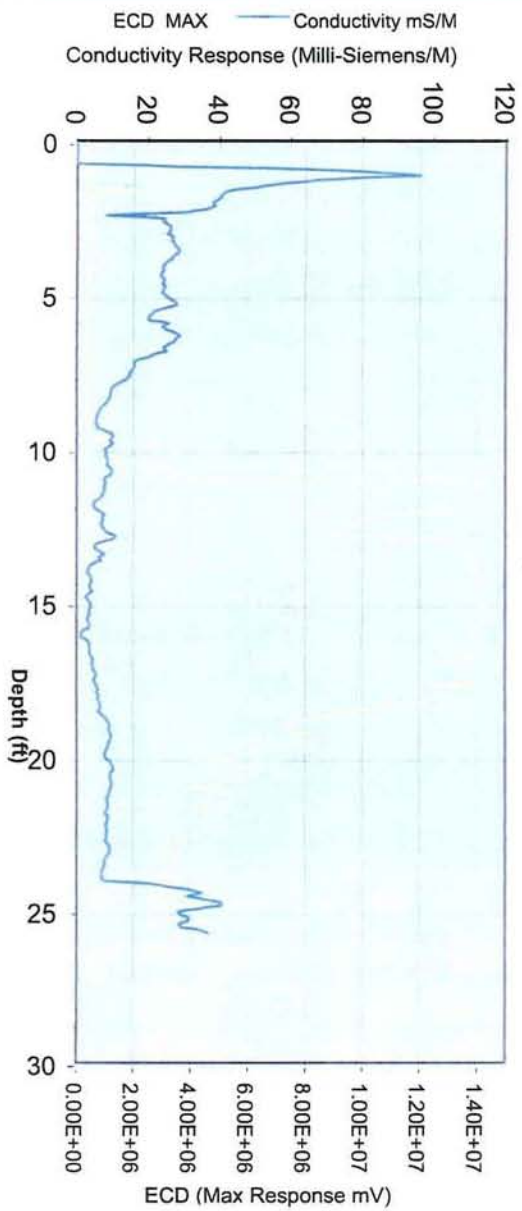
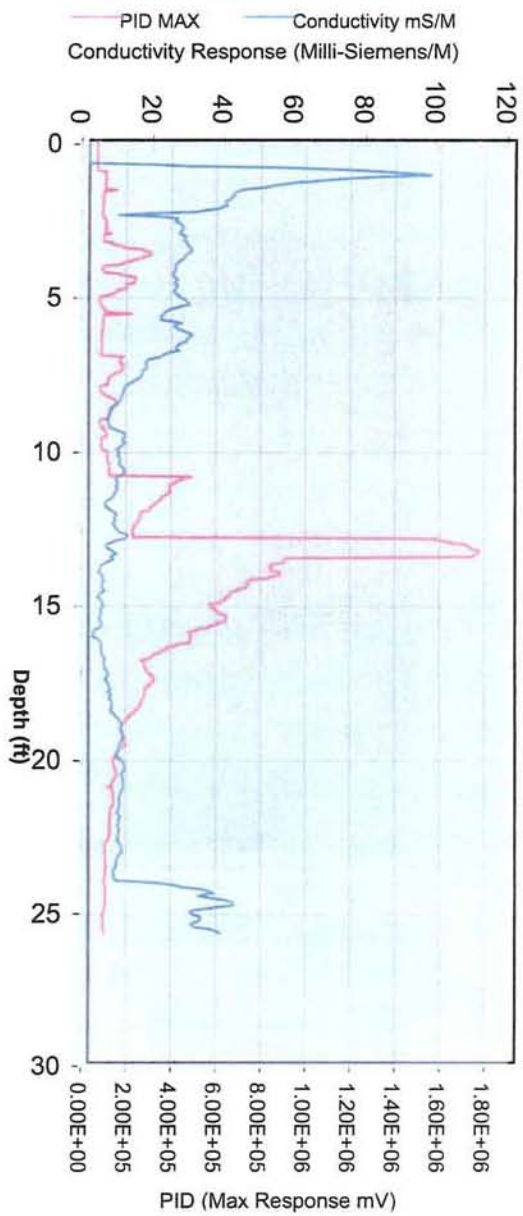
Boring Name: 43MIP19

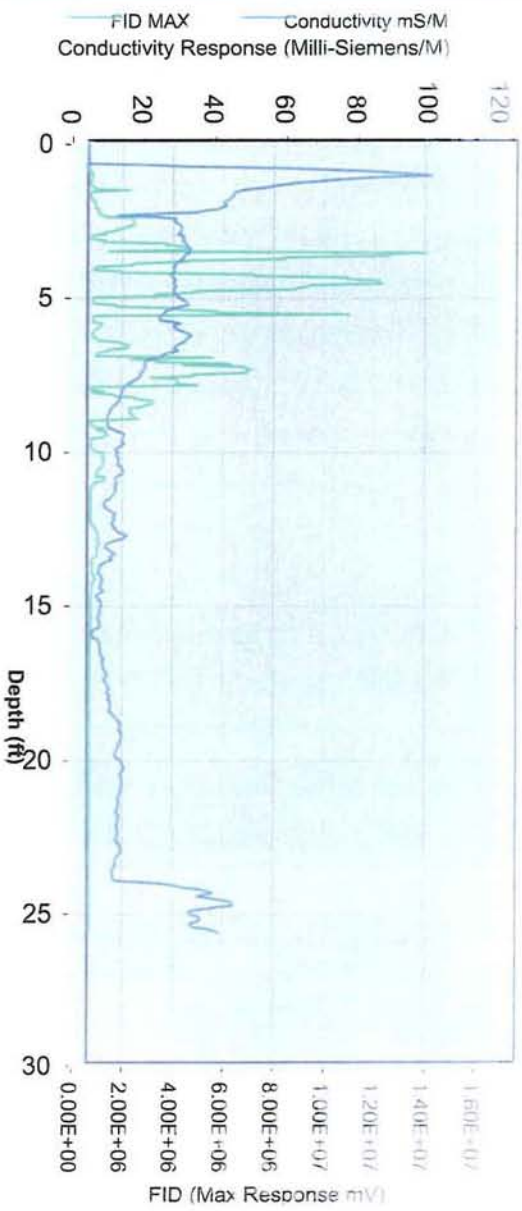
Total Depth (ft): 75

Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Thu Feb 19 2009 14:50
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Thu Feb 19 2009 15:16
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry







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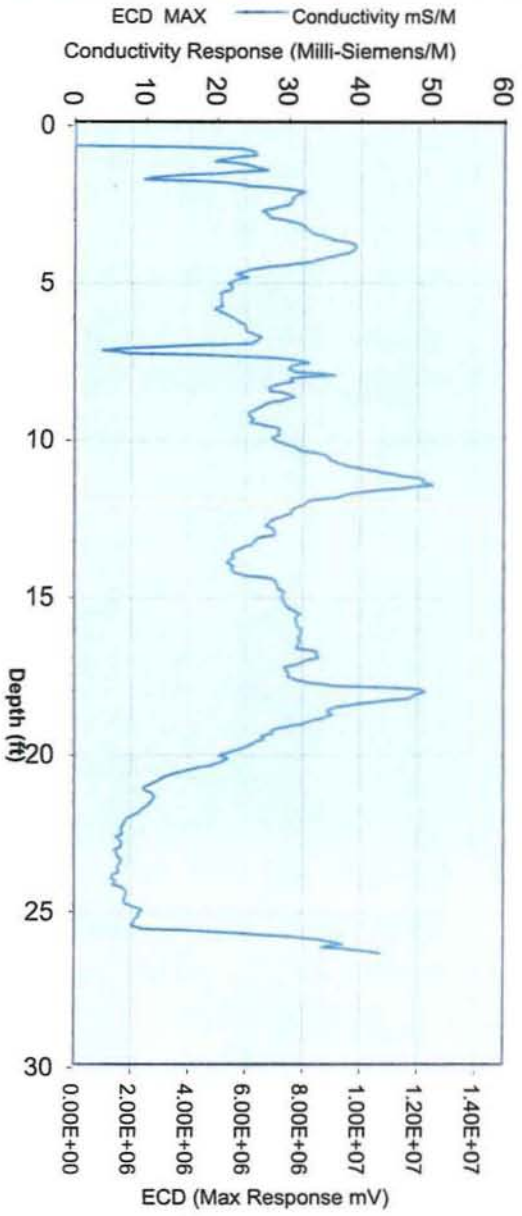
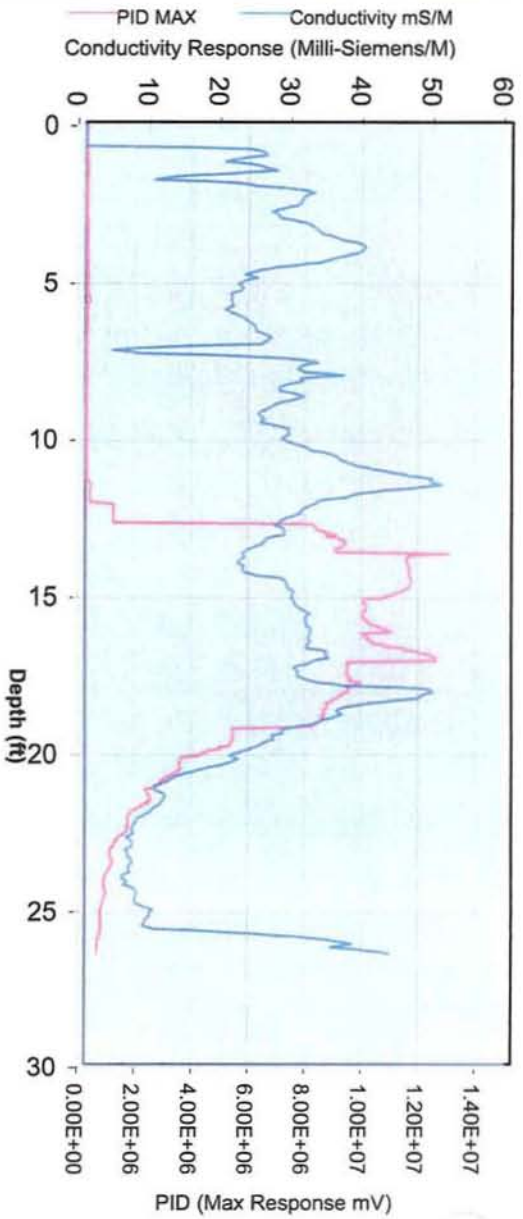
Boring Name: S43MIP20

