FINAL

INTERIM DATA SUMMARY REPORT
PHASE 1 REMEDIAL INVESTIGATION
AND
PHASE 2 SAP ADDENDUM
SITE 43 – TOLUENE DISPOSAL AREA

NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

Naval Facilities Engineering Command
Washington

Contract Number N62472-03-D-0057
Contract Task Order 114

April 2012

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NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

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ACRONYM LIST

bgs	below ground surface
CLEAN	Comprehensive Long-Term Action Navy [Contract]
COPC	Chemical of Potential Concern
CSM	conceptual site model
DCA	dichloroethane
DCE	dichloroethene
DNAPL	dense non-aqueous phase liquid
DOD	Department of Defense
DPT	direct push technology
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HSA	hollow stem auger
ID	inner diameter or [sample] identification
IDW	investigation derived waste
kg	kilogram
L	liter
m^3	cubic meter
µg	micrograms
MDE	Maryland Department of Environment
MIP	Membrane Interface Probe
msl	mean sea level
MS/MSD	Matrix Spike and Matrix Spike Duplicate
NAD	North American Datum
NAVFAC	Naval Facilities Engineering Command
NSF-IH	Naval Support Facility Indian Head
OD	outer diameter
PA	Preliminary Assessment
PAL	Project Action Limit
PID	photoionization detector
PRT	Post-Run Tubing
PVC	polyvinyl chloride
QA/QC	quality assurance and quality control
RI	Remedial Investigation
RSL	regional screening level
Site	Site 43 – Toluene Disposal Area
SSP	Site Screening Process

ACRONYM LIST

TAL	target analyte list
TCE	trichloroethene
TCL	target contaminant list
TOC	total organic carbon
USGS	U. S. Geologic Survey
U.S.	United States
VC	vinyl chloride
VOC	volatile organic compound

1.0 INTRODUCTION

This report has been prepared by Tetra Tech for Naval Facilities Engineering Command (NAVFAC) Washington under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62472-03-D-0057, Contract Task Order 114. This summary report provides a summary of the data collected during Phase 1 of the Remedial Investigation (RI) for Site 43 – Toluene Disposal Area (Site) at Naval Support Facility Indian Head (NSF-IH).

1.1 PURPOSE

The purpose of this interim data summary report is to present the findings of the Phase 1 RI and provide the basis for the Phase 2 RI, which is detailed in the Sampling and Analysis Plan (SAP) Addendum as part of this report. The goal of the RI at Site 43 is to characterize the nature and extent of volatile organic compounds (VOCs), explosives, and metals contamination in soil and groundwater near Building 1040, refine the Conceptual Site Model (CSM), and support the Feasibility Study (FS). The characterization includes determining the following:

- Horizontal and vertical extent of explosives-, solvent-, and/or metals-contaminated soils in the Building 1040 source area.
- Whether there is a continuing source of VOC contamination in soils near Building 1040.
- Extent of the solvent groundwater contamination near Building 1040.
- Groundwater flow direction near Building 1040

Soil gas sampling was conducted during the Phase 1 RI to determine if there is potential vapor intrusion issues near Building 1040. Human health risks from site contamination will be evaluated by performing a baseline human health risk assessment (HHRA). Groundwater sampling was conducted to verify cobalt concentrations in groundwater near Building 1041.

1.2 SITE BACKGROUND

The Site includes two distinct areas in the southwestern portion of NSF-IF (Figure 1-2). The first area is located in the southern portion of the site near a utility pole approximately 30 feet northwest of and across the road from Building 1041 (Figure 1-3). The second area is located in the northern portion of the site on the northern corner of Building 1040 (Figure 1-3). The Site is an industrial area where the handling of explosives and rocket production still occurs in Building 720.

Facilities within the Site were reportedly active between the late 1950s and 1989 when approximately 23,000 to 30,000 gallons of spent solvents, used in the Cast Plant (Buildings 1040 and 1041) to remove propellants and oily residues from various metal parts, were disposed of directly on the ground outside Building 1040 (acetone) at the drainage ditch and at the utility pole across from Building 1041 (acetone and toluene) (NEESA, 1992). This dumping took place two or three times per week for a period of more than 2 years in Building 1041. No signs of stressed vegetation or solvent dumping stains have been observed at the Site (NEESA, 1992; Tetra Tech, 2011).

Operational history and/or functions of nearby buildings were reviewed to evaluate other potential sources of groundwater contamination (Tetra Tech, 2009). According to the E/A&H (1994) Site Inspection (SI) Report, acetone was known to have been used in Building 1040 (Parts Cleaning House). Based on information provided by NSF-IH, trichloroethene (TCE) was reportedly used for production processes in Building 720 (Grain Manufacture and Motor Load Building), which is adjacent to Building 1040 (Figure 1-3). The duration of use and quantities of TCE are unknown and not documented. Other buildings near Building 1040 include Building 1360 (Scrap Powder Shed; approximately 80 feet south), Building 1257 (Transformer Station; approximately 110 feet north-northwest), and Building 821 (Toilet Building; approximately 150 feet west-southwest). It is not likely that these other buildings are the source of TCE detected in shallow groundwater.

A review of sewer lines was conducted to determine whether a leaking sewer could be a source of TCE detected in shallow groundwater (Tetra Tech, 2007). There are no sanitary sewers in the immediate vicinity of Building 1040 (Figure 1-3). The nearest sanitary sewer begins at Building 821 (Toilet Building), located across Gallery Road from Buildings 720 and 1040, and runs approximately 300 feet northwest and north to the former sewage treatment plant. Another sanitary sewer is located approximately 200 feet northwest of and parallel to Gallery Road. There are also sanitary sewers associated with Building 713 (offices – not shown on figures), Building 714 (change house, laundry, and offices), and Buildings 812 and 813 (lunch houses), all located north to north-northwest of Building 1040 near the former sewage treatment plant. The distance between the former sewage treatment plant and Building 1040 is approximately 400 feet. These observations indicate that the sewers are not a likely source of the localized shallow TCE contamination near Building 1040.

A short length of storm sewer exists emanating from Building 720 that empties into a drainage swale /ditch adjacent to Building 1040 and Schuyler Road (Figure 1-3). Based on topography, water in the ditch flows to the southeast.

The building descriptions above are from the report entitled *Water Pollution Study at the Naval Ordnance Station* (Dodohara, 1976). Although the building uses may have changed since 1976, this older report

provides a historical perspective of nearby activities and sewer lines that are a potential source of groundwater contamination. The uses of the buildings served by nearby sanitary sewers do not appear to be sources of the contaminants detected in shallow groundwater. However, this RI will provide information necessary to evaluate the extent of contamination.

1.3 PREVIOUS SITE INVESTIGATIONS

A multi-site Preliminary Assessment (PA) was performed in 1991 (NEESA, 1992). The PA recommended a Site Inspection (SI) for the area near the utility pole across the road from Building 1041. The SI was performed in the Building 1041 area in 1993 (E/A&H, 1994). Toluene and chlorinated solvents were detected at soil-gas locations near the utility pole. The SI recommended additional sampling to determine whether volatile organic compounds (VOCs) were present in subsurface soil over a larger area.

A multi-phase Site Screening Process (SSP) Investigation began in 2005 to determine whether residual contamination in soil or groundwater at the Site poses potential risks to human health or the environment (Tetra Tech, 2009).

Soil borings were installed during the 2005 SSP Investigation near Building 1041, and one soil boring was converted into a shallow groundwater monitoring well. Soil samples and a groundwater sample were collected and analyzed for target compound list (TCL) VOCs, explosives, metals, and cyanide. Several VOCs (2-butanone, acetone, carbon disulfide, methylene chloride, and toluene), one explosive (3-nitrotoluene), and several metals were detected in the soil samples. In addition, TCE was detected in shallow groundwater at 1.3 micrograms per liter (µg/L). A screening risk evaluation was performed using the limited surface and subsurface soil data. The risk evaluation concluded no unacceptable risks to human health or the environment from chemicals detected in soil and shallow groundwater under a residential use scenario at Building 1041. Therefore, no additional investigation was proposed in this vicinity except to verify the groundwater screening results.

During the 2005 SSP Investigation in the Building 1040 vicinity, soil borings were collected and one soil boring was converted into a shallow groundwater monitoring well. Soil samples and a groundwater sample were collected and analyzed for VOCs, nitroaromatics, metals, and cyanide. TCE and methylene chloride, one explosive constituent (nitrocellulose), and several metals were detected in soils. A screening risk evaluation was performed. The risk evaluation concluded no unacceptable risks to human health or the environment from chemicals detected in soil. However, TCE (54,000 µg/L) and cis-1,2-dichloroethene (DCE) (530 µg/L) were detected in shallow groundwater in monitoring well MW01, posing potential risks to human health under a residential use scenario; however, a contaminant source area was not found. Therefore, additional investigation was warranted to determine the source and extent of

shallow groundwater contamination detected near Building 1040. The presence of cis-1,2-DCE in the same well as TCE was an indication that TCE is degrading biochemically, although geochemical conditions were not necessarily ideal for this type of degradation.

Supplemental SSP efforts continued at the Site in 2007 when membrane interface probe (MIP) technology was used to detect VOCs in the subsurface (Tetra Tech, 2009). MIP responses indicating the presence of chlorinated (or brominated) VOCs occurred at depths of approximately 19 to 27 feet below ground surface (bgs). The soil conductivity sensor data suggested a basal clay layer beginning at approximately 25 ft bgs.

Direct-push technology (DPT) grab groundwater samples were collected from select locations and existing wells MW01 and MW02 to confirm the MIP results. All groundwater samples were analyzed for VOCs and were evaluated for the presence of dense non-aqueous phase liquid (DNAPL) using the Oil Red O dye field test (there was no indication of DNAPL). Several VOCs were detected near Building 1040, however, TCE was the only constituent detected at a significant concentration (>36,000 µg/L). TCE was detected again at Building 1041 in well MW02 (3.2 µg/L).

The next phase of the supplemental SSP effort (termed Supplemental Phase 1A SSP) was recommended to further delineate VOCs in shallow groundwater at the Site. MIP field screening was utilized again during this 2009 effort (Tetra Tech, 2008).

At Building 1040, the MIP probes were advanced to depths ranging from approximately 25 to 29 feet bgs. Elevated MIP readings indicated the presence of halogenated compounds around monitoring well MW01, the location of elevated TCE concentrations in 2005 and 2007. At Building 1041, the probes were advanced to depths ranging from approximately 19 to 25 feet bgs. No significant readings were made at any of the locations.

The Tetra Tech (2009) SSP Summary Report presented all the SSP results, and provided a screening risk evaluation. The vapor intrusion pathway was not assessed in the human health risk screening evaluation.

The results for Building 1040 identified chromium as a Chemical of Potential Concern (COPC) for surface soil; manganese for subsurface soil; and bromoform, TCE, antimony, cobalt, iron, and manganese for shallow groundwater. Following additional evaluation, no unacceptable risks were determined for hypothetical future residents exposed to COPCs in soil to a depth of 3 feet bgs. There were no surface water or sediment media at Site 43.