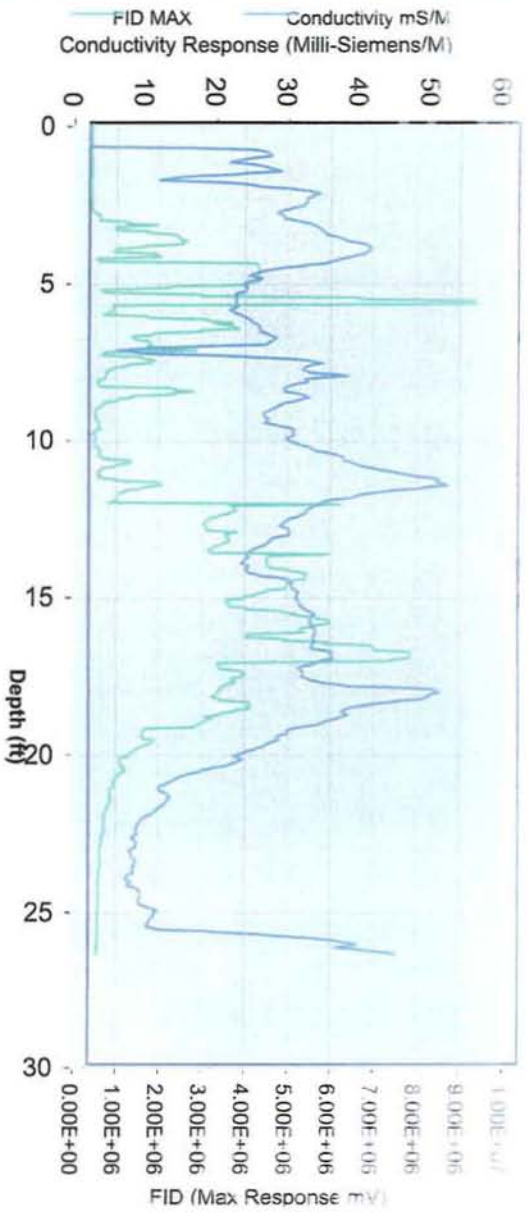
Total Depth (ft): 26.45

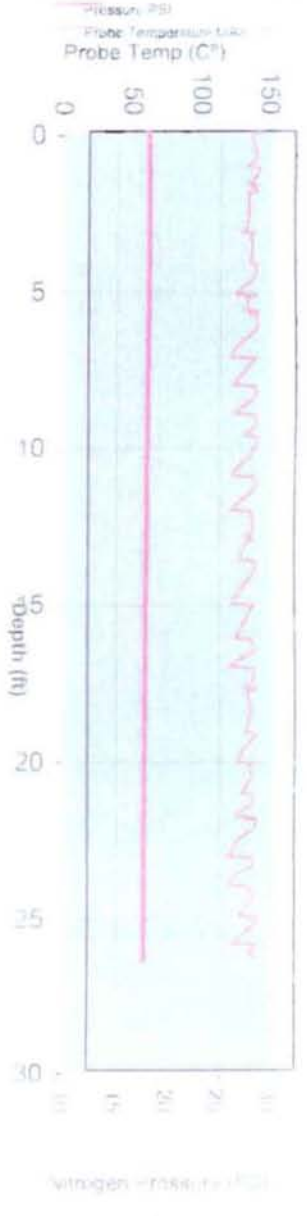
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Thu Feb 19 2009 15:51
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Thu Feb 19 2009 16:20
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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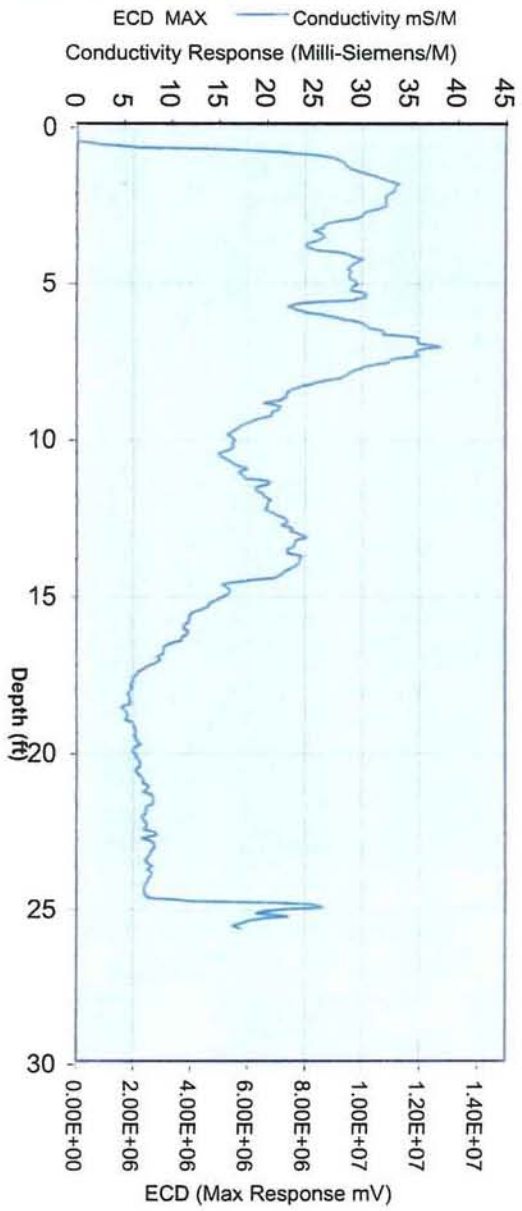
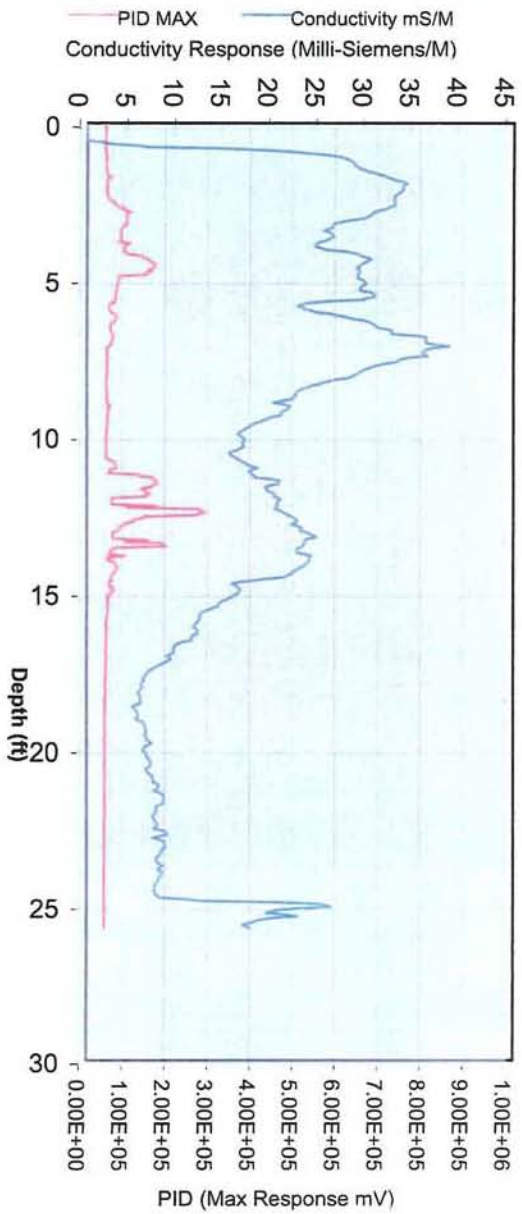
Boring Name: 43MIP21

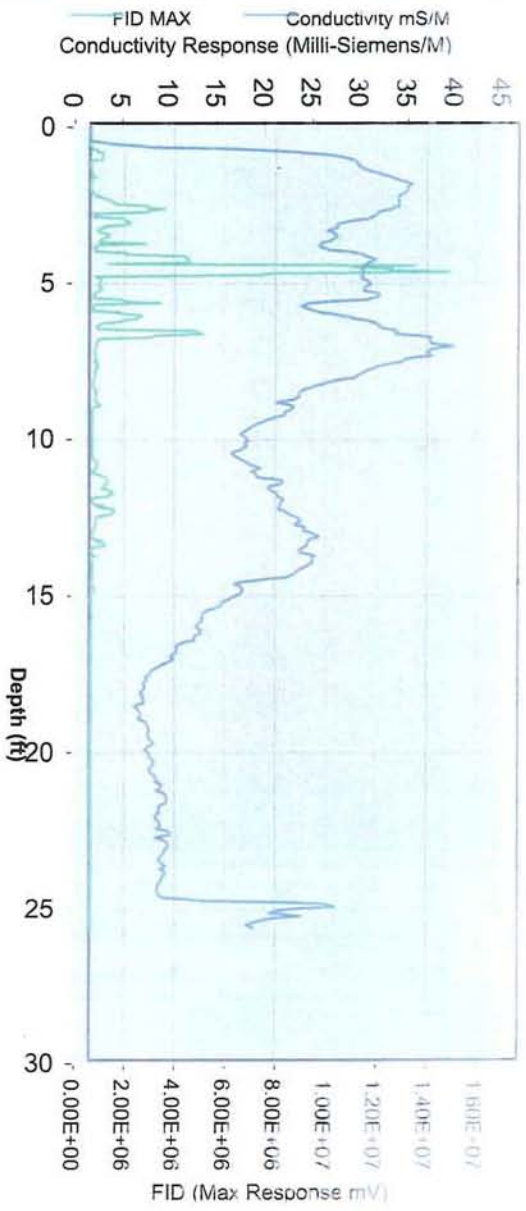
Total Depth (ft): 75

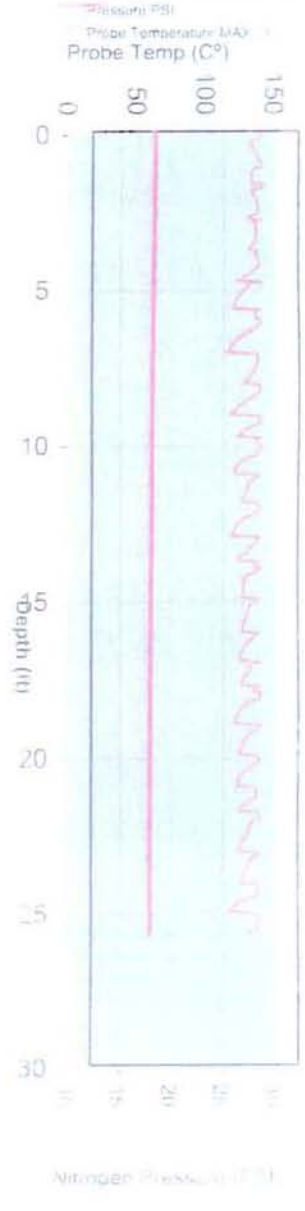
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Fri Feb 20 2009 08:23
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Fri Feb 20 2009 08:53
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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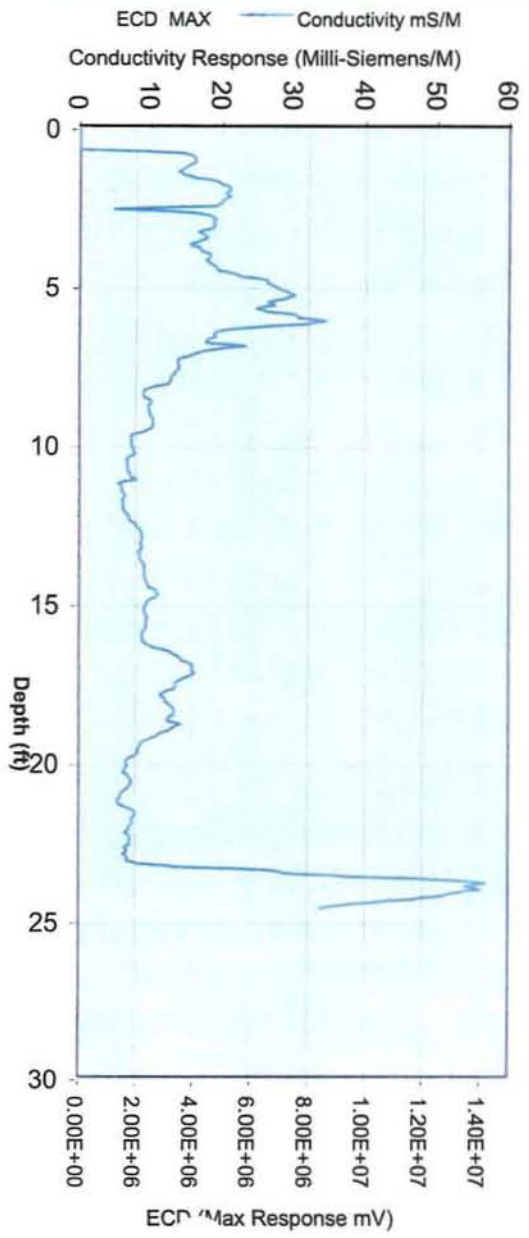
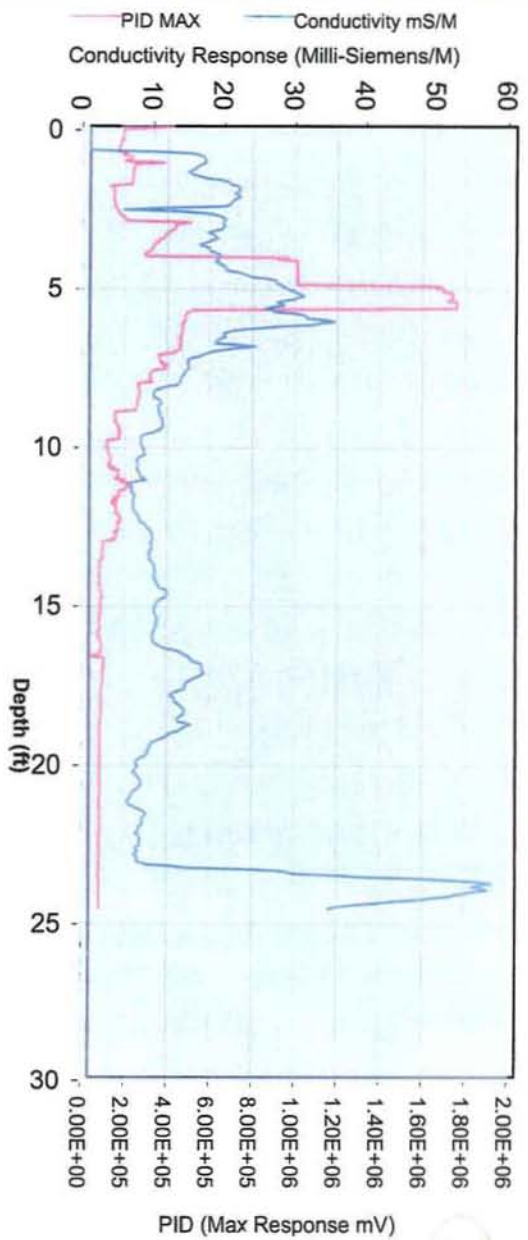
Boring Name: S43MIP22