The TCE concentrations observed in groundwater (at approximately 15 feet bgs) indicate the potential for migration of TCE from soil to groundwater; however, a source of this contamination was not found in soil during the SSP.

For Building 1041, iron was identified as a COPC for subsurface soil and 1,1-dichloroethane (DCA), TCE, antimony, cobalt, manganese, and nickel were identified as COPCs for shallow groundwater. There were no COPCs for surface soil. Following additional evaluation, no unacceptable risks were determined for hypothetical future residents exposed to COPCs in soils to a depth of 3 feet bgs.

Considering the potential unacceptable human health risk from exposure to VOCs in groundwater at the Site (Building 1040), the Site was recommended to proceed to an RI and FS. Additional groundwater data were needed to confirm and assess the potential risk from exposure to cobalt in groundwater near Building 1041.

2.0 FIELD INVESTIGATION ACTIVITIES

2.1 REMEDIAL INVESTIGATION ACTIVITIES

Phase 1 RI fieldwork began at Site 43 in June 2011. The investigation was designed to further characterize the nature and extent of contamination, assess human health risks, including the potential for subsurface vapors to intrude into buildings, and help determine further corrective action at the Site. Field activities conducted during the RI included the following:

- Soil sampling at twelve installed soil borings
- Seven temporary well/groundwater grab samples
- Installation of four monitoring wells
- Well development
- Six monitoring well groundwater samples
- Four soil gas samples
- Slug testing
- Surveying

The locations of the soil borings, temporary wells, monitoring wells, and soil gas locations are shown on Figure 1-4.

2.1.1 Soil Borings and Soil Sampling

During the investigation, 12 soil borings were advanced via a Geoprobe® 6620DT DPT rig using both continuous and discrete soil macrocoring methods. Ten of the 12 soil borings were advanced to the top of a dark gray clay confining unit that was encountered from approximately 30 to 35 feet bgs across the study area. Soil cores were screened with a photoionization detector (PID), logged, and visually inspected for evidence of contamination. Soil boring logs are provided as Appendix A

Continuous soil coring consisted of incrementally advancing a 5-foot long soil sampler with a 1-inch cutting shoe, without a drive point into the subsurface. The soil cores were retrieved within a 5-foot by 2 inch macrocore liner located inside the soil sampler. This method was utilized to a depth of 28 or 30 feet bgs. Discrete soil cores were collected below 30 ft bgs which consisted of incrementally advancing a 5-foot soil sampler and liner with a drive point within a 2-inch cutting shoe. During advancement, control rods were inserted into the drill string to prevent the drive point from releasing in the sampler at discrete depths.

Soil samples were collected from each of the 12 soil borings. Eleven soil samples (S43SB008 through S43SB018) were collected just above the water table and analyzed for VOCs, metals, total cyanide, total organic carbon (TOC), explosives, and perchlorate. Soil samples also were collected just above the water table at S43SB019 and S43SB022 and analyzed for VOCs. Grain size samples were collected at S43SB008 (6 to 8 feet bgs), S43SB017 (15 to 17 feet bgs), and S43SB018 (33 to 35 feet bgs). A bulk density sample was collected from 6 to 8 feet bgs at S43SB008 and a shelby tube was collected from the dark gray basal clay unit at S43SB011 from 33 to 35 feet bgs. Three total oxidant demand samples also were collected, two within the suspected source area (S43SB019 and S43SB022) and one outside the source area (S43SB011), from 13 to 15 feet bgs. Table 2-1 provides a summary of soil samples and soil sample log sheets are provided as Appendix B.

2.1.2 Groundwater Grab Sampling

Seven temporary wells (S43TW06 through S43TW12) were installed using a 4-foot by 1-inch stainless steel screen. Each temporary well was screened within a fine to course sand directly above the dark gray basal clay unit. A peristaltic pump was used to purge the screened interval for a minimum of 30 minutes with approximately 2 gallons taken out at each temporary well prior to sampling. Water quality parameters were recorded with a Horiba U-52 meter and LaMotte 2020 turbidity meter.

Six groundwater grab samples were collected. Temporary well S43TW10 did not produce groundwater. The six groundwater grab samples were sent to an offsite lab and analyzed for VOCs, total and filtered metals, total cyanide, explosives, and perchlorate. In addition, field test kits were used to evaluate ferrous iron and dense non-aqueous phase liquid (DNAPL) at each of the temporary well locations. Two of the samples (S43TW07 and S43TW09) were also analyzed by the lab for anions; alkalinity; methane, ethane, and ethene ; sulfide; and filtered TOC. Table 2-2 provides a summary the groundwater grab samples and Appendix C provides the groundwater grab sample log sheets and the low flow purge data sheets.

2.1.3 Monitoring Well Installation and Development

Four monitoring wells (S43MW03 through S43MW06) were installed during the investigation. The monitoring wells were installed with a Geoprobe® 7822DT DPT rig using 6-inch outer diameter (OD) hollow stem augers (HSAs) directly above the basal clay within a fine to coarse sand. Each monitoring well was constructed with 2-inch inner diameter (ID) Schedule 40 polyvinyl chloride (PVC) well casing and 10-feet of PVC well screen (0.010-inch slot). A sand pack was installed from the total depth to approximately 3 feet above the top of the screen using No.1 silica sand. A 2-foot bentonite seal was placed on top of the sand pack and allowed to hydrate before the remainder of the annulus was filled with

cement/bentonite grout to ground surface. Monitoring wells S43MW05 and S43MW06 were completed as flush mount wells with concreted pads. Monitoring wells S43MW03 and S43MW04 were completed as stick up wells with a lockable steel protective casing and concrete pad. Table 2-3 provides a summary of the monitoring well construction details and Appendix D provides monitoring well construction log sheets.

Five monitoring wells, existing well S43MW01 and new wells S43MW03 through S43MW06, were developed using a submersible pump and manually surging the well screen. Water quality readings were recorded during development and are provided in Appendix D. Approximately 100 gallons were purged out of each monitoring well during development activities.

2.1.4 Groundwater Sampling

Groundwater samples were collected from six monitoring wells (existing wells MW01 and MW02 and new wells MW04 through MW06) via low-flow sampling methodology. Water quality parameters measured during purging consisted of pH, conductivity, temperature, turbidity, dissolved oxygen, and oxidation-reduction potential. Groundwater samples were collected after parameter stabilization. Groundwater sample log sheets and low-flow purge data sheets are provided in Appendix E. Groundwater level measurements were recorded and are provided in Table 3-1 and Appendix F.

Groundwater samples were sent to an offsite lab for analysis of VOCs, total and filtered metals, total cyanide, energetics, and wet chemistry (anions, methane, ethane, ethene, sulfide, alkalinity, and dissolved TOC). The sample collected at S43MW02 was analyzed for TCE and total and filtered cobalt. Groundwater samples from S43MW01 and S43MW03 through S43MW06 were analyzed for VOCs, total and filtered metals, total cyanide, explosives and perchlorate. Samples collected at S43MW01, S43MW02, S43MW04, and S43MW06 were also analyzed for wet chemistry parameters. In addition to the laboratory samples, field test kits were used for ferrous iron and DNAPL at each monitoring well. A groundwater sampling summary is provided in Table 2-2.

2.1.5 Soil Gas Sampling

Three soil gas samples (S43SG01, SG03, and SG04) were collected above the water table on the vicinity of Buildings 1040 and 720 (Figure 1-4). A Geoprobe® rig using an expendable point and the Post-Run Tubing (PRT) System was used to collect the soil gas samples. Three tubing volumes were purged and screened using a PID at each location. A helium leak test was performed at each location to verify sample integrity. Each of the soil gas samples was collected with a 6-liter Summa canister fitted with a 30-minute regulator. The samples were sent to an offsite laboratory for VOC analysis (method EPA TO-15). The sampling interval was in a tight geologic formation causing the sampling times at S43SG01,

S43SG03, and S43SG04 to exceed 30 minutes. This tight formation likely prevented flowable soil gas at S43SG02 (no sample). Table 2-4 provides a soil gas sample summary and soil gas sample log sheets are provided in Appendix G.

2.1.6 Slug Testing

Falling head and rising head slug tests were performed at S43MW01, MW03, and MW05. An In-Situ Level TROLL® transducer was inserted into the screen interval and a 5-foot by 1.5-inch PVC slug was used to displace water for each slug test. The transducer recorded the pressure of the water column over time to estimate the hydraulic conductivity of the geologic formation in which the monitoring well was screened. Slug tests analysis sheets are provided in Appendix H.

2.1.7 Surveying

The newly installed monitoring wells and the refurbished S43MW01, were surveyed in August 2011 by a Maryland-licensed surveyor. The horizontal (± to 0.1 foot) coordinates and vertical (± to 0.01 foot) elevations were surveyed in North American Datum (NAD) 1983, Maryland State Plane Coordinate System relative to the coordinates of established Site benchmarks or the nearest U.S. Geological Survey (USGS) benchmark. The survey results are provided in Appendix I.

2.1.8 Quality Assurance and Investigation Derived Waste

Quality Assurance/Quality Control (QA/QC) samples collected during the investigation include field duplicate samples and laboratory Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples. Equipment rinsate blanks and field blank samples were also collected as part of the investigation.

Investigation derived waste (IDW) generated during the investigation consisted of soil cuttings, purge water, and decontamination water. All IDW was containerized in 55-gallon drums. The temporary decontamination pad and temporary IDW drum storage area were located at the NSF-IH waste storage area, adjacent to Environmental building. QA sample log sheets are provided in Appendix J.

3.0 SITE CHARACTERISTICS

3.1 SURFACE FEATURES

The Main Area of NSF-IH, located on the Cornwallis Neck Peninsula, 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.

The peninsula is located in the Atlantic Coastal Plain Physiographic Province, approximately 8 to 10 miles east of the Fall Line that marks the western extent of the physiographic province (Figure 1-1). The facility has gently rolling to undulating topography with elevations ranging from sea level to more than 100 feet above mean sea level (msl). The higher elevations are on the eastern portion of the facility, and the land surface generally slopes to the southwest and southeast. The portion of NSF-IH along the Potomac River is characterized by 20- to 100-foot bluffs. The portion along Mattawoman Creek is more gently sloping.

Site 43 is a mostly flat industrial area with a few buildings, paved roads, a bunker, and drainage swales. A relatively steep earthen, grass-covered bunker is located immediately northwest of the utility pole near Building 1041. The area northeast of this vicinity is covered with mowed grasses and a few trees. The area surrounding the building southwest of Schuyler Road is mostly covered with mowed grasses. The area northeast of Schuyler Road is mostly wooded with a drainage swale cutting northwest to southeast through that area. Drainage swales parallel most of the roads, and many contain standing water. The drainage swale along Schuyler Road, north of Building 1040 (suspect disposal area) flows to the southeast. Refer to the 2009 SSP Report for additional information and Site photographs (Tetra Tech, 2009).

3.2 GEOLOGY

NSF-IH is underlain by unconsolidated sand, gravel, and clay from the Pleistocene and Cretaceous Periods. The soil in this area consists of silty and sandy loams, with minor amounts of gravel. The soils tend to have low permeability and low shrink-swell potential.

Soil borings installed near Building 1040 indicate that from ground surface to approximately 20 feet bgs the geology is comprised primarily of clayey sand and fine grained sand with varying amounts of clay and silt. Some gravel is present at shallow depths near paved roads and buildings. A medium to coarse grained sand was encountered from approximately 20 to 30 feet bgs. Within this coarse grained unit was a 5-foot thick semi-continuous clay confining unit. A basal clay confining unit was encountered at approximately 30 feet bgs across the study area and extends to an unknown depth. The geologic units

vary both laterally and vertically, due to the fluvial depositional environment, and many units swell/pinch depending on the direction. Figure 1-4 shows transects A-A', B-B', and C-C'. Figures, 3-1, 3-2, and 3-3, show each respective cross-section.

3.3 HYDROGEOLOGY

The shallow groundwater beneath Site 43 is unconfined. The water table at Site 43 was consistently encountered between 6 and 10 feet bgs during previous investigations (see below). The water table is recharged by precipitation that infiltrates the ground surface. The shallow groundwater flow direction could not be determined with the limited data collected during the SSP investigations and this RI; however, the potentiometric surface is higher near Building 1040 than Building 1041.

The Building 1041 utility pole is located in a drainage ditch adjacent to Gallery Road. A drainage ditch is located between Building 1040 and Schuyler Road. These ditches are mostly dry until large precipitation events. Precipitation either infiltrates into the soil or is combined with other runoff from nearby areas. A drainage and groundwater divide (exact location unknown) extending along the NSF-IH Main Area is located west of Site 43 nearer the shore of the Potomac River. Based on the expected presence of this divide (and Site topography, including drainage swales), it is assumed that all groundwater at Site 43 flows to the south or southeast toward Mattawoman Creek (to be determined/confirmed during additional investigation activities). Brown and Root Environmental (1997) reported that combined runoff at the Site 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. Groundwater elevations are presented in Table 3-1.

A potentiometric surface map could not be generated with the current RI data. Figure 3-4 presents the groundwater elevations as recorded in August 2011. The groundwater elevations suggest a radial flow at the Site. A potable water line leaking near the Site may be affecting the local water table and actual groundwater flow. Groundwater flow will be further evaluated during the Phase 2 RI investigation.

4.0 RESULTS

Groundwater samples were collected and analyzed for VOCs, total and filtered metals, total cyanide, explosives, perchlorate, filtered TOC, sulfide, anions, alkalinity, methane, ethane, and ethene. Soil samples were collected and analyzed for VOCS, metals, total cyanide, TOC, explosives, and perchlorate. One shelby tube sample, three grain size samples, one bulk density/effective porosity sample, and three total oxidant demand samples were collected to evaluate remedial alternatives in the forthcoming FS. Three soil gas samples and one outdoor air sample were collected and analyzed for VOCs. All samples were collected in accordance with the Sampling Action Plan (SAP) and sent to an approved lab. The laboratory analytical results were validated in accordance with current EPA Region 3 functional guidelines (EPA, 1994). The chain-of-custody records, validation letters, and validated analytical results can be found in Appendices K, L, and M, respectively.

4.1 Soils

Twenty-three soil samples were collected from 12 locations. All soil samples were collected above the water table (8 feet bgs) and contained elevated concentrations of five VOCs. The TCE Project Action Level (PAL) was exceeded at one location (S43SB017) with a concentration of 3,940 µg/kg. TCE was detected at 470 µg/kg and 776 µg/kg at S43SB011 and S43SB018, respectively. Other soil samples contained elevated concentrations of 4-methyl-2-pentanone at 19,100 µg/kg, acetone at 4,660,000 µg/kilograms (kg), cis-1,2-DCE at 585 µg/kg, and vinyl chloride (VC) at 14.3 µg/kg. The locations with the highest concentrations either bound the length of a northwest-southeast trending ditch (suspected source area) or are in the area south of the ditch and north of Building 720.

Explosives were not detected in soil at concentrations exceeding PALs. PALs were exceeded for aluminum, arsenic, chromium, cobalt, iron, and vanadium but the concentrations did not exceed NSF-IH background concentrations for these metals (Brown and Root Environmental, 1997). Table 4-1 and Figure 4-1 present a summary of the soil analytical detections and PALs.

4.2 Soil Gas

Three soil gas samples were collected around Buildings 1040 and 720 at approximately 5 feet bgs. An attempt was made to collect a fourth soil gas sample (at S43-SG02); however, the soil gas sample could not be obtained, likely due to the tight fine grained soils at this location. Twelve VOCs exceeded the PALs in soil gas samples: DCA, 1,4-dioxane, 2-butanone, 2-hexanone, 4-methyl-2-pentanone, acetone, benzene, chloromethane, cis-1,2-DCE, xylenes, toluene, and VC. The EPA Regional Screening Levels (RSLs) for residential air were used in evaluating the soil gas results. The VOCs posing potential concern

or impact to indoor air include the following: acetone (690,000 micrograms per cubic meter [µg/m^3]), cis-1,2-DCE (29,000 µg/m^3), and VC (30,000 µg/m^3).

An outdoor air sample was also collected upwind of the soil gas locations. PAL exceedances of benzene and carbon tetrachloride were observed in this ambient air sample.

Table 4-2 and Figure 4-2 present a summary of the soil gas analytical detections and PALs.

4.3 Groundwater

Twelve groundwater samples were collected, from six permanent monitoring wells and six temporary wells during the investigation. Six VOCs exceeded PALs: chloroform, cis-1,2-DCE, methylene chloride, TCE, and VC. Chloroform was detected at two locations with one PAL exceedance at S43MW01 (8.32 µg/liter [L]). Methylene chloride was detected at three locations with PAL exceedances at two (maximum concentration of 9.74 µg/L at S43TW07). Cis-1,2-DCE was detected at eight of the sample locations with PAL exceedances at five (maximum concentration of 284 µg/L at S43MW01). TCE was detected at 10 locations with 7 PAL exceedances (maximum concentration of 10,900 µg/L at S43MW01). VC was detected at 6 locations with PAL exceedances at five locations (maximum concentration of 26.2 µg/L at S43TW07).

Groundwater concentrations exceeded PALs for four explosives: 1,3-Dinitrobenzene, 3-nitrotoluene, nitroglycerin, and RDX. 1,3-Dintrobenzene was detected at four locations with a PAL exceedance of 0.421 µg/L at S43TW11. 3-Nitrotoluene was detected at five locations with PAL exceedances at four locations (maximum concentration of 3.57 µg/L at S43MW04). Nitroglycerin was detected at five locations with PAL exceedances at three locations (maximum concentration of 32.3 µg/L at S43MW06). RDX was detected at seven locations with PAL exceedances at four locations (maximum concentration of 1.7 µg/L at S43MW06).

Groundwater analytical results along with the PALs are presented in Tables 4-3 and 4-4 and the detections are shown on Figure 4-3.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are based on the Phase 1 RI results at Site 43:

- A potential soil source area may exist along the ditch (southside of Schuyler Road) east of the suspected disposal area.
- The extent of groundwater contamination (VOCs, explosives, and metals) near Building 1040 has not been delineated.
- Local groundwater flow near Building 1040 has not been determined.
- A potable water line leak and other site utilities may be influencing local groundwater flow and contaminant migration.
- VOC detections in soil gas (acetone, cis-1,2-dce, and VC) indicate potential concern for vapor intrusion into Building 720
- The elevated cobalt detection in groundwater at MW002, near Building 1041 was confirmed.

The following are recommendations for the Phase 2 investigation at Site 43:

- Investigate potential soil source area along the ditch, east of the assumed disposal area
- Delineate groundwater contamination near Building 1040
- Determine local groundwater flow direction in both portions of Site 43 (Buildings 1040 and 1041)
- Determine the impact of site utilities on groundwater flow and contaminant migration
- Further evaluate potential vapor intrusion into Building 720 (indoor air sampling)
- Further investigate cobalt in groundwater near Building 1041

Based on the results of the Phase 1 RI, further investigation is required to determine nature and extent of contamination at Site 43. To address the data gaps observed in the Phase 1 RI field effort, a SAP Addendum has been prepared and included as Appendix N. This SAP Addendum presents the proposed additional sampling for the Phase 2 RI and will be used in conjunction with the original SAP for the additional investigation at Site 43.

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TABLES

TABLE 2-1
SOIL SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample ID	Sample Interval (feet bgs)	Sampe Date	
S43SB008-0608	6-8	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC, Grain Size, Bulk Density, Effective Porosity
S43SB008-0607	6-7	6/10/2011	VOCs[2]
S43SB009-0608	6-8	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB009-0708	7-8	6/10/2011	VOCs[2]
S43SB009-0708-D	7-8	6/10/2011	VOCs[2]
S43SB010-0709	7-9	6/3/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB011-0709	7-9	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB011-0709-D	7-9	6/4/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB011-3335	33-35	6/12/2011	Shelby Tube
S43SB011-0507	5-7	6/10/2011	VOCs[2]
S43SB011Outside1-1315	13-15	6/10/2011	Total Oxidant Demand
S43SB012-0507	5-7	6/11/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB012-0507-D	5-7	6/11/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB013-0608	6-8	6/3/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB014-0709	7-9	6/4/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB015-0810	8-10	6/3/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB016-0608	6-8	6/5/2011	VOCs[1], Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB016-0607	6-7	6/12/2011	VOCs[2]
S43SB017-0608	6-8	6/10/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB017-1517	15-17	6/10/2011	Grain Size
S43SB018-0507	5-7	6/10/2011	VOCs, Explosives, Perchlorate, TAL Metals, Total Cyanide, TOC
S43SB018-3234	32-34	6/10/2011	Grain Size
S43SB019-0607	6-7	6/11/2011	VOCs
S43SB019Inside2-1315	13-15	6/11/2011	Total Oxidant Demand
S43SB022-0708	7-8	6/11/2011	VOCs
S43SB022Inside1-1315	13-15	6/11/2011	Total Oxidant Demand

Notes:
bgs : below ground surface
D : Duplicate sample
TAL: Target Analyte List
TOC : Total Organic Carbon
VOC : Volatile Organic Compound
[1] VOC sample exceeded holding time due to wrong preservative
[2] VOC sample recollected