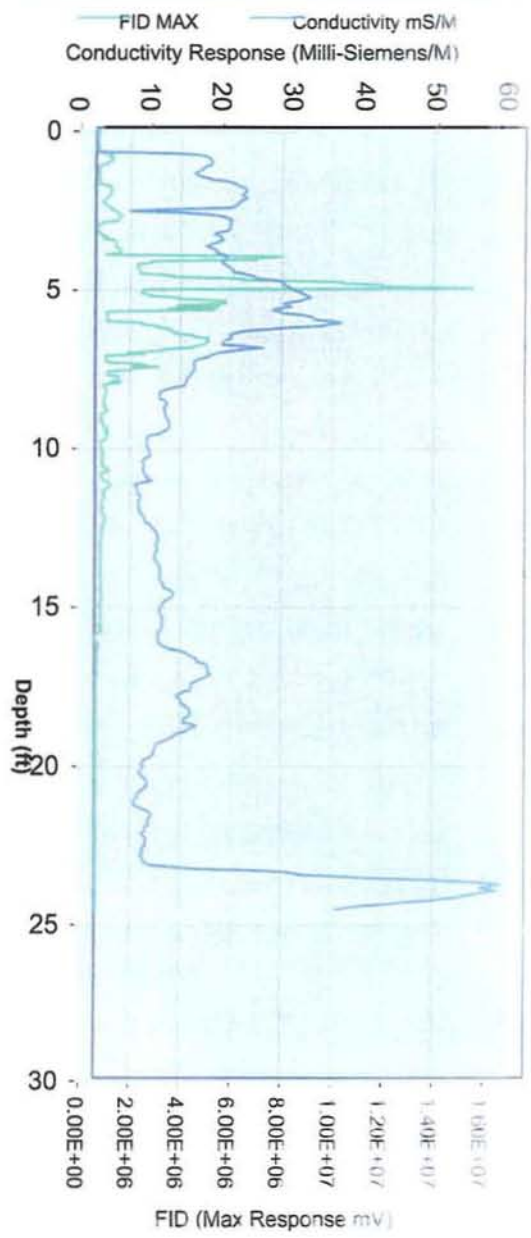
Total Depth (ft): 24.65

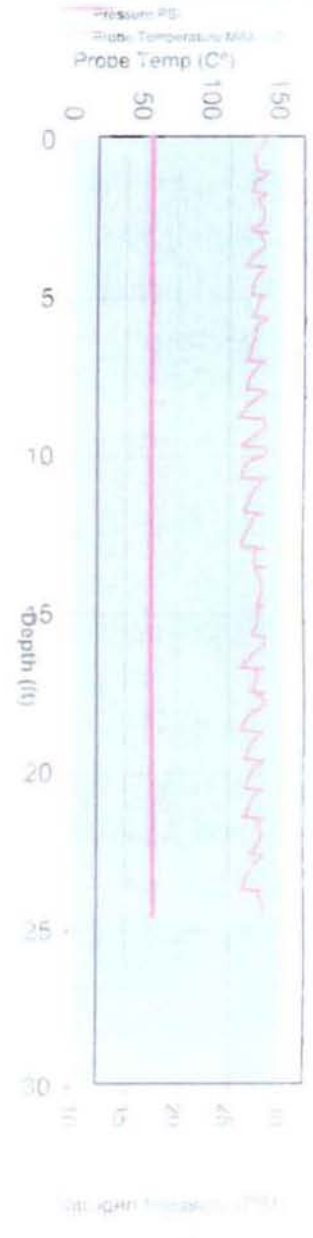
Notes:
None

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Fri Feb 20 2009 09:29
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time.	Fri Feb 20 2009 09:55
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









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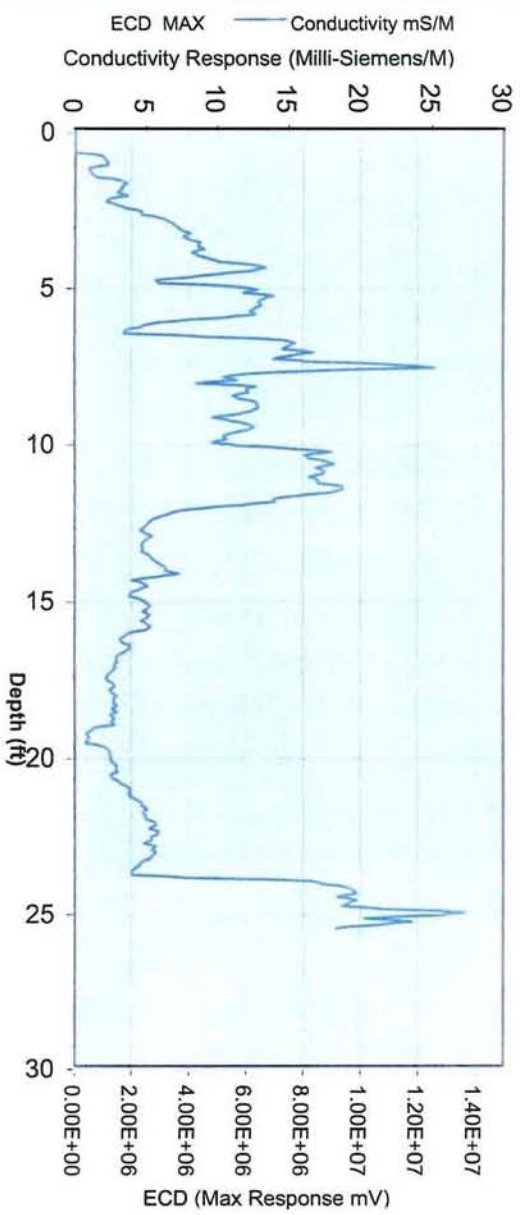
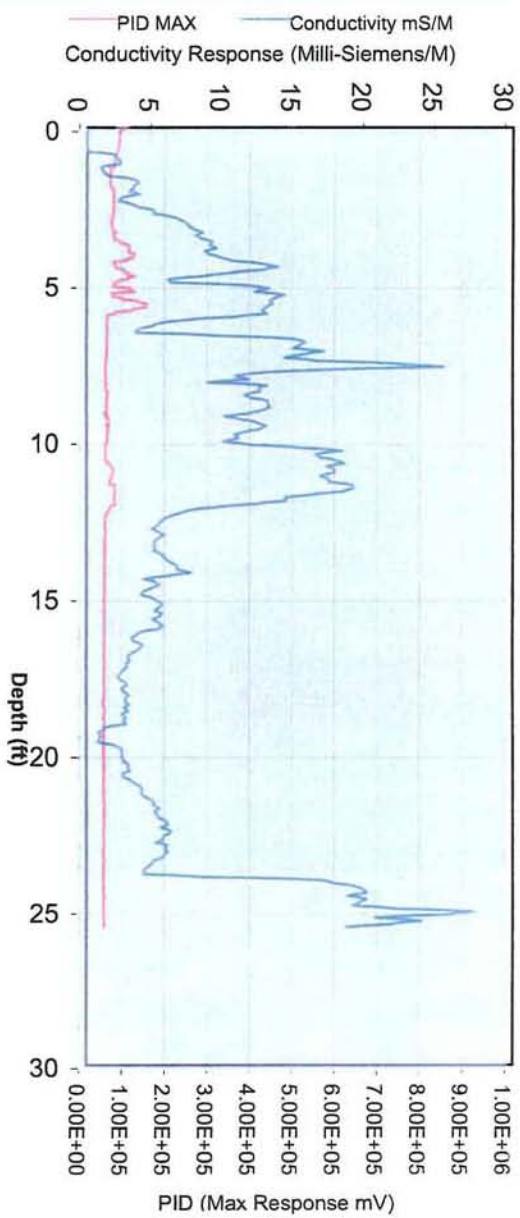
Boring Name: 43MIP23

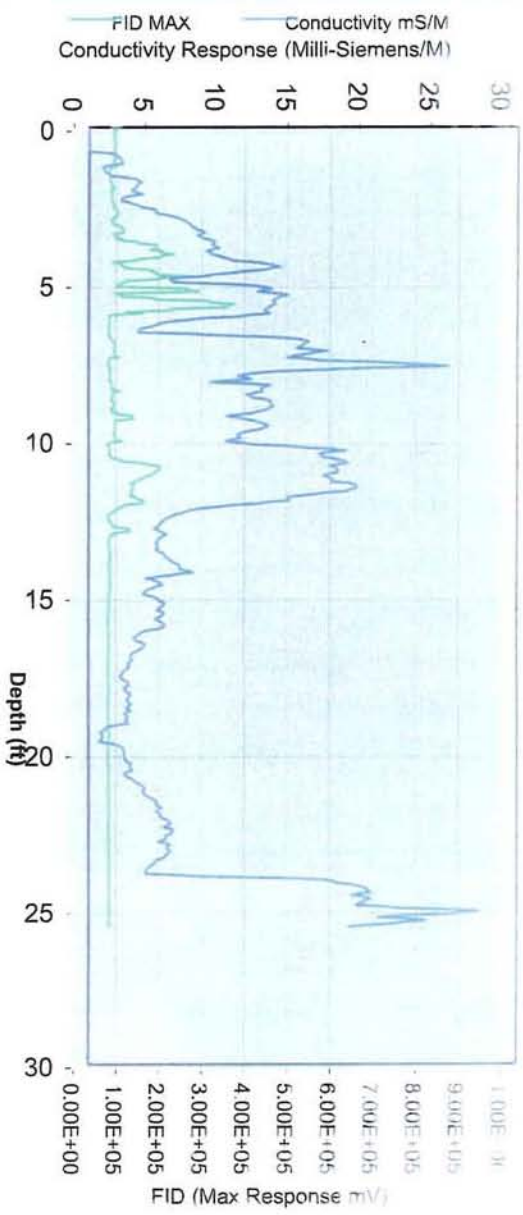
Total Depth (ft): 55

Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Fri Feb 20 2009 10:53
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Fri Feb 20 2009 11:19
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry







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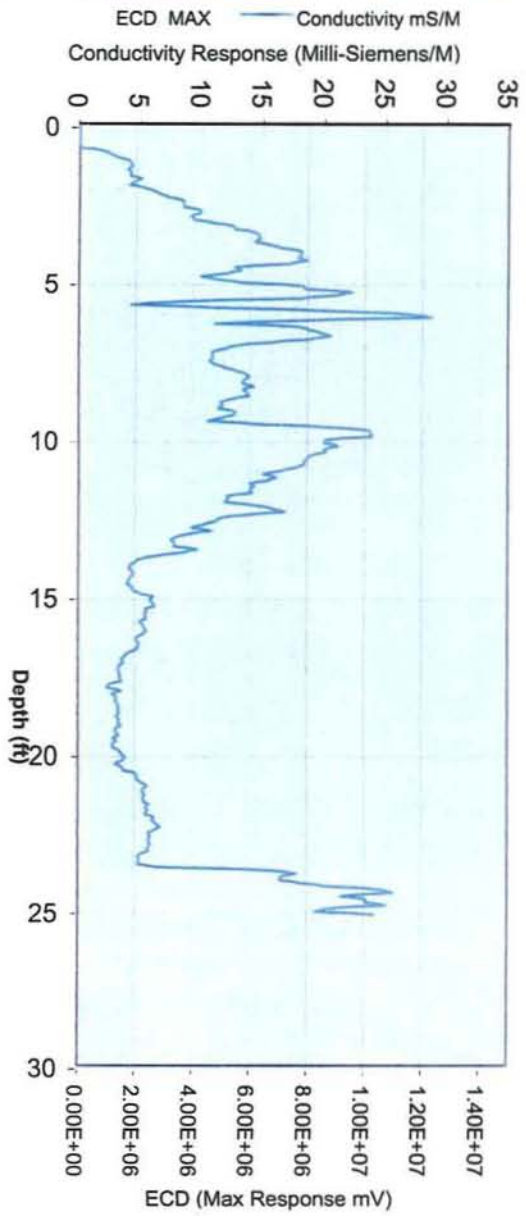
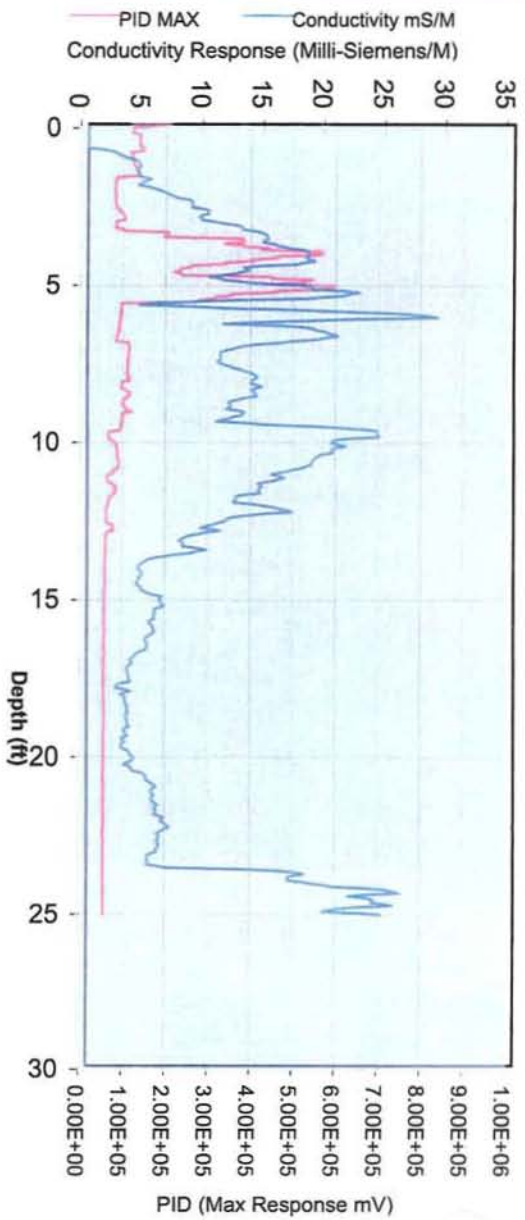
Boring Name: S43MIP24

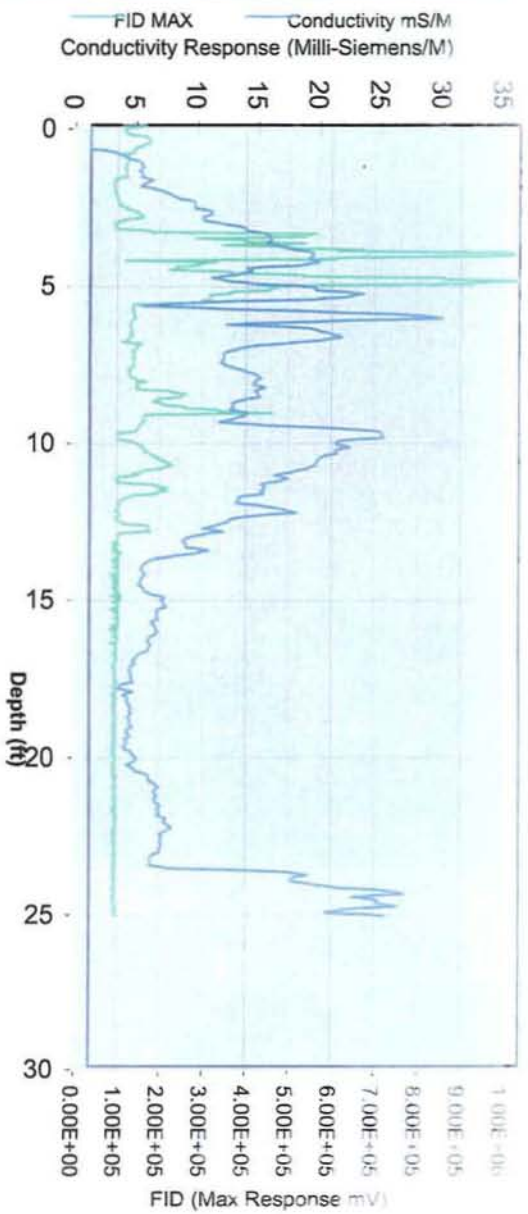
Total Depth (ft): 25.15

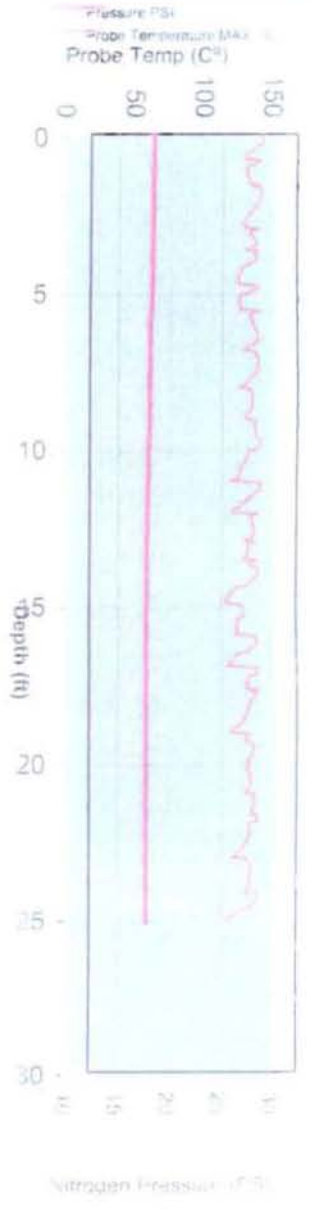
Notes:
None.

Job Information				MIP Sampling Information	
Client Company:	TetraTech	Trunkline Length:	150	Start Boring Time:	Fri Feb 20 2009 13:25
Project Name:	Site 43 Phase 1A SSP	Probe Type:	6520	End Boring Time:	Fri Feb 20 2009 13:52
Site Address:	Indian Head,MD	Rig Type:	Geoprobe 66DT	MIP Specialist:	Chuck Terry









APPENDIX D

ANALYTICAL DATA

Indian Head
Site 43
Surface Soils
Full Appendix Results

order	001	002	003	004	005	006	007	008
site	43	43	43	43	43	43	43	43
location	S43SB001	S43SB002-MW001	S43SB003	S43SB003	S43SB003	S43SB004	S43SB005	S43SB006-MW002
nsample	S43SS0010001	S43SS0020001	S43SS0030001	S43SS0030001-AVG	S43SS0030001-D	S43SS0040001	S43SS0050001	S43SS0060001
sample	S43SS0010001	S43SS0020001	S43SS0030001	S43SS0030001-AVG	S43SSDUP0001	S43SS0040001	S43SS0050001	S43SB0060001
matrix	SS	SS	SS	SS	SS	SS	SS	SS
sacode	NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
top_depth	0	0	0	0	0	0	1	1
bottom_dep	1	1	1	1	1	1	2	2
gis_date	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
sample_dat	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
Volatile Organics (ug/kg)								
1,1,1-TRICHLOROETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,1,2,2-TETRACHLOROETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,1,2-TRICHLOROETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,1,2-TRICHLOROTRIFLUOROETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,1-DICHLOROETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,1-DICHLOROETHENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,2,4-TRICHLOROBENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,2-DIBROMO-3-CHLOROPROPANE	15 UR	20 UR	13 UR	13 UR	13 UR	14 UR	10 UR	7 UR
1,2-DIBROMOETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,2-DICHLOROBENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,2-DICHLOROETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,2-DICHLOROPROPANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,3-DICHLOROBENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
1,4-DICHLOROBENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
2-BUTANONE	15 U	20 U	8 J	8 J	13 U	14 U	10 U	7 U
2-HEXANONE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
4-METHYL-2-PENTANONE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
ACETONE	15 U	20 U	31 J	39.5 J	48 J	12 J	25 J	16 J
BENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
BROMODICHLOROMETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
BROMOFORM	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
BROMOMETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CARBON DISULFIDE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	0.8 J
CARBON TETRACHLORIDE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CHLOROBENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CHLORODIBROMOMETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CHLOROETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CHLOROFORM	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CHLOROMETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CIS-1,2-DICHLOROETHENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CIS-1,3-DICHLOROPROPENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
CYCLOHEXANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
DICHLORODIFLUOROMETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
ETHYLBENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
ISOPROPYLBENZENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
METHYL ACETATE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
METHYL CYCLOHEXANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
METHYL TERT-BUTYL ETHER	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
METHYLENE CHLORIDE	8 B	210 J	130 J	66.5 J	6 B	130 J	6 B	9 B
STYRENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
TETRACHLOROETHENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U

from kss_sam.dbf
from kss_res.dbf
from kss_res.xls
from q:\sql_server\indian_head\upload

Indian Head
Site 43
Surface Soils
Full Appendix Results

order	001	002	003	004	005	006	007	008
site	43	43	43	43	43	43	43	43
location	S43SB001	S43SB002-MW001	S43SB003	S43SB003	S43SB003	S43SB004	S43SB005	S43SB006-MW002
nsample	S43SS0010001	S43SS0020001	S43SS0030001	S43SS0030001-AVG	S43SS0030001-D	S43SS0040001	S43SS0050001	S43SS0060001
sample	S43SS0010001	S43SS0020001	S43SS0030001	S43SS0030001-AVG	S43SSDUP0001	S43SS0040001	S43SS0050001	S43SB0060001
matrix	SS	SS	SS	SS	SS	SS	SS	SS
sacode	NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
top_depth	0	0	0	0	0	0	1	1
bottom_dep	1	1	1	1	1	1	2	2
gis_date	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
sample_dat	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
TOLUENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	0.8 J
TOTAL XYLENES	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
TRANS-1,2-DICHLOROETHENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
TRANS-1,3-DICHLOROPROPENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
TRICHLOROETHENE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
TRICHLOROFLUOROMETHANE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
VINYL CHLORIDE	15 U	20 U	13 U	13 U	13 U	14 U	10 U	7 U
Explosives (mg/kg)								
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.043 J	0.25 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROCELLULOSE	8 J	9 J	1.2 B	1.25 B	1.3 B	1.4 B	1.4 B	1 B
NITROGLYCERIN	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
NITROGUANIDINE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Inorganics (mg/kg)								
ALUMINUM	4410 J	7230 J	17000 J	17650 J	18300 J	18400 J	7190 J	3370 J
ANTIMONY	1.3 B	1.3 B	2.0 B	1.9 B	1.8 B	1.3 B	1.1 B	0.86 B
ARSENIC	4.3	5.3 K	5.7 K	4.8 K	3.9	3.8	5.2 K	4.6
BARIUM	25.9 J	64.0 J	165 J	311 J	457 J	112 J	37.8 J	15.1 J
BERYLLIUM	0.27	0.4	1.2	1.075	0.95	0.63	0.37	0.19
CADMIUM	0.95	0.82 K	0.35 K	0.24 K	0.13	0.22	0.20 K	0.16 K
CALCIUM	1610	1170	279	267.5	256	350	1140	20000
CHROMIUM	19.9 J	37.5 J	20.2 J	18.65 J	17.1 J	20.2 J	27.5 J	23.5 J
COBALT	7	19.3	1.7 L	2.05 L	2.4	3.2	5.7	4.1
COPPER	22.8 J	25.7 J	20.2 J	17.1 J	14.0 J	13.9 J	13.0 J	17.1 J
IRON	13500	23400	34600	25700	16800	16500	19700	12100
LEAD	91	42.3	22.9	21.3	19.7	15.8	9.5	5.5
MAGNESIUM	3860	765	469	502	535	675	369	11500
MANGANESE	228 J	813 J	9.9 J	9.9 J	9.9 J	15.9 J	156 J	102 J
MERCURY	0.05 U	0.05 U	0.062 K	0.062 K	0.063 U	0.34	0.051 U	0.043 U
NICKEL	38.8	12.6	5.1 L	6.25 L	7.4	7.1	6.6	7.7

from kss_sam.dbf
from kss_res.dbf
from kss_res.xls
from server\indian_head\upload

Indian Head
Site 43
Surface Soils
Full Appendix Results

order	001	002	003	004	005	006	007	008
site	43	43	43	43	43	43	43	43
location	S43SB001	S43SB002-MW001	S43SB003	S43SB003	S43SB003	S43SB004	S43SB005	S43SB006-MW002
nsample	S43SS0010001	S43SS0020001	S43SS0030001	S43SS0030001-AVG	S43SS0030001-D	S43SS0040001	S43SS0050001	S43SS0060001
sample	S43SS0010001	S43SS0020001	S43SS0030001	S43SS0030001-AVG	S43SSDUP0001	S43SS0040001	S43SS0050001	S43SB0060001
matrix	SS	SS	SS	SS	SS	SS	SS	SS
sacode	NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
top_depth	0	0	0	0	0	0	1	1
bottom_dep	1	1	1	1	1	1	2	2
gis_date	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
sample_dat	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
POTASSIUM	299	441	366 L	416 L	466	530	351	366
SELENIUM	0.56 UR	0.54 UR	0.62 UR	0.67 UR	0.72 UR	0.56 UR	0.52 UR	0.54 UR
SILVER	0.46 B	0.55 B	1.7 B	1.85 B	2.0 B	2.0 B	0.60 B	0.13 U
SODIUM	281	465	99.9 K	105.45 K	111	102	173	133
THALLIUM	0.38 U	0.36 U	0.41 U	0.645 U	0.88 B	0.38 U	0.34 U	0.36 U
VANADIUM	39.4	36	26.3	25.25	24.2	31	37.3	42
ZINC	70.8 K	58.4 K	14.5 K	15.35 K	16.2 K	19.4 K	13.2 K	9.7 K
Miscellaneous Parameters (mg/kg)								
CYANIDE	0.095 U	0.089 U	0.12 U	0.12 U	0.12 U	0.12 U	0.10 U	0.096 U

from kss_sam.dbf
from kss_res.dbf
from kss_res.xls
from q:\sql_server\indian_head\upload

Indian Head
Site 43
Subsurface Soils
Full Appendix Results

order	001	002	003	004	005	006	007	008
site	43	43	43	43	43	43	43	43
location	S43SB001	S43SB002-MW001	S43SB003	S43SB003	S43SB003	S43SB004	S43SB005	S43SB006-MW002
nsample	S43SB0010101	S43SB0020101	S43SB0030101	S43SB0030101-AVG	S43SB0030101-D	S43SB0040101	S43SB0050101	S43SB0060101
sample	S43SB0010101	S43SB0020101	S43SB0030101	S43SB0030101-AVG	S43SBDUP0101	S43SB0040101	S43SB0050101	S43SB0060101
matrix	SB	SB	SB	SB	SB	SB	SB	SB
sacode	NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
top_depth	1	1	1	1	1	1	2	2
bottom_dep	2	2	2	2	2	2	3	3
gis_date	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
sample_dat	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
Volatile Organics (ug/kg)								
1,1,1-TRICHLOROETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,1,2-TRICHLOROETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,1,2-TRICHLOROTRIFLUOROETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,1-DICHLOROETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,1-DICHLOROETHENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,2,4-TRICHLOROBENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,2-DIBROMO-3-CHLOROPROPANE	10 UR	12 UR	14 UR	13.5 UR	13 UR	14 UR	12 UR	10 UR
1,2-DIBROMOETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,2-DICHLOROBENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,2-DICHLOROETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,2-DICHLOROPROPANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,3-DICHLOROBENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
1,4-DICHLOROBENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
2-BUTANONE	10 U	12 U	9 J	7.5 J	6 J	7 J	8 J	10 U
2-HEXANONE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
4-METHYL-2-PENTANONE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
ACETONE	10 U	12 U	12 J	12.5 J	13 J	10 J	17 J	19 J
BENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
BROMODICHLOROMETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
BROMOFORM	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
BROMOMETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CARBON DISULFIDE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CARBON TETRACHLORIDE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CHLOROBENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CHLORODIBROMOMETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CHLOROETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CHLOROFORM	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CHLOROMETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CIS-1,2-DICHLOROETHENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
CYCLOHEXANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
DICHLORODIFLUOROMETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
ETHYLBENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
ISOPROPYLBENZENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
METHYL ACETATE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
METHYL CYCLOHEXANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
METHYL TERT-BUTYL ETHER	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
METHYLENE CHLORIDE	8 B	5 B	150 J	140 J	130 J	140 J	120 J	8 B
STYRENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
TETRACHLOROETHENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U

from ksb_sam.dbf
from ksb_res.dbf
from ksb_res.xls
from server\indian_head\upload