TABLE 2-2
GROUNDWATER SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample ID	Sample Interval (feet bgs)	Sample Date	TAL Analysis
S43MW01-03	9-19	6/17/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43MW02-03	12-22	6/17/2011	TCE, Total and Filtered Cobalt, Total Cyanide, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43MW03-01	24-34	6/17/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43MW04-01	23-33	6/17/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43MW04-01D	23-33	6/17/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43MW05-01	21-31	6/17/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43MW06-01	17-27	6/17/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43TW006-2832	28-32	6/11/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43TW007-2327	23-27	6/3/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43TW007-2327-D	23-27	6/3/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43TW008-2832	28-32	6/5/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43TW009-2125	21-25	6/3/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate, Anions and Alkalinity, MEE, Sulfide, Dissolved TOC
S43TW010-2933	29-33	No sample	No sample[1]
S43TW011-3034	30-34	6/10/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate
S43TW012-2630	26-30	6/11/2011	VOCs, Total and Filtered TAL Metals, Total Cyanide, Explosives, Filtered Perchlorate

Notes:
bgs : below ground surface
D : Duplicate
MEE : Methane, Ethane, Ethene
TA: Target Analyte List
TCE : Trichloroethene
TOC : Total Organic Carbon
VOC : Volatile Organic Compound
[1] Temporary well did not yield any groundwater from three seperate attempts

TABLE 2-3
MONITORING WELL CONSTRUCTION DETAILS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Monitoring Well ID	Installation Date	Total Depth (feet below TOC)	Screened Interval Depth (feet bgs)	Northing*	Easting*	Reference Elevation TOC (feet MSL)	Ground Surface Elevation (feet MSL)
S43MW01	7/15/2005	18.75	9-19	330545	1254737	32.982	33.218
S43MW02	7/14/2005	21.4	12-22	329986	1254243	33.677	34.05
S43MW03	6/4/2011	36.72	24-34	330472	1254533	36.497	33.967
S43MW04	6/5/2011	35	23-33	330590	1254589	35.519	33.226
S43MW05	6/4/2011	30.5	21-31	330713	1254748	33.412	33.855
S43MW06	6/5/2011	27	17-27	330469	1254852	32.838	33.043

Notes:
bgs : below ground surface
MW : Monitoring Well
MSL : Mean Sea Level
TOC : Top of Casing
* Coordinates recorded with GPS in NAD 1983 Sate Plane Maryland US Feet

TABLE 2-4
SOIL GAS SAMPLE SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sample ID	Sample Interval (feet bgs)	Sample Date	Collection Method	Comments
S43ODA01	-	6/11/2011	8 hour Summa	Sample collected in 4 hours and is located on the NE corner of Gallery Rd and Schuyler Rd
S43SG01	0-6	6/11/2011	30 minute Summa	Sample collected in 1.5 hours and is located in a grass area 3 feet west of Building 1040
S43SG02	0-6	No sample	30 minute Summa	No sample
S43SG02-D	0-6	No sample	30 minute Summa	No sample
S43SG03	0-5	6/11/2011	30 minute Summa	Sample collected in 1 hour and is located in an asphalt[1] area 3 feet north of Building 720
S43SG04	0-6	6/11/2011	30 minute Summa	Sample collected in 1.5 hours and is located in an asphalt[1] area 3 feet north of Building 720

Notes:
bgs : below ground surface
D : Duplicate
[1] Aspahlt approximately 3-5 inches thick with approximately 2 inches of gravel beneath

TABLE 3-1
2011 GROUNDWATER ELEVATION SUMMARY
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Well	Total Depth (feet below TOC)	Screened Interval Depth (feet bgs)	June 2011 Water Level (feet below TOC)	August 2011 Water Level (feet below TOC)	Surveyed TOC (feet MSL)	Ground Surface Elevation (feet MSL)	June 2011 Water Level (feet MSL)	August 2011 Water Level (feet MSL)
S43MW01	18.75	9-19	6.59	8.27	32.982	33.218	26.39	24.71
S43MW02	21.40	12-22	10.94	11.40	33.677	34.05	22.74	22.28
S43MW03	36.72	24-34	15.94	16.66	36.497	33.967	20.56	19.84
S43MW04	35.00	23-33	9.44	11.01	35.519	33.226	26.08	24.51
S43MW05	30.50	21-31	7.76	9.20	33.412	33.855	25.65	24.21
S43MW06	27.00	17-27	7.15	8.31	32.838	33.043	25.69	24.53

Notes:
bgs : below ground surface
MSL : Mean sea level
TOC : top of casing

TABLE 4-1
ANALYTICAL DETECTIONS - SOIL
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

	NSF-IH Background Subsurface Soil	Selected PAL [1]	S43SB008-0607	S43SB008-0608	S43SB009-0608	S43SB009-0708	S43SB009-0708-DUP	S43SB010-0709	S43SB011-0507DL	S43SB011-0709	S43SB011-0709-DUP	S43SB012-0507	S43SB012-0507-DUP	S43SB013-0608	S43SB014-0709	S43SB015-0810	S43SB016-0607	S43SB016-0608
Sample Date			**06/10/2011**	**06/04/2011**	**06/04/2011**	**06/10/2011**	**06/10/2011**	**06/03/2011**	**06/10/2011**	**06/04/2011**	**06/04/2011**	**06/11/2011**	**06/11/2011**	**06/03/2011**	**06/04/2011**	**06/03/2011**	**06/12/2011**	**06/05/2011**
Volatile Organics Compounds (µg/kg)																		
2-BUTANONE	-	2,800,000	ND	-	-	ND	ND	ND	ND	-	-	ND	ND	ND	-	564 J	ND	-
2-HEXANONE	-	21,000	ND	-	-	ND	ND	ND	ND	-	-	ND	ND	ND	-	16	ND	-
4-METHYL-2-PENTANONE	-	530,000	ND	-	-	ND	ND	ND	ND	-	-	ND	ND	ND	-	5,190 J	ND	-
ACETONE	-	6,100,000	20 J	-	-	14.5 J	13.3 J	ND	ND	-	-	12.1 B	12 J	ND	-	157,000 J	18.3 J	-
CIS-1,2-DICHLOROETHENE	-	16,000	ND	-	-	ND	ND	ND	ND	-	-	ND	ND	ND	-	ND	ND	-
METHYLENE CHLORIDE	-	11,000	ND	-	-	ND	ND	9.47 B	ND	-	-	ND	ND	6.81 J	-	8.6 J	ND	-
TETRACHLOROETHENE	-	550	ND	-	-	ND	ND	1.65 J	ND	-	-	ND	ND	ND	-	ND	ND	-
TOLUENE	-	500,000	ND	-	-	ND	ND	ND	ND	-	-	ND	ND	1.29 J	-	ND	ND	-
TRICHLOROETHENE	-	1,600	ND	-	-	ND	ND	ND	470	-	-	ND	ND	ND	-	ND	ND	-
VINYL CHLORIDE	-	60	ND	-	-	ND	ND	ND	ND	-	-	ND	ND	ND	-	ND	ND	-
Explosives (mg/kg)																		
1,3-DINITROBENZENE	-	0.61	-	ND	0.0375 J	-	-	ND	-	ND	ND	ND	ND	ND	ND	ND	-	0.032 J
4-NITROTOLUENE	-	30	-	ND	ND	-	-	ND	-	0.064 J	ND	ND	ND	ND	0.0234 J	ND	-	0.0239 J
PERCHLORATE (µg/kg)	-	5,500	-	3.86 J	ND	-	-	ND	-	ND	4.84 J	ND	ND	ND	1.08 J	ND	-	ND
Inorganics/Metals (mg/kg)																		
ALUMINUM	21,400	7,700	-	5,890	8,690	-	-	5,970	-	8,040	7,100	10,500	8,440	2,180	12,300	10,600	-	9,680
ARSENIC	28.7	0.39	-	1.53 J	3.01 J	-	-	0.925 J	-	2.25 J	5.24 J	2.91	2.92	0.834 J	2.48 J	2.14 L	-	1.19
BARIUM	66.5	1,500	-	28.2 J	51.1 J	-	-	30.8	-	39.6 J	16.7 J	221	**165**	19	**115 J**	**148**	-	55.4
BERYLLIUM	1.5	16	-	0.361	0.777	-	-	0.455 J	-	0.557	0.613	0.713	0.666	0.295 J	0.855	0.844	-	0.675
CHROMIUM	59.1	0.29	-	8.03 K	15.8 K	-	-	10	-	13.3 K	14.5 K	16.2	13.4	18.5	15.7 K	13.1	-	14.2 K
COBALT	14.7	2.3	-	3.36	5.28	-	-	2.54	-	6.12	5.13	6.16	5.32	1.47	5.45	4.17	-	5.29
COPPER	47.6	310	-	4.8	14	-	-	10	-	8.13	11.6	12.1	10.2	7.38	15.3	12.9	-	10.4
IRON	35,200	5,500	-	9,430	14,500	-	-	8,670	-	9,380	15,500	9,620	9,590	4,010	10,600	8,630	-	8,290
LEAD	38.6	400	-	5.34	11.6	-	-	5.99	-	9.23	9.19	10.7	9.36	5.02	13.3	11.4	-	9.87
MANGANESE	155	160	-	23.3 K	16.9 K	-	-	11.5	-	28.6 K	30 K	30.9	18.1	23	17 K	10.3	-	9.75 K
MERCURY	0.14	0.56	-	0.0128 J	ND	-	-	ND	-	ND	ND	ND	ND	ND	0.0133 J	ND	-	ND
NICKEL	15.9	150	-	6.02	10.3	-	-	5.92	-	10.4	9.5	11.2	9.88	5.26	11.8	10.1	-	9.09
SELENIUM	3.8	39	-	ND	0.343 J	-	-	ND	-	0.223 J	0.258 J	ND	ND	ND	ND	ND	-	ND
VANADIUM	102	7.8	-	11.3 K	27.1 K	-	-	12.7	-	16.4 J	29.9 J	18.3	18	7.53	20.3 J	20.1	-	12.6 K
ZINC	49.7	2,300	-	18.8 K	35.7 K	-	-	16.9	-	27.8 K	31.4 K	35.2	33.8	9.98	46.6 K	26.3	-	36.2 K
Miscellaneous (mg/kg)																		
TOTAL ORGANIC CARBON	-	NA	-	1,180 J	1,660	-	-	702 J	-	1,210 J	900 J	1,260 J	1,690	1,100 J	1,030 J	828 J	-	1,020 J

Notes:
- : not analyzed/no value
PAL : Project Action Limit
DUP : Duplicate sample
µg/kg : microgram per kilogram
mg/kg : milligram per kilogram
J : Estimated value
B : Compound detected in blank sample
K : Biased high
L : Biased Low
DL : Diluted sample
ND : Not detected
Blank cell indicates no sample taken
Bold values indicate an exceedance of background levels
Shaded cells indicate exceedances of PALs
[1] Selected PAL is the lowest (most conservative) of Project Screening Levels
Note: Complete validated analytical data set can be found in Appendix M

TABLE 4-1
ANALYTICAL DETECTIONS - SOIL
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