Indian Head
Site 43
Subsurface Soils
Full Appendix Results

order	001	002	003	004	005	006	007	008
site	43	43	43	43	43	43	43	43
location	S43SB001	S43SB002-MW001	S43SB003	S43SB003	S43SB003	S43SB004	S43SB005	S43SB006-MW002
nsample	S43SB0010101	S43SB0020101	S43SB0030101	S43SB0030101-AVG	S43SB0030101-D	S43SB0040101	S43SB0050101	S43SB0060101
sample	S43SB0010101	S43SB0020101	S43SB0030101	S43SB0030101-AVG	S43SBDUP0101	S43SB0040101	S43SB0050101	S43SB0060101
matrix	SB	SB	SB	SB	SB	SB	SB	SB
sacode	NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
top_depth	1	1	1	1	1	1	2	2
bottom_dep	2	2	2	2	2	2	3	3
gis_date	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
sample_dat	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
TOLUENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
TOTAL XYLENES	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
TRANS-1,2-DICHLOROETHENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
TRICHLOROETHENE	8 J	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
TRICHLOROFLUOROMETHANE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
VINYL CHLORIDE	10 U	12 U	14 U	13.5 U	13 U	14 U	12 U	10 U
Explosives (mg/kg)								
1,3,5-TRINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-DINITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-TRINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-AMINO-4,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-AMINO-2,6-DINITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-NITROTOLUENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROBENZENE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
NITROCELLULOSE	1.5 B	1.4 B	1.1 B	1.15 B	1.2 B	1.5 B	1.5 B	1.5 B
NITROGLYCERIN	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
NITROGUANIDINE	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
RDX	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
TETRYL	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Inorganics (mg/kg)								
ALUMINUM	3490 J	3380 J	16200 J	16500 J	16800 J	16200 J	18300 J	18500 J
ANTIMONY	0.74 B	1.1 B	1.7 B	1.8 B	1.9 B	1.9 B	1.2 B	1.6 B
ARSENIC	3.6	2.7	11.3 K	12.4 K	13.5 K	8.5	2.6	3
BARIUM	20.4	29.5	93.4	92.9	92.4	106	133	134
BERYLLIUM	0.26	1.6	1.2	1.2	1.2	1.1	0.88	0.91
CADMIUM	0.16	0.4	0.41 K	0.405 K	0.40 K	0.16	0.058	0.1
CALCIUM	176	1280	143	168.5	194	116	296	131
CHROMIUM	18.2 J	17.3 J	18.5 J	20.3 J	22.1 J	16.7 J	17.1 J	17.0 J
COBALT	3.5	4.6	3	3	3	4.9	3.8	2.8
COPPER	9.7	21.9	16.8	17.25	17.7	14.8	12	11.6
IRON	14100	18700	41200	41350	41500	19200	8550	13400
LEAD	6.1	7.7	15.6	16.2	16.8	17	18.5	17.2
MAGNESIUM	196	777	586	611.5	637	607	629	579
MANGANESE	110 J	227 J	10.9 J	11.6 J	12.3 J	10.2 J	29.9 J	43.4 J
MERCURY	0.045 U	0.048 U	0.056 U	0.058 U	0.06 U	0.065 U	0.056 U	0.049 U
NICKEL	7	5.5	7.5 L	7.7 L	7.9 L	9.7	8.2	7.4

from ksb_sam.dbf
from ksb_res.dbf
from ksb_res.xls
from q:\sql_server\indian_head\upload

Indian Head
Site 43
Subsurface Soils
Full Appendix Results

order	001	002	003	004	005	006	007	008
site	43	43	43	43	43	43	43	43
location	S43SB001	S43SB002-MW001	S43SB003	S43SB003	S43SB003	S43SB004	S43SB005	S43SB006-MW002
nsample	S43SB0010101	S43SB0020101	S43SB0030101	S43SB0030101-AVG	S43SB0030101-D	S43SB0040101	S43SB0050101	S43SB0060101
sample	S43SB0010101	S43SB0020101	S43SB0030101	S43SB0030101-AVG	S43SBDUP0101	S43SB0040101	S43SB0050101	S43SB0060101
matrix	SB	SB	SB	SB	SB	SB	SB	SB
sacode	NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
top_depth	1	1	1	1	1	1	2	2
bottom_dep	2	2	2	2	2	2	3	3
gis_date	20050714	20050714	20050714	20050714	20050714	20050714	20050714	20050714
sample_dat	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05	07/14/05
validated	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**
POTASSIUM	311	380	420 L	462 L	504 L	408	357	412
SELENIUM	0.49 UR	0.58 UR	0.60 UR	0.635 UR	0.67 UR	0.71 UR	0.65 UR	0.64 UR
SILVER	0.31 B	0.14 U	1.5 B	1.55 B	1.6 B	1.8 B	2.0 B	2.0 B
SODIUM	288	265	128 K	128.5 K	129 K	263	344	260
THALLIUM	0.33 U	0.39 U	0.40 U	0.425 U	0.45 U	0.48 U	0.43 U	0.61 B
VANADIUM	16.2	25.3	49.2	52.5	55.8	38.7	18.3	22.2
ZINC	23.1 K	13.1 K	16.7 K	17.7 K	18.7 K	22.6 K	20.5 K	15.2 K
Miscellaneous Parameters (mg/kg)								
CYANIDE	1.4	0.097 U	0.13 U	0.125 U	0.12 U	0.12 U	0.11 U	0.21

from ksb_sam.dbf
from ksb_res.dbf
from ksb_res.xls
from server\indian_head\upload

Indian Head
Site 43
Groundwaters
Full Appendix Results

order	001	002	003	004
site	43	43	43	43
location	S43SB002-MW001	S43SB002-MW001	S43SB002-MW001	S43SB006-MW002
nsample	S43MW0010101	S43MW0010101-AVG	S43MW0010101-D	S43MW0020101
sample	S43MW0010101	S43MW0010101-AVG	S43MWDUP0101	S43MW0020101
matrix	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL
top_depth	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999
gis_date	20050725	20050725	20050725	20050727
sample_dat	07/25/05	07/25/05	07/25/05	07/27/05
validated	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**
Volatile Organics (ug/L)				
1,1,1-TRICHLOROETHANE	500 U	500 U	500 U	0.51
1,1,2,2-TETRACHLOROETHANE	500 U	500 U	500 U	0.5 U
1,1,2-TRICHLOROETHANE	500 U	500 U	500 U	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	500 U	500 U	500 U	0.5 U
1,1-DICHLOROETHANE	500 U	500 U	500 U	2.7
1,1-DICHLOROETHENE	500 U	500 U	500 U	1.1
1,2,3-TRICHLOROBENZENE	500 U	500 U	500 U	0.5 U
1,2,4-TRICHLOROBENZENE	500 U	500 U	500 U	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	500 U	500 U	500 U	0.5 U
1,2-DIBROMOETHANE	500 U	500 U	500 U	0.5 U
1,2-DICHLOROBENZENE	500 U	500 U	500 U	0.5 U
1,2-DICHLOROETHANE	500 U	500 U	500 U	0.5 U
1,2-DICHLOROPROPANE	500 U	500 UJ	500 UJ	0.5 U
1,3-DICHLOROBENZENE	500 U	500 U	500 U	0.5 U
1,4-DICHLOROBENZENE	500 U	500 U	500 U	0.5 U
2-BUTANONE	5000 U	5000 U	5000 U	5 U
2-HEXANONE	5000 U	5000 U	5000 U	5 U
4-METHYL-2-PENTANONE	5000 U	5000 U	5000 U	5 U
ACETONE	5000 U	5000 U	5000 U	5 U
BENZENE	500 U	500 U	500 U	0.5 U
BROMOCHLOROMETHANE	500 U	500 U	500 U	0.5 U
BROMODICHLOROMETHANE	500 U	500 UJ	500 UJ	0.5 U
BROMOFORM	500 U	500 U	500 U	0.5 U
BROMOMETHANE	500 U	500 U	500 U	0.5 U
CARBON DISULFIDE	500 U	500 U	500 U	0.5 U
CARBON TETRACHLORIDE	500 U	500 U	500 U	0.5 U
CHLOROBENZENE	500 U	500 U	500 U	0.5 U
CHLORODIBROMOMETHANE	500 U	500 U	500 U	0.5 U
CHLOROETHANE	500 U	500 U	500 U	0.5 U
CHLOROFORM	500 U	500 U	500 U	0.5 U
CHLOROMETHANE	500 U	500 U	500 U	0.5 U
CIS-1,2-DICHLOROETHENE	580	530 J	480 J	0.5 U
CIS-1,3-DICHLOROPROPENE	500 U	500 U	500 U	0.5 U
CYCLOHEXANE	500 U	500 UJ	500 UJ	0.5 U
DICHLORODIFLUOROMETHANE	500 U	500 U	500 U	0.5 U
ETHYLBENZENE	500 U	500 U	500 U	0.5 U
ISOPROPYLBENZENE	500 U	500 U	500 U	0.5 U
METHYL ACETATE	500 U	500 U	500 U	0.5 U
METHYL CYCLOHEXANE	500 U	500 UJ	500 UJ	0.5 U
METHYL TERT-BUTYL ETHER	500 U	500 U	500 U	0.5 U
METHYLENE CHLORIDE	500 U	615 U	730 B	0.5 U
STYRENE	500 U	500 U	500 U	0.5 U
TETRACHLOROETHENE	500 U	500 U	500 U	0.5 U
TOLUENE	500 U	500 U	500 U	0.5 U
TOTAL XYLENES	500 U	500 U	500 U	0.5 U
TRANS-1,2-DICHLOROETHENE	500 U	500 U	500 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	500 U	500 U	500 U	0.5 U
TRICHLOROETHENE	53000 J	54000 J	55000 J	1.3 J
TRICHLOROFLUOROMETHANE	500 U	500 U	500 U	0.5 U
VINYL CHLORIDE	500 U	500 U	500 U	0.5 U
Explosives (ug/L)				
1,3,5-TRINITROBENZENE	0.1 U	0.1 U	0.1 U	0.1 U
1,3-DINITROBENZENE	0.1 U	0.1 U	0.1 U	0.1 U
2,4,6-TRINITROTOLUENE	0.1 U	0.1 U	0.1 U	0.1 U
2,4-DINITROTOLUENE	0.1 U	0.1 U	0.1 U	0.1 U
2,6-DINITROTOLUENE	0.1 U	0.1 U	0.1 U	0.1 U
2-AMINO-4,6-DINITROTOLUENE	0.1 U	0.1 U	0.1 U	0.1 U
2-NITROTOLUENE	0.5 U	0.5 U	0.5 U	0.5 U
3-NITROTOLUENE	0.5 U	0.5 U	0.5 U	0.5 U
4-AMINO-2,6-DINITROTOLUENE	0.1 U	0.1 U	0.1 U	0.1 U
4-NITROTOLUENE	0.5 U	0.5 U	0.5 U	0.5 U
HMX	0.1 U	0.1 U	0.1 U	3.4
NITROBENZENE	0.1 U	0.1 U	0.1 U	0.1 U

from kgw_sam.dbf
from kgw_res.dbf
from kgw_res.xls
from q:\sql_server\indian_head\upload