	NSF-IH Background Subsurface Soil	Selected PAL [1]	S43SB017-0608	S43SB018-0507	S43SB019-0607	S43SB022-0708
Sample Date			**06/10/2011**	**06/10/2011**	**06/11/2011**	**06/11/2011**
Volatile Organics Compounds (µg/kg)						
2-BUTANONE	-	2,800,000	ND	ND	ND	837
2-HEXANONE	-	21,000	ND	ND	ND	ND
4-METHYL-2-PENTANONE	-	530,000	ND	ND	ND	19,100 J
ACETONE	-	6,100,000	ND	ND	23.6 J	4,660,000
CIS-1,2-DICHLOROETHENE	-	16,000	397	ND	ND	585
METHYLENE CHLORIDE	-	11,000	ND	ND	ND	ND
TETRACHLOROETHENE	-	550	ND	ND	ND	ND
TOLUENE	-	500,000	ND	ND	ND	ND
TRICHLOROETHENE	-	1,600	3,940	776	ND	ND
VINYL CHLORIDE	-	60	ND	ND	14.3	ND
Explosives (mg/kg)						
1,3-DINITROBENZENE	-	0.61	ND	ND	-	-
4-NITROTOLUENE	-	30	ND	ND	-	-
PERCHLORATE (µg/kg)	-	5,500	ND	ND	-	-
Inorganics/Metals (mg/kg)						
ALUMINUM	21,400	7,700	7,220	7,260	-	-
ARSENIC	28.7	0.39	1.28	0.895	-	-
BARIUM	66.5	1,500	33.2	25.6	-	-
BERYLLIUM	1.5	16	0.545	0.605	-	-
CHROMIUM	59.1	0.29	12.7	11.9	-	-
COBALT	14.7	2.3	5.04	4.71	-	-
COPPER	47.6	310	6.77	9.81	-	-
IRON	35,200	5,500	9,110	10,500	-	-
LEAD	38.6	400	8.21	8.1	-	-
MANGANESE	155	160	16.5	15.4	-	-
MERCURY	0.14	0.56	ND	ND	-	-
NICKEL	15.9	150	8.38	8.97	-	-
SELENIUM	3.8	39	ND	ND	-	-
VANADIUM	102	7.8	17.8	16.7	-	-
ZINC	49.7	2,300	23.1	22.7	-	-
Miscellaneous (mg/kg)						
TOTAL ORGANIC CARBON	-	NA	588 J	1,130 J	-	-

Notes:
- : not analyzed/no value
PAL : Project Action Limit
DUP : Duplicate sample
µg/kg : microgram per kilogram
mg/kg : milligram per kilogram
J : Estimated value
B : Compound detected in blank sample
K : Biased high
L : Biased Low
DL : Diluted sample
ND : Not detected
Blank cell indicates no sample taken
Bold values indicate an exceedance of background levels
Shaded cells indicate exceedances of PALs
[1] Selected PAL is the lowest (most conservative) of Project Screening Levels
Note: Complete validated analytical data set can be found in Appendix M

TABLE 4-2
ANALYTICAL DETECTIONS-SOIL GAS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

	Selected PAL[1]	S43ODA01	S43SG01-06	S43SG03-05	S43SG04-06
Sample Date		6/11/2011	6/11/2011	6/11/2011	6/11/2011
Volatile Organics Compounds (µg/m^3)					
1,1,1-TRICHLOROETHANE	520	0.071 J	ND	0.24 J	ND
1,1-DICHLOROETHANE	1.5	ND	140	0.069 J	ND
1,1-DICHLOROETHENE	21	ND	ND	0.19	ND
1,2-DICHLOROETHANE	0.094	0.046 J	ND	0.07 J	ND
1,4-DIOXANE	0.32	ND	ND	0.68 J	ND
2-BUTANONE	520	6.1	160 J	100	1,600 J
2-HEXANONE	3.1	0.86 J	ND	12	ND
4-METHYL-2-PENTANONE	310	ND	ND	ND	1,600 J
ACETONE	3,200	17	3,100	190	690,000
BENZENE	0.31	0.31	ND	1.1	ND
CARBON DISULFIDE	73	0.55 J	ND	2.8 J	ND
CARBON TETRACHLORIDE	0.16	0.66 J	ND	ND	ND
CHLOROETHANE	1,000	ND	180 J	0.64 J	ND
CHLOROMETHANE	9.4	1.8	100 J	2.3	ND
CIS-1,2-DICHLOROETHENE	6.3	ND	140	59	29,000
ETHYL BENZENE	0.97	0.068 J	ND	0.53	ND
FREON 11	73	1.6	ND	1.6 J	ND
FREON 12	21	2.6	ND	2.7	ND
METHYLENE CHLORIDE	5.2	0.68 J	ND	5	ND
METHYL TERT-BUTYL ETHER	9.4	0.026 J	ND	0.083 J	ND
m,p-XYLENE	10	0.11 J	100	1.1	ND
o-XYLENE	10	0.055 J	ND	0.68	ND
TETRACHLOROETHENE	0.41	0.1 J	ND	0.19 J	ND
TOLUENE	520	0.52	790	2	ND
TRANS-1,2-DICHLOROETHANE	6.3	ND	ND	0.44 J	ND
TRICHLOROETHENE	1.2	ND	ND	0.33	ND
VINYL CHLORIDE	0.16	ND	30,000	100	ND

Notes:
PAL : Project Action Limit
µg/m^3 : micrograms per cubic meter
ND : non-detect
J : Estimated value
Shaded cells indicate exceedances of PALs
[1] Selected PAL is the lowest (most conservative)
of Project Screening Levels
Note: Complete validated analytical data set can be found in Appendix M

TABLE 4-3
ANALYTICAL DETECTIONS TEMPORARY WELLS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

	Selected PALs [1]	S43TW06-2832	S43TW07-2327	S43TW07-2327-DUP	S43TW08-2832	S43TW09-2125	S43TW11-3034	S43TW12-2630
Sample Date		**06/11/2011**	**06/03/2011**	**06/03/2011**	**06/05/2011**	**06/03/2011**	**06/10/2011**	**06/11/2011**
Volatile Organic Compounds (µg/L)								
1,1-DICHLOROETHENE	7	ND	4.5 J	4.75 J	0.364 J	ND	ND	ND
ACETONE	550	ND	ND	ND	10.6 J	55.6 J	ND	ND
CIS-1,2-DICHLOROETHENE	7.3	4.49	56.5	61.3	21.8	2.61 J	ND	ND
METHYLENE CHLORIDE	4.8	ND	7.7 J	9.74 J	0.748 J	4.84 J	ND	ND
TRICHLOROETHENE	2	53.9	923	1,010	41.9	563	1.68	ND
VINYL CHLORIDE	0.016	0.724 J	26.2	25.8	16.2	ND	ND	ND
Other/Dissolved Gases (µg/L)								
ETHANE	2	-	10.3 J	11.5 J	-	ND	-	-
ETHENE	1	-	8.89	10.3	-	ND	-	-
METHANE	1	-	196 J	235 J	-	46.4 J	-	-
Explosives(µg/L)								
1,3-DINITROBENZENE	0.37	ND	ND	ND	ND	ND	0.421 J	ND
2-NITROTOLUENE	0.31	ND	ND	ND	ND	0.11 J	ND	ND
3-NITROTOLUENE	0.37	ND	0.898 J	0.708 J	0.156 J	ND	ND	0.811 J
4-AMINO-2,6-DINITROTOLUENE	7.3	ND	0.176 J	0.177 J	ND	0.0873 J	ND	ND
4-NITROTOLUENE	4.2	ND	ND	0.401 J	0.146 J	ND	ND	ND
HMX	180	ND	ND	ND	ND	ND	1.33 J	ND
NITROGLYCERIN	0.37	ND	ND	ND	ND	ND	0.639 J	0.341 J
RDX	0.61	0.37 J	0.628 P	0.616 J	0.49 J	0.763	ND	ND
Total Inorganics/Metals (µg/L)								
ALUMINUM	3,700	21,900	23,700	24,300	21,500	13,900	27,100	20,500
ARSENIC	0.045	12.9	11.7 J	11.8 J	28.8	13.8 L	43.5	39.2
BARIUM	730	234	295	301	316	208	267	243
BERYLLIUM	4	2.38	2.53 J	2.54 J	4.11 J	1.99 J	1.98 J	1.76 J
CHROMIUM	0.043	141	53.2	53.6	75.7	78.5	126	239
COBALT	1.1	29.5	28.3	29.6	132	11.4 J	32.3	29.6
COPPER	150	99.2	93.5	98.2	91.8	87	93.7	163
IRON	2,600	52,800 K	58,200	58300	58,500	61,300	58,200 K	68,500 K
LEAD	15	42.6	48.1	48.7	41.9	43.4	38.7	32
MANGANESE	73	811	610	618	678	485	418	507
MERCURY	0.057	0.125 J	0.261	0.25	0.36	0.0857 J	0.236	0.206
NICKEL	73	34	23.1	23.8	112	15 L	64.9	85.6
SELENIUM	18	ND	ND	ND	ND	ND	6.49	2.92
VANADIUM	3.7	101	80.2	82.2	104	64.8	91	78.6
ZINC	1,100	66	99.3	104	312	42	103	129
Filtered Inorganics/Metals (µg/L)								
ALUMINUM	3,700	3,150	11,400 J	2,740 J	2,150	42.2 J	373	1,340
ARSENIC	0.045	**2.97**	7.17 K	2.86 J	5.84 J	7.59 L	3.74	4.53
BARIUM	730	93.4	173 J	106 J	93.7	108 J	92.2	90.9
BERYLLIUM	4	0.386 J	1.11 J	ND	ND	ND	ND	ND
CHROMIUM	0.043	16.3	23.8 J	5.59 J	9.44 J	ND	1.83 J	15.3
COBALT	1.1	14.2	14.7 J	7.12 J	17.8	2.5 J	ND	2.2 J
COPPER	150	11.9	38.9 J	9.23 J	9.53 J	ND	ND	9.95
IRON	2,600	28,300 K	48,200	39,900	32,500	47,200	23,700 K	24,200 K
LEAD	15	5.6	18.7 J	4.78 J	3.72 J	ND	ND	1.12 L
MANGANESE	73	566	550	472	491	475	270	274
MERCURY	0.057	ND	0.0825 J	ND	ND	ND	ND	ND
NICKEL	73	8.43	12.7 J	5.2 J	17.9	8.06 J	4.4	10.2
VANADIUM	3.7	14.9	38 J	9.44 J	11.9 J	ND	1.54 J	5.39
ZINC	1,100	10.9	42.5 J	12.2 J	33.1	17.4 J	2.72 J	11.4
Other/Wet Chemistry (mg/L)								
ALKALINITY	50	-	27.4	41	-	41.8	-	-
CHLORIDE	10	-	41.7	41	-	54	-	-
NITRATE-N	1	-	0.043 J	ND	-	ND	-	-
SULFATE	20	-	11.8	11.2	-	0.926 J	-	-
TOTAL ORGANIC CARBON	20	-	1.86 J	4.33 J	-	3.86	-	-