Indian Head
Site 43
Groundwaters
Full Appendix Results

order	001	002	003	004
site	43	43	43	43
location	S43SB002-MW001	S43SB002-MW001	S43SB002-MW001	S43SB006-MW002
nsample	S43MW0010101	S43MW0010101-AVG	S43MW0010101-D	S43MW0020101
sample	S43MW0010101	S43MW0010101-AVG	S43MWDUP0101	S43MW0020101
matrix	GW	GW	GW	GW
sacode	ORIG	AVG	DUP	NORMAL
top_depth	-9999	-9999	-9999	-9999
bottom_dep	-9999	-9999	-9999	-9999
gis_date	20050725	20050725	20050725	20050727
sample_dat	07/25/05	07/25/05	07/25/05	07/27/05
validated	Y	Y	Y	Y
cto_proj	2193	2193	2193	2193
proj_manag	TURNBULL,K	TURNBULL,K	TURNBULL,K	TURNBULL,K
sort	**c_001**	**c_002**	**c_003**	**c_004**
NITROCELLULOSE	500 U	310 U	120 B	500 U
NITROGLYCERIN	0.65 U	0.65 U	0.65 U	0.65 U
NITROGUANIDINE	20 U	20 U	20 U	20 U
RDX	0.17	0.195	0.22	0.11
TETRYL	0.1 U	0.1 U	0.1 U	0.1 U
Inorganics (ug/L)				
ALUMINUM	134 B	110	153	215
ANTIMONY	2.0 L	1.5 L	2.0 UL	2.1 L
ARSENIC	2.0 UL	2 UL	2.0 UL	2.0 UL
BARIUM	203	200	197	354
BERYLLIUM	0.69	0.675	0.66	4.6
CADMIUM	0.3	0.28	0.26	0.61
CALCIUM	3890	3825	3760	3450
CHROMIUM	0.71	0.65	0.59	0.50 U
COBALT	35.2	34.7	34.2	96.4
COPPER	9.3 B	7.6 B	5.9 B	8.2 B
CYANIDE	2.0 U	2 U	2.0 U	2.0 U
IRON	4230	4130	4030	37.3 B
LEAD	2.8 K	2.5 K	2.2 K	0.90 U
MAGNESIUM	2340	2305	2270	4640
MANGANESE	306	301	296	270
MERCURY	0.13 U	0.13 U	0.13 U	0.13 U
NICKEL	40.6 J	40.05 J	39.5 J	78.3 J
POTASSIUM	1660	1670	1680	1690
SELENIUM	3.0 U	3 U	3.0 U	3.0 U
SILVER	0.70 U	0.7 U	0.70 U	0.70 U
SODIUM	40100	39600	39100	60500
THALLIUM	3.7 B	3.2 B	2.7 B	2.0 U
VANADIUM	0.49	0.605	0.72	0.40 U
ZINC	51.9 J	50.9 J	49.9 J	134 J

from kgw_sam.dbf
from kgw_res.dbf
from kgw_res.xls
from q:\sql_server\indian_head\upload

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43FB0010102	nsample	S43FB0010102	nsample	S43MW0010102
samp_date	11/11/2007	samp_date	11/11/2007	samp_date	11/11/2007
lab_id	F1663-10A	lab_id	F1663-10A	lab_id	F1663-07A
qc_type	NM	qc_type	NM	qc_type	NM
units	UG/L	units	UG/L	units	UG/L
Pct_Solids		Pct_Solids		Pct_Solids	
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	18.0		
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	1.6		
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	UJ	C
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.32	J	CP
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.32	J	P
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	
1,1,1-TRICHLOROETHANE	800	U	
1,1,2,2-TETRACHLOROETHANE	800	U	
1,1,2-TRICHLOROETHANE	800	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	800	U	
1,1-DICHLOROETHANE	800	U	
1,1-DICHLOROETHENE	800	U	
1,2,3-TRICHLOROBENZENE	800	U	
1,2,4-TRICHLOROBENZENE	800	U	
1,2-DIBROMO-3-CHLOROPROPANE	800	U	
1,2-DIBROMOETHANE	800	U	
1,2-DICHLOROBENZENE	800	U	
1,2-DICHLOROETHANE	800	U	
1,2-DICHLOROPROPANE	800	U	
1,3-DICHLOROBENZENE	800	U	
1,4-DICHLOROBENZENE	800	U	
2-BUTANONE	8000	U	
2-HEXANONE	8000	U	
4-METHYL-2-PENTANONE	8000	U	
ACETONE	8000	U	
BENZENE	800	U	
BROMOCHLOROMETHANE	800	U	
BROMODICHLOROMETHANE	800	U	
BROMOFORM	800	U	
BROMOMETHANE	800	U	
CARBON DISULFIDE	800	U	
CARBON TETRACHLORIDE	800	U	
CHLOROBENZENE	800	U	
CHLORODIBROMOMETHANE	800	U	
CHLOROETHANE	800	U	
CHLOROFORM	800	U	
CHLOROMETHANE	800	U	
CIS-1,2-DICHLOROETHENE	800	U	

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43MW0010102	nsample	S43MW0020102	nsample	S43MW0020102
samp_date	11/11/2007	samp_date	11/11/2007	samp_date	11/11/2007
lab_id	F1663-07A	lab_id	F1663-09A	lab_id	F1663-09A
qc_type	NM	qc_type	NM	qc_type	NM
units	UG/L	units	UG/L	units	UG/L
Pct_Solids		Pct_Solids		Pct_Solids	
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	800	U	
CYCLOHEXANE	800	U	
DICHLORODIFLUOROMETHANE	800	UR	C
ETHYLBENZENE	800	U	
ISOPROPYLBENZENE	800	U	
METHYL ACETATE	800	UJ	C
METHYL CYCLOHEXANE	800	U	
METHYL TERT-BUTYL ETHER	800	U	
METHYLENE CHLORIDE	800	U	
STYRENE	800	U	
TETRACHLOROETHENE	800	U	
TOLUENE	800	U	
TOTAL XYLENES	800	U	
TRANS-1,2-DICHLOROETHENE	800	U	
TRANS-1,3-DICHLOROPROPENE	800	U	
TRICHLOROETHENE	36000		
TRICHLOROFLUOROMETHANE	800	U	
VINYL CHLORIDE	800	U	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	1.3		
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	15		
1,1-DICHLOROETHENE	3.9		
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	UJ	C
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.5	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	3.2		
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43MWDUP0102	nsample	S43MWDUP0102	nsample	S43RB0010102
samp_date	11/11/2007	samp_date	11/11/2007	samp_date	11/11/2007
lab_id	F1663-08A	lab_id	F1663-08A	lab_id	F1663-11A
qc_type	NM	qc_type	NM	qc_type	NM
units	UG/L	units	UG/L	units	UG/L
Pct_Solids		Pct_Solids		Pct_Solids	
DUP_OF:	S43MW0010102	DUP_OF:	S43MW0010102	DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	800	U	
1,1,2,2-TETRACHLOROETHANE	800	U	
1,1,2-TRICHLOROETHANE	800	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	800	U	
1,1-DICHLOROETHANE	800	U	
1,1-DICHLOROETHENE	800	U	
1,2,3-TRICHLOROBENZENE	800	U	
1,2,4-TRICHLOROBENZENE	800	U	
1,2-DIBROMO-3-CHLOROPROPANE	800	U	
1,2-DIBROMOETHANE	800	U	
1,2-DICHLOROBENZENE	800	U	
1,2-DICHLOROETHANE	800	U	
1,2-DICHLOROPROPANE	800	U	
1,3-DICHLOROBENZENE	800	U	
1,4-DICHLOROBENZENE	800	U	
2-BUTANONE	8000	U	
2-HEXANONE	8000	U	
4-METHYL-2-PENTANONE	8000	U	
ACETONE	8000	U	
BENZENE	800	U	
BROMOCHLOROMETHANE	800	U	
BROMODICHLOROMETHANE	800	U	
BROMOFORM	960		
BROMOMETHANE	800	U	
CARBON DISULFIDE	800	U	
CARBON TETRACHLORIDE	800	U	
CHLOROBENZENE	800	U	
CHLORODIBROMOMETHANE	800	U	
CHLOROETHANE	800	U	
CHLOROFORM	800	U	
CHLOROMETHANE	800	U	
CIS-1,2-DICHLOROETHENE	800	U	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	800	U	
CYCLOHEXANE	800	U	
DICHLORODIFLUOROMETHANE	800	UR	C
ETHYLBENZENE	800	U	
ISOPROPYLBENZENE	800	U	
METHYL ACETATE	800	UJ	C
METHYL CYCLOHEXANE	800	U	
METHYL TERT-BUTYL ETHER	800	U	
METHYLENE CHLORIDE	800	U	
STYRENE	800	U	
TETRACHLOROETHENE	800	U	
TOLUENE	800	U	
TOTAL XYLENES	800	U	
TRANS-1,2-DICHLOROETHENE	800	U	
TRANS-1,3-DICHLOROPROPENE	800	U	
TRICHLOROETHENE	36000		
TRICHLOROFLUOROMETHANE	800	U	
VINYL CHLORIDE	800	U	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	20.0		
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	1.6		
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43RB0010102
samp_date	11/11/2007
lab_id	F1663-11A
qc_type	NM
units	UG/L
Pct_Solids	
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	UJ	C
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.32	J	CP
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.31	J	P
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

nsample	S43TB0010102
samp_date	11/10/2007
lab_id	F1663-01A
qc_type	NM
units	UG/L
Pct_Solids	
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	UL	R

nsample	S43TB0010102
samp_date	11/10/2007
lab_id	F1663-01A
qc_type	NM
units	UG/L
Pct_Solids	
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	U	
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.5	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	UL	R
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43TW0010102	nsample	S43TW0010102	nsample	S43TW0020102
samp_date	11/10/2007	samp_date	11/10/2007	samp_date	11/10/2007
lab_id	F1663-02A	lab_id	F1663-02A	lab_id	F1663-03A
qc_type	NM	qc_type	NM	qc_type	NM
units	UG/L	units	UG/L	units	UG/L
Pct_Solids		Pct_Solids		Pct_Solids	
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.36	J	P

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	U	
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.5	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	3.2		
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43TW0020102	nsample	S43TW0030102	nsample	S43TW0030102
samp_date	11/10/2007	samp_date	11/11/2007	samp_date	11/11/2007
lab_id	F1663-03A	lab_id	F1663-04A	lab_id	F1663-04A
qc_type	NM	qc_type	NM	qc_type	NM
units	UG/L	units	UG/L	units	UG/L
Pct_Solids		Pct_Solids		Pct_Solids	
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	U	
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.5	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	4.2	J	P
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	17.0		
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	U	
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.5	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43TW0040102	nsample	S43TW0040102	nsample	S43TW0050102
samp_date	11/10/2007	samp_date	11/10/2007	samp_date	11/10/2007
lab_id	F1663-05A	lab_id	F1663-05A	lab_id	F1663-06A
qc_type	NM	qc_type	NM	qc_type	NM
units	UG/L	units	UG/L	units	UG/L
Pct_Solids		Pct_Solids		Pct_Solids	
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	U	
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.5	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

Parameter	Result	Val Qual	Qual Code
1,1,1-TRICHLOROETHANE	0.5	U	
1,1,2,2-TETRACHLOROETHANE	0.5	U	
1,1,2-TRICHLOROETHANE	0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5	U	
1,1-DICHLOROETHANE	0.5	U	
1,1-DICHLOROETHENE	0.5	U	
1,2,3-TRICHLOROBENZENE	0.5	U	
1,2,4-TRICHLOROBENZENE	0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE	0.5	U	
1,2-DIBROMOETHANE	0.5	U	
1,2-DICHLOROBENZENE	0.5	U	
1,2-DICHLOROETHANE	0.5	U	
1,2-DICHLOROPROPANE	0.5	U	
1,3-DICHLOROBENZENE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
2-BUTANONE	5	U	
2-HEXANONE	5	U	
4-METHYL-2-PENTANONE	5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMOCHLOROMETHANE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	0.5	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	0.5	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	

PROJ_NO: 00771

SDG: F1663 MEDIA: WATER DATA FRACTION: OV

nsample	S43TW0050102
samp_date	11/10/2007
lab_id	F1663-06A
qc_type	NM
units	UG/L
Pct_Solids	
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
CIS-1,3-DICHLOROPROPENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	0.5	UR	C
ETHYLBENZENE	0.5	U	
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	0.5	U	
METHYL CYCLOHEXANE	0.5	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.5	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	0.5	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRANS-1,3-DICHLOROPROPENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	0.5	U	
VINYL CHLORIDE	0.5	U	

APPENDIX E

DATA VALIDATION MEMORANDA

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: K. TURNBULL **DATE:** OCTOBER 14, 2005

FROM: BERNARD F SPADA III **COPIES:** DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOC/EXP
CTO 006, NDW INDIAN HEAD
SDG D0836

SAMPLES: 2/Aqueous

S43RB0010001	S43TB0010001*

14/Soil

S43SB0010101	S43SB0020101	S43SB0030101
S43SB0040101	S43SB0050101	S43SB0060101
S43SBDUP0101	S43SS0010001	S43SS0020001
S43SS0030001	S43SS0040001	S43SS0050001
S43SS0060001	S43SSDUP0001	

Overview

The sample set for CTO 006, NDW INDIAN HEAD, SDG D0836 consists of twelve (12) environmental soil samples, one (1) trip blank, one (1) rinse blank, and two (2) field duplicates. The trip blank sample denoted with an asterisk (*) was analyzed for volatile organic compounds (VOC) only. All remaining samples were analyzed for VOC and explosives (EXP). The field duplicate pairs included in this SDG are (S43SBDUP0101 / S43SB0030101) and (S43SSDUP0001 / S43SS0030001).

The samples were collected by Tetra Tech NUS on July 14and 15, 2005 and analyzed by Laucks Testing Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using OLC03.2, OLM04.3, SW-846 8330, and EPA 353.2 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GCMS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, field duplicate precision, and detection limits. Areas of concern are listed below.

Major

- The soil VOC initial calibration performed on July 14, 2005 and all continuing calibrations were below the 0.05 relative response factor (RRF) quality control criterion for 1,2-dibromo-3-chloropropane. Non-detected results for 1,2-dibromo-3-chloropropane were rejected (UR) in all soil samples.

Minor

- Positive results below the detection limit but above the method detection limit were qualified as estimated (J) due to uncertainty near detection limit.

- The field duplicate pair S43SSDUP0001 and S43SS0030001 exceeded the 50% relative percent difference (RPD) quality control criteria for methylene chloride. The positive result for methylene chloride was qualified as estimated (J) in sample S43SS0030001. No action was taken for sample S43SSDUP0001 on this basis because the result was qualified for method blank contamination. The imprecision present suggests that methylene chloride concentration in S43SS0030001 is a laboratory contaminant.

- The aqueous volatile continuing calibration performed on July 20 at 10:11 exceeded the 30% relative standard deviation (RSD) quality control criteria (and was >50%) for total-xylenes. Non-detected results for total-xylenes were qualified as estimated (UJ) in samples S43RB0010001 and S43TB0010001.

- The soil volatile initial calibration performed on July 14, 2005 exceeded the 30% RSD quality control criteria (but was <50%) for acetone. Positive results for acetone were qualified as estimated (J) in samples S43SB0030101, S43SB0040101, S43SB0050101, S43SB0060001, S43SB0060101, S43SBDUP0101, S43SS0030001, S43SS0040001, S43SS0050001, and 42SSDUP0001.

- The soil volatile continuing calibration performed on July 19 at 10:52 exceeded the 25% difference quality control criteria (but was <50%) for acetone, methyl aceatate, 2-butanone, cyclohexane, 4-methyl-2-pentanone, and 2-hexanone. Positive results for acetone and 2-butanone were qualified as estimated (J) in samples S43SB0030101, S43SB0040101, S43SB0050101, S43SB0060001, S43SB0060101, S43SS0030001, S43SS0040001, and S43SS0050001. No action was taken on this basis for non-detected results.

- The following compounds were detected in the aqueous method blank:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	2.6 ug/L	26 ug/L
Nitrocellulose	0.16 mg/L	0.8 mg/L

Sample aliquot and dilution factors were taken into consideration when applying the blank action levels. No action was taken on this basis because field blanks were not qualified for method blank contamination.

- The following compounds were detected in the soil method blanks:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	3.0 ug/kg	30 ug/kg
Nitrocellulose	1.3 ug/kg	6.5 ug/kg

Sample aliquot, percent solids, and dilution factors were taken into consideration when applying the blank action levels. Positive results for methylene chloride and nitrocellulose below the action level were qualified as non-detected (B).

- Although acetone was not detected in the method blanks, it is a suspected laboratory contaminant. Positive results for acetone were qualified as estimated (J) in all samples. In addition, positive results for methylene chloride above the action level were qualified as estimated (J) because they are also suspected laboratory contaminants.

- The VOC deuterated monitoring compound trans-1,3-dichloropropene-d4 was below the percent recovery quality control criterion in samples S43RB0010001 and S43TB0010001. Non-detected results for cis-1,3-dichloropropene, trans-1,3-dichloropropene, and 1,1,2-trichloroethane were qualified as estimated (UJ) in samples S43RB0010001 and S43TB0010001.

- All nitrocellulose samples were extracted outside of holding time. No action was taken for non-detected results on this basis because they were qualified for method blank contamination. Positive results for nitrocellulose were qualified as estimated (J) in samples S43SS0010001 and S43SS0020001.

- The positive results for 1,3-dinitrobenzene and 2,4-dinitrotoluene were qualified as estimated (J) due to exceeding the 25% difference between analytical columns quality control criterion.

Notes

The laboratory did not submit raw data for the explosives analyses. On August 31 the laboratory was requested to submit the raw data for all explosives analyses. The laboratory re-submitted the explosives analyses including the raw data on October 10.

The aqueous volatile initial calibration performed on July 19, 2005 exceeded the 30% relative standard deviation (RSD) quality control criteria (but was <50%) for methylene chloride and 1,2,3-trichlorobenzene. No action was taken on this basis because all results for the aforementioned compounds were non-detected.

The soil volatile continuing calibration performed on July 20 at 10:13 exceeded the 25% difference quality control criterion (but was <50%) for trichlorofluoromethane. No action was taken on this basis because all results for trichlorofluoromethane were non-detected.

The percent recovery of nitroguanidine was below the laboratory's quality control criterion in the MS/MSD performed on sample S43SB0020101. No action was taken for MS/MSD non-compliance alone.

Sample ID S43SS0060001 was incorrectly written on the COCs as S43SB0060001. The reviewer amended the Form Is and the database.

Executive Summary

Laboratory Performance: Qualifications were made based on calibration non-compliances, %D between analytical columns, holding time non-compliances, and method blank contamination. Submission of explosives data was extremely late.

Other Factors Affecting Data Quality: Qualifications were made based on MS/MSD imprecision.

The data for these analyses were reviewed with reference to U.S. EPA National Functional Guidelines for Data Validation as modified by EPA Region III (9/94), National Functional Guidelines for Low Concentration Organics (June 2001), and the NFESC guidelines entitled Navy IRCDQM (Sept. 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Bernard F Spada III
Chemist/Data Validator

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: K. TURNBULL **DATE:** OCTOBER 4, 2005

FROM: ERIN M. FAUST **COPIES:** DV FILE

SUBJECT: INORGANIC DATA VALIDATION – TAL METALS AND CYANIDE
CTO 006 NDW INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – D0836

SAMPLES: 14/Soil/

S43SB0010101	S43SB0020101	S43SB0030101
S43SB0040101	S43SB0050101	S43SB0060101
S43SBDUP0101	S43SS0010001	S43SS0020001
S43SS0030001	S43SS0040001	S43SS0050001
S43SS0060001	S43SSDUP0001	

1/Aqueous/

S43RB0010001

Overview

The sample set for NDW Indian Head, CTO 006, SDG D0836, consists of fourteen (14) soil environmental samples and one (1) aqueous rinsate blank. Two (2) field duplicate pairs (S43SBDUP0101 / S43SB0030101 and S43SSDUP0001 / S43SS0030001) are included within this SDG.

All samples were analyzed for target analyte list (TAL) metals and cyanide. The samples were collected on July 14 and 15, 2005 and analyzed by Mitkem Corporation under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) method ILM04.1.

Summary

All analytes, with the exception of selenium, were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory duplicate results, post digestion spike results, laboratory control sample (LCS) results, field duplicate results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) instrumentation. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA) instrumentation.

Areas of concern with respect to data quality are listed below.

Major Problems

- The matrix spike (MS) percent recovery for selenium (0%) was < 30% quality control limit, affecting all soil samples. The nondetected results reported for selenium were qualified as unusable, "UR", due to severe MS noncompliance.

Minor Problems

- The Contract Required Detection Limit (CRDL) percent recovery for mercury was > 120% quality control limit, affecting all samples. The positive result, less than two times the CRDL, reported for mercury in sample S43SS0030001 was qualified as biased high, "K".

- The CRDL percent recovery for antimony was < 90% quality control limit, affecting all samples. The nondetected result reported for antimony in sample S43RB0010001 was qualified as biased low, "UL". No validation action was required for the remaining antimony results because they were qualified "B" as a result of laboratory blank contamination.

- The CRDL percent recovery for arsenic was < 90% quality control limit, affecting samples S43RB0010001 and S43SS0040001. The nondetected result reported for arsenic in sample S43RB0010001 was qualified as biased low, "UL". No validation action was necessary for the arsenic result in sample S43SS0040001 because it was greater than two times the CRDL.

- The CRDL percent recovery for selenium was > 110% quality control limit, affecting samples S43RB0010001 and S43SS0040001. The nondetected result reported for selenium in sample S43RB0010001 was qualified as biased low, "UL". No validation action was necessary for the selenium result in sample S43SS0040001 because it was qualified as unusable, "UR", due to severe MS noncompliance.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Aluminum[(1)]	7.415 mg/kg	37.075 mg/kg
Antimony	2.2 µg/L	2.2 mg/kg
Barium[(1)]	0.141 mg/kg	0.705 mg/kg
Calcium[(1)]	17.644 mg/kg	88.22 mg/kg
Copper	3.3 µg/L	3.3 mg/kg
Iron[(1)]	2.811 mg/kg	14.055 mg/kg
Magnesium	12.1 µg/L	12.1 mg/kg
Manganese[(1)]	0.209 mg/kg	1.045 mg/kg
Potassium	75.8 µg/L	75.8 mg/kg
Silver	4.7 µg/L	4.7 mg/kg
Sodium	32.8 µg/L	32.8 mg/kg
Thallium	3.0 µg/L	3.0 mg/kg
Vanadium	0.70 µg/L	0.70 mg/kg
Zinc[(1)]	1.944 mg/kg	1.944 mg/kg

[(1)] Maximum concentration present in a laboratory preparation blank.

An action level of 5X the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot, percent solids and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the blank action level reported for antimony, silver and thallium were qualified "B" as a result of laboratory blank contamination.

- The interfering analyte iron was present in samples S43SB0030101 and S43SBDUP0101 at concentrations that were comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, arsenic, barium, cadmium, chromium, cobalt, lead, manganese, nickel, potassium, selenium, silver, sodium, thallium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for arsenic, cadmium, manganese, nickel, potassium, sodium and zinc in the affected samples. The positive results reported for arsenic, cadmium, sodium and zinc were qualified as biased high, "K". The positive results reported for nickel and potassium were qualified as biased low, "L". The positive results reported for manganese were qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analyte iron was present in samples S43SS0020001 and S43SS0050001 at concentrations that were comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, arsenic, barium, cadmium, chromium, cobalt, lead, manganese, nickel, potassium, selenium, silver, sodium, thallium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for arsenic and cadmium in the affected samples. The positive results reported for arsenic and cadmium were qualified as biased high, "K".

- The interfering analyte iron was present in sample S43SS0030001 at a concentration that was comparable to the level of iron in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, arsenic, barium, cadmium, chromium, cobalt, lead, manganese, nickel, potassium, selenium, silver, sodium, thallium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for arsenic, cadmium, cobalt, manganese, nickel, potassium, sodium and zinc in the affected sample. The positive results reported for arsenic, cadmium, sodium and zinc were qualified as biased high, "K". The positive results reported for cobalt, nickel and potassium were qualified as biased low, "L". The positive result reported for manganese was qualified as estimated, "J", due to conflicting noncompliances.

- The interfering analyte calcium was present in sample S43SS0060001 at a concentration that was comparable to the level of calcium in the Interference Check Sample (ICS) solution. Several analytes, namely, antimony, arsenic, barium, cadmium, chromium, cobalt, lead, manganese, nickel, potassium, selenium, silver, sodium, thallium and zinc were present in the ICS solution at a concentration that exceeded the absolute value of the Instrument Detection Limit (IDL). Interference effects exist for cadmium in the affected sample. The positive result reported for cadmium was qualified as biased high, "K".

- The MS percent recovery for zinc was > 125% quality control limit, affecting all soil samples. The positive results reported for zinc were qualified as biased high, "K".

- Laboratory duplicate imprecision (RPD > 35%) was noted for chromium and manganese, affecting the soil samples. Positive results reported for these analytes were qualified as estimated, "J".

- The ICP serial dilution percent difference for aluminum was > 10% quality control limit and the sample result was > 50X Instrument Detection Limit (IDL), affecting the soil samples. The positive results reported for aluminum were qualified as estimated, "J". A direction of bias could not be determined.

- Field duplicate imprecision (RPD > 50%) was noted for copper in the S43SSDUP0001 / S43SS0030001 sample pair. The positive results reported for copper in the surface soil samples were qualified as estimated, "J".

- Field duplicate imprecision (difference > 4X CRDL) was noted for barium in the S43SSDUP0001 / S43SS0030001 sample pair. The positive results reported for barium in the surface soil samples qualified as estimated, "J".

Notes

The rinsate blank sample was not used to establish blank action levels and was not qualified due to laboratory blank contamination.

The CRDL percent recoveries for lead and thallium were > 110% quality control limit, affecting all samples. No validation action was required for the lead results because they were all greater than two times the CRDL. No validation action was required for the thallium results because they were all either reported by the laboratory as nondetected or were qualified "B" due to laboratory blank contamination.

The MS percent recovery for antimony was < 75% quality control limit, affecting all soil samples. No validation action was taken because all results for antimony were qualified "B" as a result of laboratory blank contamination.

The post digestion spike (PDS) percent recovery for selenium was 0%. No validation action was taken based on the PDS percent recovery. All nondetected results for selenium were already qualified as unusable, "UR", due to severe MS noncompliance.

The Form I for sample S43SS0060001 was mislabeled as S43SB0060001. The data reviewer amended the Form I.

Executive Summary

Laboratory Performance: Antimony, arsenic, mercury and selenium were qualified due to calibration noncompliance. Several analytes were present in the laboratory method/preparation blanks. Laboratory duplicate imprecision was noted for chromium and manganese.