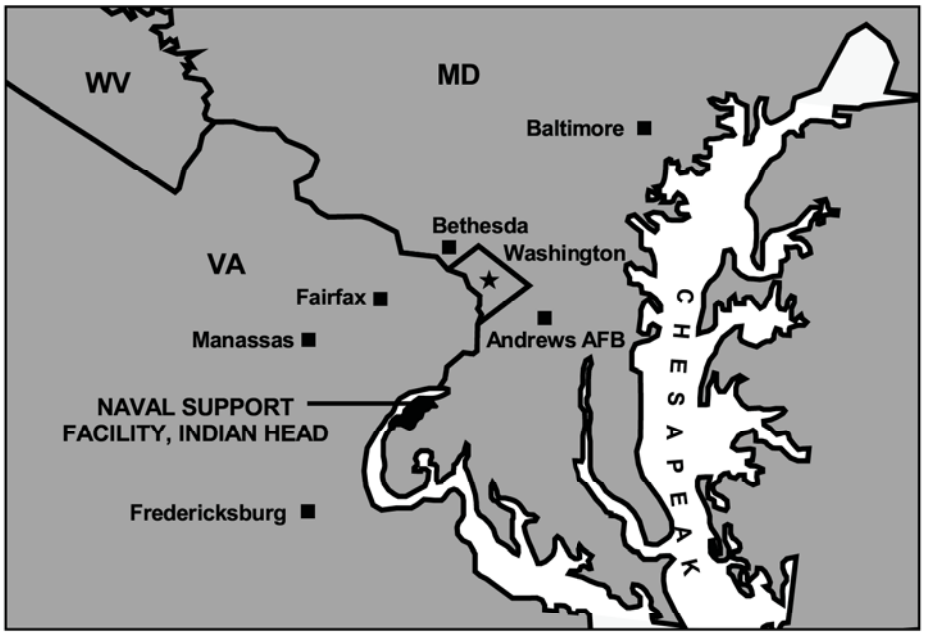
Notes:
- : not analyzed/no value
PAL : Project Action Limit
DUP : Duplicate sample
µg/L : microgram per liter
mg/L : milligram per liter
ND : Not detected
J : Estimated value
K : Biased High
L : Biased Low
Shaded cells indicate exceedances of PALs
[1] Selected PAL is the lowest (most conservative) of Project Screening Levels
Note: Complete validated analytical data set can be found in Appendix M

TABLE 4-4
ANALYTICAL DETECTIONS-MONITORING WELLS
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

	Selected PALs [1]	S43MW01-03	S43MW02-03	S43MW03-01	S43MW04-01	S43MW04-01DUP	S43MW05-01	S43MW06-01
Sample Date		**06/17/2011**	**06/17/2011**	**06/17/2011**	**06/17/2011**	**06/17/2011**	**06/17/2011**	**06/17/2011**
Volatile Organic Compounds (µg/L)								
1,1,1-TRICHLOROETHANE	200	ND	-	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	2.4	ND	-	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	7	ND	-	ND	2.56 J	2.43 J	ND	ND
CHLOROFORM	0.19	8.32 J	-	ND	ND	ND	ND	ND
CHLOROMETHANE	19	ND	-	6.35	5.05	ND	3.41	ND
CIS-1,2-DICHLOROETHENE	7.3	284	-	0.896 J	152	156	ND	41.6
TRICHLOROETHENE	2	10,900	0.398 J	1.74	699	682	ND	1,130
VINYL CHLORIDE	0.016	ND	-	1.16	15.7	14.1	ND	ND
Other/Dissolved Gases (µg/L)								
ETHANE	2	15.8 J	ND		60.6 J	ND		2.94 J
ETHENE	1	ND	ND		11.5 J	ND		ND
METHANE	1	687 J	ND		623 J	5.14 J		257 J
Explosives(µg/L)								
1,3-DINITROBENZENE	0.37	0.15 J	-	ND	ND	ND	0.131 J	0.244 J
2-NITROTOLUENE	0.31	0.236 J	-	ND	ND	ND	ND	ND
3-NITROTOLUENE	0.37	0.723 J	-	ND	2.91	3.57 J	ND	ND
2-AMINO-4,6-DINITROTOLUENE	7.3	0.274 J	-	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	7.3	ND	-	ND	ND	ND	0.0929 J	0.128 J
4-NITROTOLUENE	4.2	ND	-	ND	ND	ND	ND	0.195 J
HMX	180	ND	-	ND	0.125 J	0.125 J	ND	0.904
NITROGLYCERIN	0.37	25.2 J	-	0.262 J	ND	ND	ND	32.3 J
RDX	0.61	ND	-	ND	0.212 J	0.415 J	0.0886 J	1.7 J
PERCHLORATE	2.6	0.251 J	-	ND	0.244 J	ND	ND	ND
Total Inorganics/Metals (µg/L)								
ALUMINUM	3,700	1,550	-	22.5 J	18.2 J	14.1 J	1,090	4,050
ARSENIC	0.045	2.65	-	16.9	1.72 J	1.7 J	1.58 J	2.76
BARIUM	730	30.8	-	132	96.6	90.9	106	138
BERYLLIUM	4	0.385 J	-	ND	ND	ND	0.386	0.536 J
CADMIUM	1.8	0.558 J	-	ND	ND	ND	ND	ND
CHROMIUM	0.043	11.6	-	ND	ND	ND	2.76	9.79
COBALT	1.1	9.03	70.4	4.25	24.7	23.4	31.1	40.7
COPPER	150	14.3	-	ND	ND	ND	2.92	9.93
IRON	2,600	2,420 K	-	42,600 K	16,600 K	16,200 K	10,400	35,800 K
LEAD	15	4.57	-	ND	ND	ND	1.41 L	3.73
MANGANESE	73	101	-	602	409	383	345	611
NICKEL	73	11.7	-	0.875 J	14.3	14.0	25.5	28.8
SELENIUM	18	0.786 J	-	ND	ND	ND	ND	ND
VANADIUM	3.7	14.2	-	ND	ND	ND	4.61	15.7
ZINC	1,100	102	-	11.6	14.8	13.2	38.3	33.2
Filtered Inorganics/Metals (µg/L)								
ALUMINUM	3,700	195	-	16.2 J	ND	ND	26.5 J	17.0 J
ARSENIC	0.045	2.13 J	-	15.2	1.67 J	1.53 J	1.22 J	2.09 J
BARIUM	730	25.3	-	129	91.9	94.1	110	126
BERYLLIUM	4	ND	-	ND	ND	ND	ND	ND
CADMIUM	1.8	0.427 J	-	ND	ND	ND	ND	ND
CHROMIUM	0.043	6.58	-	ND	ND	ND	ND	ND
COBALT	1.1	8.28	73.5	4.21	23.9	24.5	33.5	35.4
COPPER	150	8.94	-	ND	ND	ND	ND	ND
IRON	2,600	768 K	-	38,600	15,900 K	16,400 K	10,900	34,800 K
LEAD	15	0.444 J	-	ND	ND	ND	ND	ND
MANGANESE	73	90	-	572	394	396	383	616
NICKEL	73	10.2	-	ND	14.4	14.5	27.7	24.9
SELENIUM	18	0.916 J	-	ND	ND	ND	ND	ND
VANADIUM	3.7	9.48	-	ND	ND	ND	ND	ND
ZINC	1,100	60.6	-	11.5	14.1	13.9	36	13.9
Other/Wet Chemistry (mg/L)								
CHLORIDE	10	32.3	125	-	39.2	39.4	-	57
NITRATE-N	1	0.845 J	0.388 J	-	ND	ND	-	ND
NITRITE-N	1	0.059 J	ND	-	ND	ND	-	ND
SULFATE	20	34.2	14	-	5.82	5.93	-	4.96
TOTAL ORGANIC CARBON	20	9.41	1.77	-	1.71	1.76	-	3.08

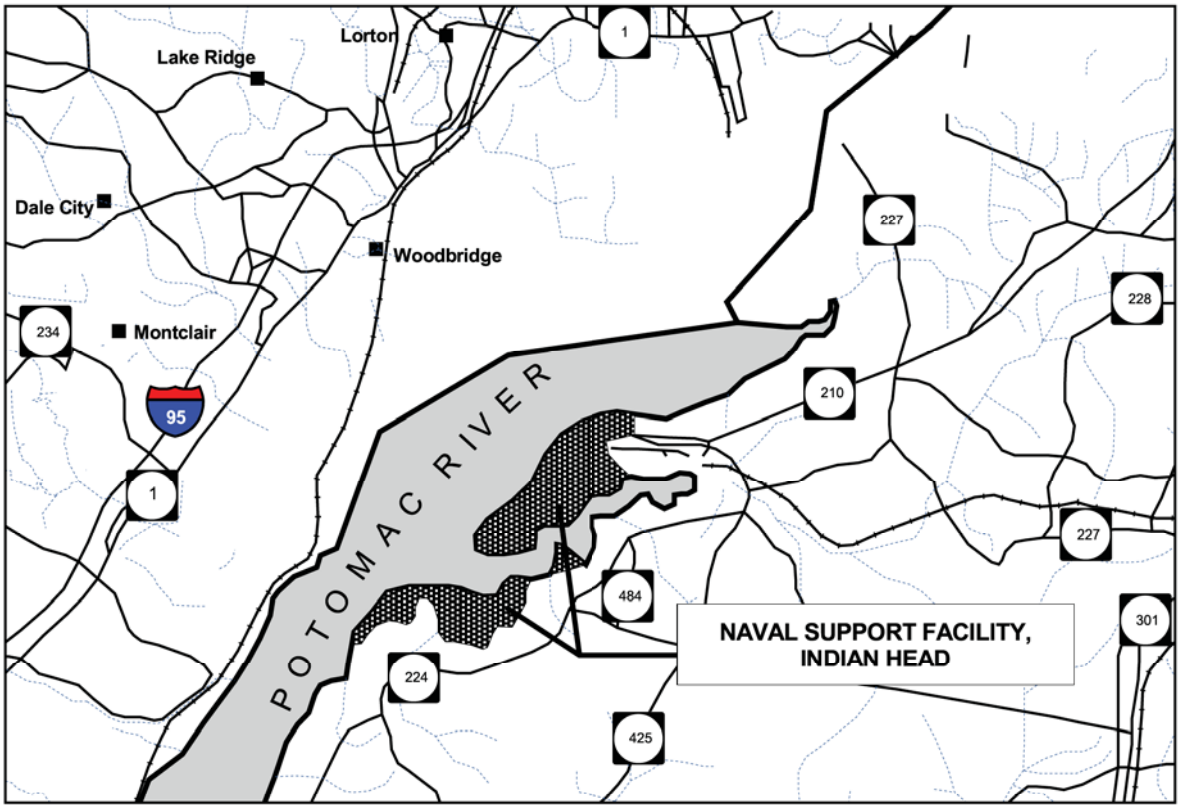
Notes:
- : not analyzed/no value
PAL : Project Action Limit
DUP : Duplicate sample
µg/L : micrograms per liter
mg/L : milligram per liter
ND : Non-detect
J : Estimated value
K : Biased High
L : Biased Low
Shaded cells indicate exceedances of PALs
[1] Selected PAL is the lowest (most conservative) of
Project Screening Levels
Note: Complete validated analytical data set can be found in Appendix M

FIGURES



LEGEND

- City
- Highway
- Railroad
- River



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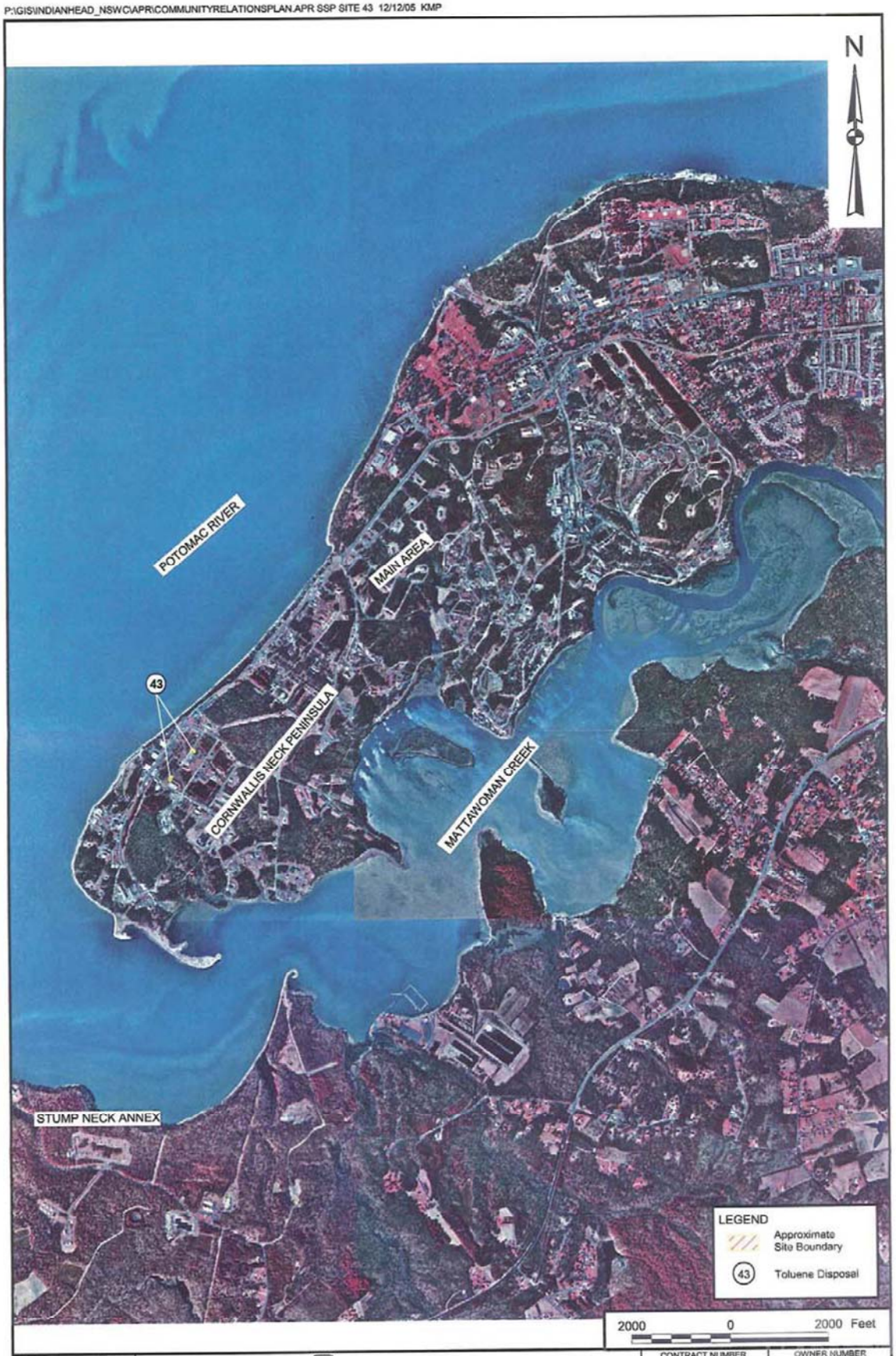
CHECKED BY G. LATULIPPE — DATE 12/03/07	FACILITY LOCATION MAP NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY G LATULIPPE	DATE 12/03/07
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 1-1	REV 0

P:\GIS\INDIANHEAD_NSWC\APR\SITE57_PILOTSTUDY_SITELOCATION.APR FACILITY LOCATION MAP 10/17/07 SS

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



DRAWN BY K. PEILA DATE 6/2/04	Tetra Tech	CONTRACT NUMBER 2193	OWNER NUMBER 0006
CHECKED BY KCT DATE 6/2/04	SITE LOCATION MAP 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

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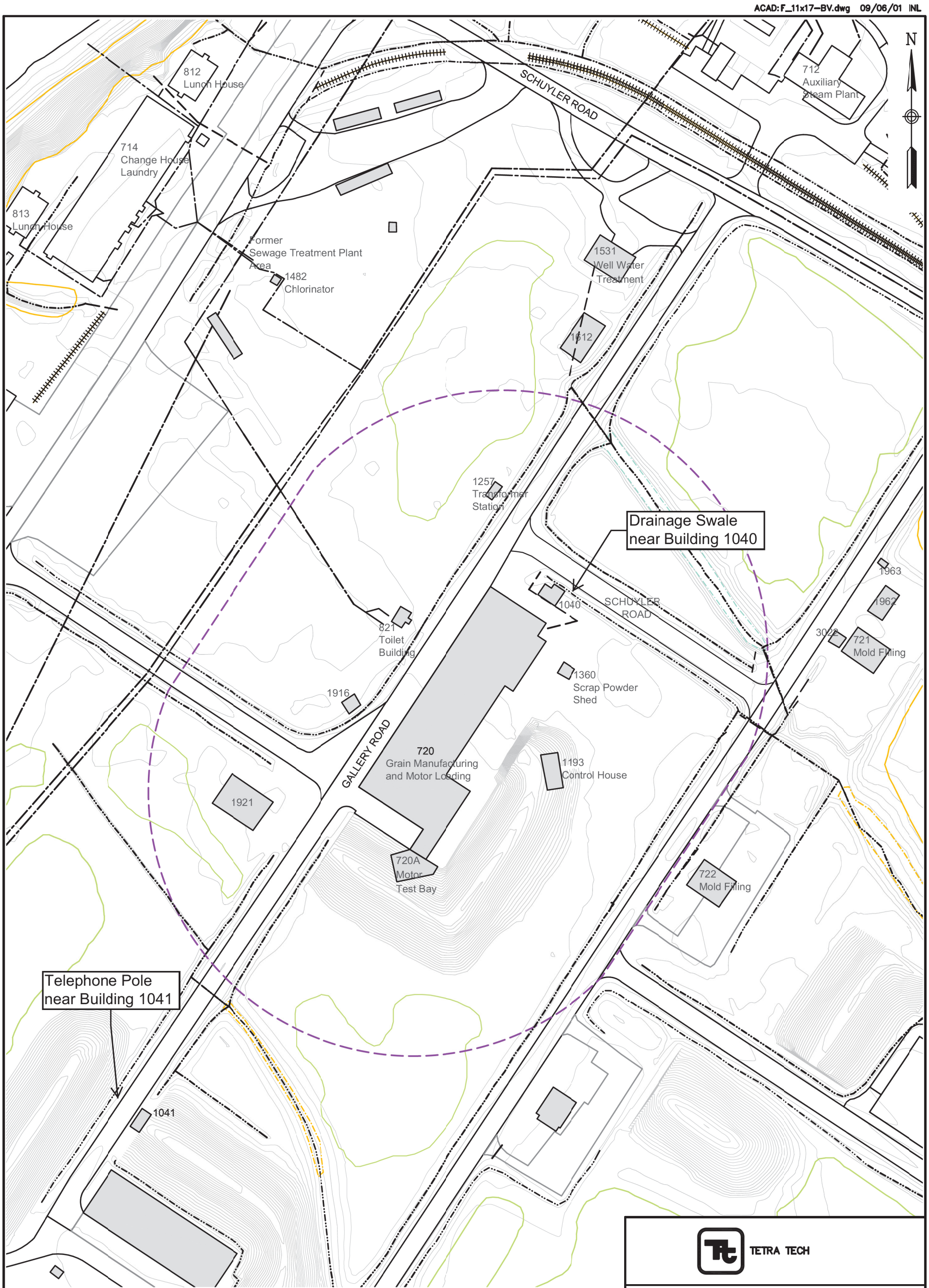

LEGEND

RAILROAD

STORM DRAIN

WATER LINE

STREAM/DRAINAGE DITCH

230 FOOT RESTRICTION

0 100 200

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 43 - TOLUENE DISPOSAL
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