Other Factors Affecting Data Quality: Selenium and zinc were qualified due to MS noncompliance. Several analytes were qualified due to ICS noncompliance. Aluminum was qualified due to ICP serial dilution noncompliance. Field duplicate imprecision was noted for barium and copper in the S43SSDUP0001 / S43SS0030001 sample pair.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
U	-	Value is a nondetect as reported by the laboratory.
UL	-	Nondetected result is considered biased low, "UL", as a result of technical noncompliances.
UR	-	Nondetected result is considered unusable, "UR", as a result of severe technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: K. TURNBULL **DATE:** OCTOBER 14, 2005

FROM: BERNARD F SPADA III **COPIES:** DV FILE

SUBJECT: ORGANIC DATA VALIDATION- VOC/EXP
CTO 006, NDW INDIAN HEAD
SDG D0875

SAMPLES: 3/Aqueous

S43MW0010101 S43MW0020101 S43MWDUP0101

Overview

The sample set for CTO 006, NDW INDIAN HEAD, SDG D0875 consists of two (2) environmental aqueous samples and one (1) field duplicate. All samples were analyzed for volatile organic compounds (VOC) and explosives (EXP). The field duplicate pair included in this SDG is S43MWDUP0101 and S43MW0010101.

The samples were collected by Tetra Tech NUS on July 25 and 27, 2005 and analyzed by Mitkem Corporation. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using OLC03.2, SW-846 8330, and EPA 353.2 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GCMS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, field duplicate precision, and detection limits. Areas of concern are listed below.

Major

- None.

Minor

- The following compounds were detected in the aqueous method blank:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	0.74 ug/L	7.4 ug/L
Nitrocellulose	0.20 mg/L	1.0 mg/L

Sample aliquot and dilution factors were taken into consideration when applying the blank action levels. Non-detected results below the action level were qualified as non-detected (B).

- The volatile continuing calibration performed on July 29 at 10:53 exceeded the 25% difference quality control criterion (but was <50%) for trichloroethene. Positive results for trichloroethene were qualified as estimated (J) in all samples.

- Positive results below the detection limit but above the method detection limit were qualified as estimated (J) due to uncertainty near detection limit.

- The VOC deuterated monitoring compound 1,2-dichloropropane-d6 was below the percent recovery quality control criterion in sample S43MWDUP0101. Target compounds associated with this surrogate were qualified as estimated (UJ).

Notes

The laboratory did not submit raw data for the explosives analyses. On August 31 the laboratory was requested to submit the raw data for all explosives analyses. The laboratory re-submitted the explosives analyses including the raw data on October 10.

The volatile initial calibration performed on July 28, 2005 exceeded the 30% relative standard deviation (RSD) quality control criteria (but was <50%) for methylene chloride and methyl acetate. No action was taken on this basis because all results for the aforementioned compounds were non-detected.

The percent recovery of trichloroethene was below the quality control criterion in the MS performed on sample S43MW0020101. No action was taken on this basis because the MSD was compliant.

Samples S43MW0010101 and S43MWDUP0101 were analyzed at 1000X and 5000X dilutions because the concentration of cis-1,2-dichloroethane and trichloroethene exceeded the linear calibration range of the instrument. The results for cis-1,2-dichloroethene from the 1000X dilutions and trichloroethene from the 5000X dilutions were used for validation. The samples were not analyzed un-diluted. This accounts for the elevated reporting limits for all non-detected compounds in the aforementioned samples.

The laboratory sub-contracted the explosives analyses. The data provided for the explosives analyses did not have the same sample names as listed on the chains of custody. The validator changed the sample names on the Form Is and in the database to match the chains of custody.

Executive Summary

Laboratory Performance: Qualifications were made based on calibration non-compliances and method blank contamination. Submission of explosives data was extremely late.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to U.S. EPA National Functional Guidelines for Data Validation as modified by EPA Region III (9/94), National Functional Guidelines for Low Concentration Organics (June 2001), and the NFESC guidelines entitled Navy IRCDQM (Sept. 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Bernard F Spada III
Chemist/Data Validator

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **K. TURNBULL** **DATE:** **SEPTEMBER 26, 2005**

FROM: **ERIN M. FAUST** **COPIES:** **DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS AND CYANIDE**
CTO 006 NDW INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – D0875

SAMPLES: 3/Aqueous/

S43MW0010101 S43MW0020101 S43MWDUP0101

Overview

The sample set for NDW Indian Head, CTO 006, SDG D0875, consists of three (3) aqueous environmental samples. One (1) field duplicate pair (S43MW0010101 / S43MWDUP0101) is included within this SDG.

All samples were analyzed for target analyte list (TAL) metals and cyanide. The samples were collected on July 25 and 27, 2005 and analyzed by Mitkem Corporation under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals and cyanide analyses were conducted using Contract Laboratory Program (CLP) method ILM04.1.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike results, laboratory duplicate results, laboratory control sample (LCS) results, field duplicate results, ICP serial dilution results, detection limits and analyte quantitation.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) instrumentation. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA) instrumentation.

Areas of concern with respect to data quality are listed below.

Minor Problems

- The Contract Required Detection Limit (CRDL) percent recoveries for antimony and arsenic were < 90% quality control limit. The positive results reported for antimony that were less than two times the CRDL were qualified as biased low, "L". The nondetected results reported for antimony and arsenic were qualified as biased low, "UL".

- The CRDL percent recoveries for lead, selenium and thallium were > 110% quality control limit. The positive results reported for lead that were less than two times the CRDL were qualified as biased high, "K". No validation action was necessary for selenium and thallium

because all results were either reported by the laboratory as nondetected or were qualified "B" due to laboratory blank contamination.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Aluminum[(1)]	21.886 µg/L	109.43 µg/L
Barium[(1)]	1.762 µg/L	8.81 µg/L
Calcium[(1)]	100.002 µg/L	500.01 µg/L
Copper[(1)]	4.062 µg/L	20.31 µg/L
Iron[(1)]	12.071 µg/L	60.355 µg/L
Magnesium	12.1 µg/L	60.5 µg/L
Manganese[(1)]	0.988 µg/L	4.94 µg/L
Silver	4.7 µg/L	23.5 µg/L
Sodium	32.8 µg/L	164 µg/L
Thallium	3.0 µg/L	15.0 µg/L
Zinc[(1)]	5.309 µg/L	26.545 µg/L

[(1)] Maximum concentration present in a laboratory preparation blank.

An action level of 5X the maximum contaminant level has been used to evaluate sample data for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the blank action level reported for aluminum, copper, iron and thallium were qualified "B" as a result of laboratory blank contamination.

- The ICP serial dilution percent differences for nickel and zinc were > 10% quality control limit and the sample result was > 50X Instrument Detection Limit (IDL). The positive results reported for nickel and zinc were qualified as estimated, "J". A direction of bias could not be determined.

Notes

Sample S43MW0010101 was incorrectly identified on the chain of custody (COC). The sample name was correct on the sample container.

The CRDL percent recovery for mercury was > 120% quality control limit. No validation action was necessary because all results for mercury were reported by the laboratory as nondetected.

Executive Summary

Laboratory Performance: Antimony, arsenic and lead were qualified due to calibration noncompliance. Several analytes were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: Nickel and zinc were qualified due to ICP serial dilution noncompliance.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

B	-	Positive result is considered to be an artifact of blank contamination and should not be considered present.
J	-	Positive result is considered estimated, "J", as a result of technical noncompliances.
K	-	Positive result is considered biased high, "K", as a result of technical noncompliances.
L	-	Positive result is considered biased low, "L", as a result of technical noncompliances.
U	-	Value is a nondetect as reported by the laboratory.
UL	-	Nondetected result is considered biased low, "UL", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**K. TURNBULL**	**DATE:**	**JANUARY 28, 2008**
FROM:	**MATTHEW D. KRAUS**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION – VOC** **NSF INDIAN HEAD – CTO 0114** **SDG – F1663**		
SAMPLES:	11/Aqueous/		

S43FB0010102	S43MW0010102	S43MW0020102
S43MWDUP0102	S43RB0010102	S43TB0010102
S43TW0010102	S43TW0020102	S43TW0030102
S43TW0040102	S43TW0050102	

Overview

The sample set for NSF INDIAN HEAD; CTO 0114, SDG F1663 contains eight aqueous environmental samples and three field quality control blanks. One field duplicate pair (S43MWDUP0102 / S43MW0010102) is included in this SDG.

Samples were collected from November 10-11, 2007 by Tetra Tech NUS, Inc. and analyzed for target compound list (TCL) volatile organic compounds (VOC) by Mitkem Corporation, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria.

The following table exhibits the analytical methods and instrumentation used for analyses.

Target Analyte	Analytical Method	Instrumentation
VOCs	USEPA OLC03.2	Gas Chromatography / Mass Spectrometry (GC/MS)

Summary

All analytes were successfully analyzed. The findings in this report are based upon a general review of all available data.

The data review was based on results pertaining to data completeness, holding times, GC/MS tuning, calibration data, laboratory method/preparation blanks, surrogate recoveries, matrix spikes, internal standard recoveries, field duplicate precision, detection limits and analyte quantization.

Major Problems

- The initial calibration verification analyzed on 11/05/07 at 17:04 on instrument V1 yielded an average relative response factor (RRF) for dichlorodifluoromethane which was less than 0.05 affecting all sample results. The non-detected results reported for dichlorodifluoromethane were qualified as rejected, "UR".

- The continuing calibration verification analyzed on 11/14/07 at 09:41 on instrument V1 yielded an average RRFs for dichlorodifluoromethane which was less than 0.05 affecting results from samples S43TB0010102, S43TW0010102, S43TW0020102, S43TW0030102, SW43TW0040102 and SW43TW0050102. The affected non-detected results reported for dichlorodifluoromethane and were qualified as rejected, "UR".

- The continuing calibration verification analyzed on 11/15/07 at 15:44 on instrument V1 yielded an average RRF for dichlorodifluoromethane which was less than 0.05 affecting results from samples S43MW0010102, S43MWDUP0102, S43FB0010102, S43RB0010102 and S43MW0020102. The affected non-detected results reported for dichlorodifluoromethane were qualified as rejected, "UR".

Minor Problems

- The initial calibration verification analyzed on 11/05/07 at 17:04 on instrument V1 yielded percent relative standard deviations (%RSD) for dichlorodifluoromethane, methyl acetate and methylene chloride which were greater than the upper quality control limit (30%) but less than 50% affecting all sample results. The affected dichlorodifluoromethane and methyl acetate results were not qualified due to this noncompliance because those results were reported as non-detected. Positive results reported for methylene chloride were qualified as estimated, "J".

- The continuing calibration verification analyzed on 11/15/07 at 15:44 on instrument V1 yielded a %D for methyl acetate outside of the ±50% affecting samples S43MW0010102, S43MWDUP0102, S43FB0010102, S43RB0010102 and S43MW0020102. The affected non-detected results reported for methyl acetate were qualified as estimated, "UJ".

- Several positive results were qualified as estimated, "J", due to uncertainty near the detection limit.

- The %R for the surrogate 1,1-dichloroethene-d2 was less than the lower quality control limit for the analysis of sample S43TB0010102. The cis-1,2-dichloroethene and trans-1,2-dichloroethene results reported for sample S43TB0010102 were qualified as biased low, "UL".

Notes

The continuing calibration verification analyzed on 11/14/07 at 09:41 on instrument V1 yielded percent differences (%Ds) for dichlorodifluoromethane and chloroethane outside of the ±30% quality control criteria but within ±50% affecting results from samples S43TB0010102, S43TW0010102, S43TW0020102, S43TW0030102, SW43TW0040102 and SW43TW0050102. No data was qualified because all of the affected compound results were reported as non-detected.

The following contaminant was detected in a laboratory method/preparation blank at the following maximum concentration.

Analyte	Maximum Concentration	Action Level
Chloromethane [1]	0.50 ug/L	2.50 ug/L

[1] Maximum contaminate concentration detected in preparation blank VBLK1J affecting samples S43TB0010102, S43TW0010102, S43TW0020102, S43TW0030102, SW43TW0040102 and SW43TW0050102.

An action level of 5X the maximum contaminate concentration was used to evaluate sample data for blank contamination. Sample aliquots and dilutions, if applicable, were taken into consideration

when evaluating for blank contamination. No data was qualified due to laboratory blank contamination.

The matrix spike duplicated analysis of sample S43MW0010102 yielded a percent recovery (%R) less than the lower quality control limit for trichloroethene. No data was qualified because the original sample concentration was greater than 4X the amount of spike added.

A laboratory control sample (LCS) was not analyzed with this SDG.

Samples S43MW0010102 and S43MWDUP0102 were analyzed at a 1,600X dilution resulting in the reporting of elevated detection limits. Those samples were not analyzed undiluted.

Executive Summary

Laboratory Performance: Dichlorodifluoromethane and acetone results were qualified as rejected due to calibration noncompliance. Acetone, methylene chloride and methyl acetate were qualified due to calibration noncompliance.

Other Factors Affecting Data Quality: Several results were qualified due to uncertainty near the detection limit.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Low Concentration Organic Data Review", June 2001, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (January 2006).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the DoD QSM Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Matthew D. Kraus
Environmental Chemist

Tetra Tech NUS
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Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U	-	Value is a non-detect as reported by the laboratory.
UR	-	Non-detected result considered rejected as a result of technical noncompliance.
UL	-	Non-detected result considered biased low as a result of technical noncompliance.
UJ	-	Non-detected result is considered estimated as a result of technical noncompliance.
L	-	Positive result considered biased low due to technical noncompliance.
J	-	Positive result is considered estimated as a result of technical noncompliance.