FILE	SCALE
112G00771GM01.DWG	AS NOTED
FIGURE NUMBER: FIGURE 1-3	REV: 0 / DATE: 06/02/10

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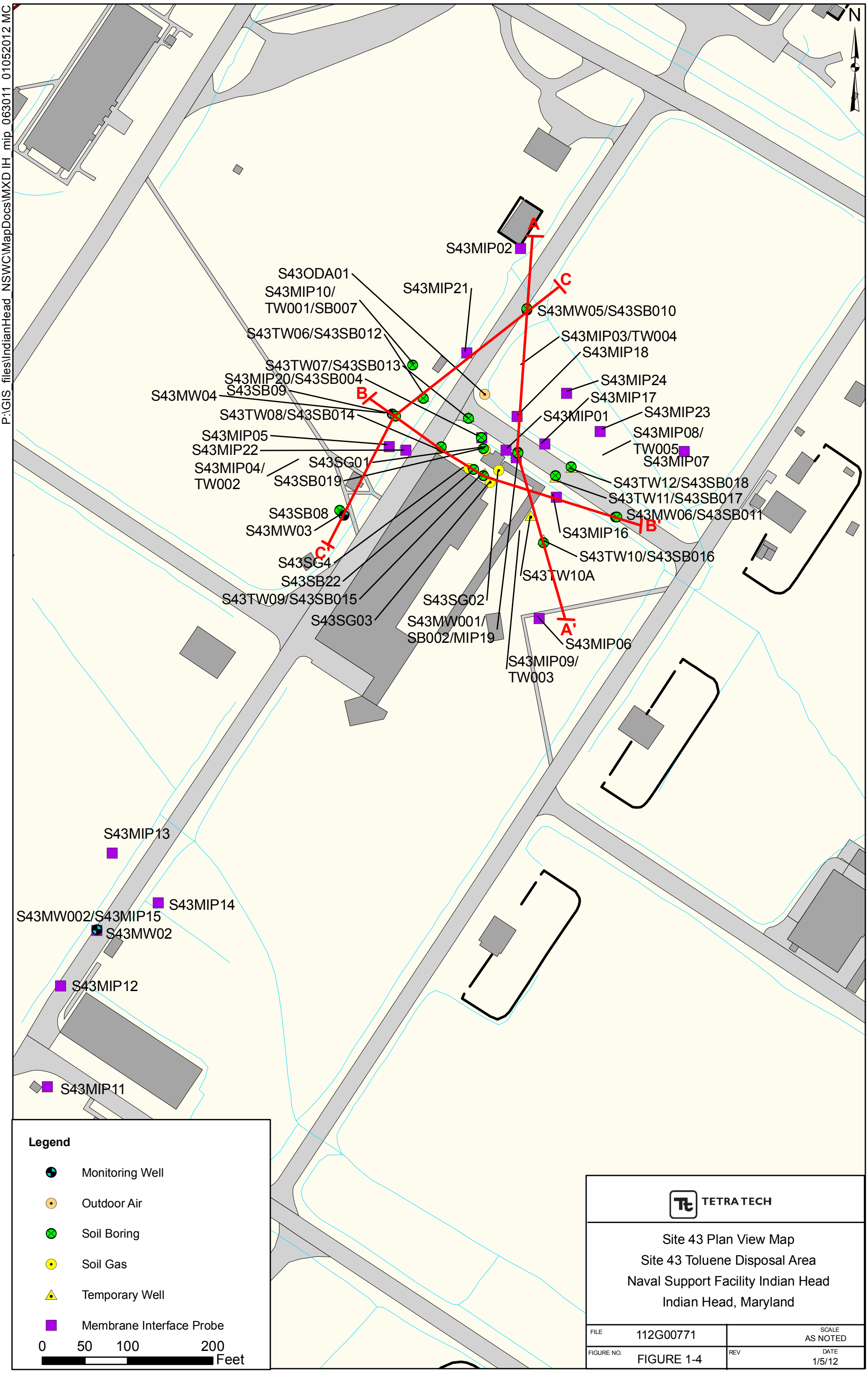

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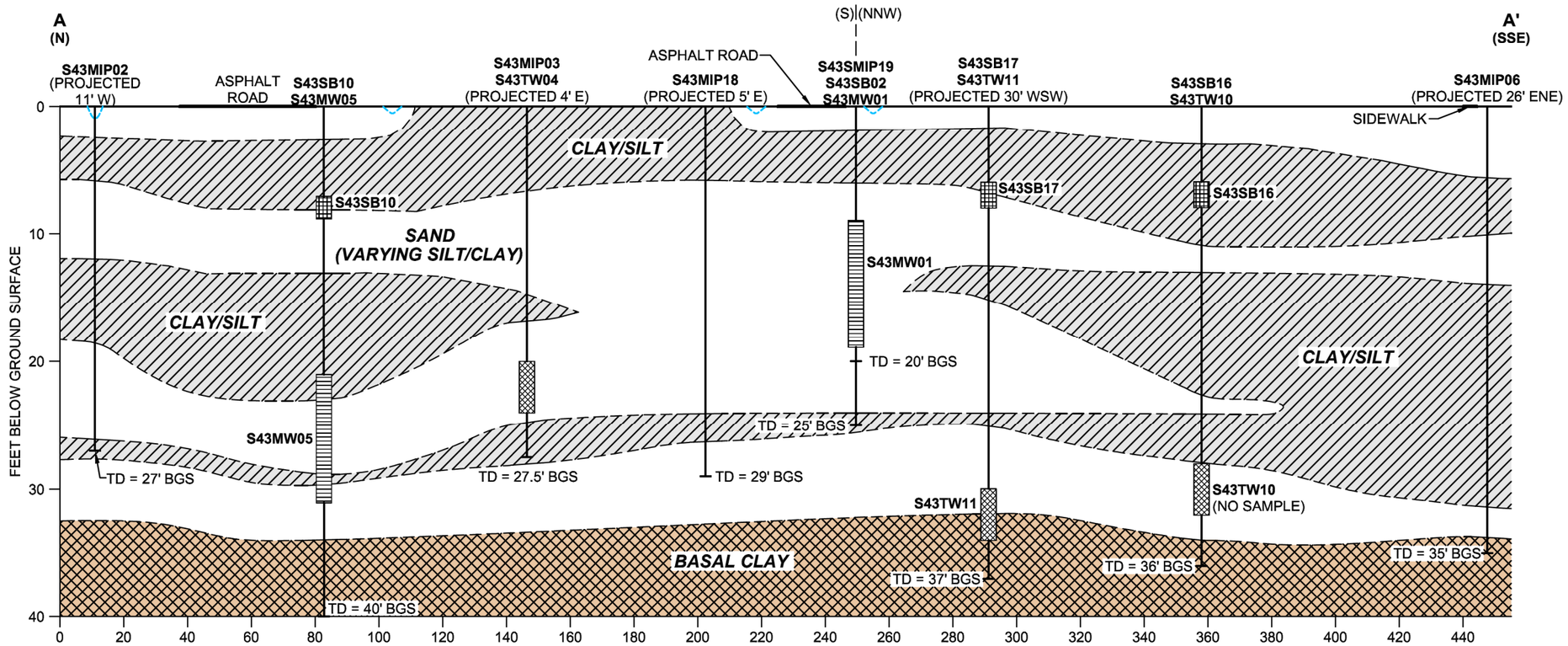
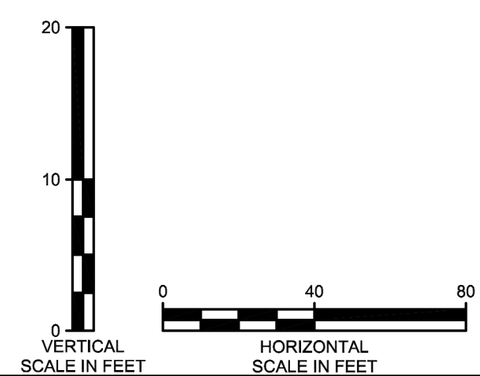


LEGEND

S43MIP02	MEMBRANE INTERFACE PROBE
S43SB10	SOIL BORING
S43MW05	MONITORING WELL
S43TW04	GROUNDWATER GRAB SAMPLE
(PROJECTED 5' S)	PROJECTED DISTANCE AND DIRECTIONS TO CROSS SECTION LINE
	GROUND SURFACE (APPROXIMATED TO BE FLAT) DITCH WITH STANDING WATER
	GEOLOGIC CONTACT (DASHED WHERE INFERRED)
	BOREHOLE
S43TW04	GROUNDWATER GRAB SAMPLE
S43SB10	SOIL SAMPLE
S43MW05	MONITORING WELL SCREEN
TD = 40' BGS	TOTAL DEPTH
	SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND GRAVEL
	CLAY OR SILT WITH VARYING AMOUNTS OF SAND
	BASAL CLAY

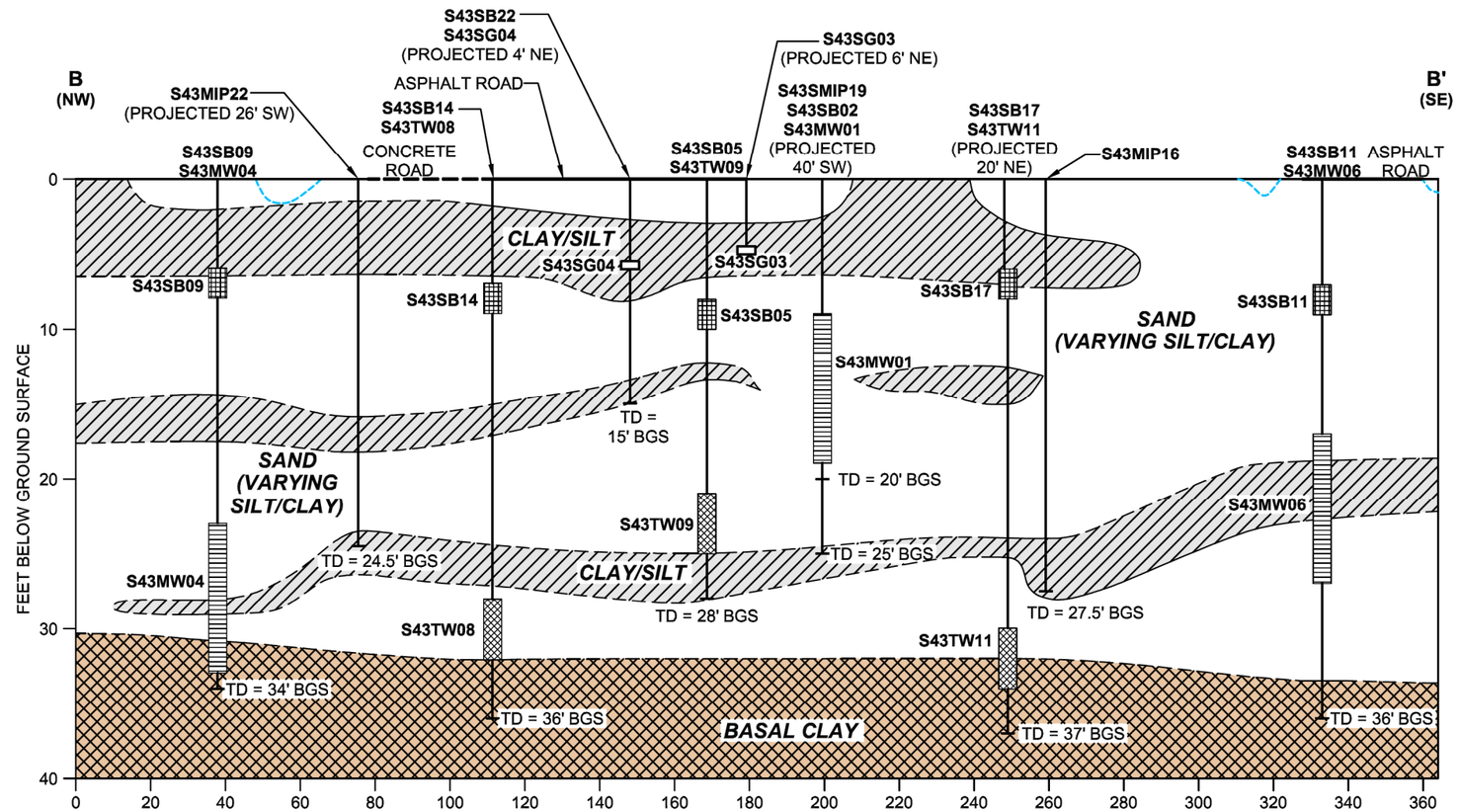


TETRA TECH

GEOLOGIC CROSS SECTION A – A'
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

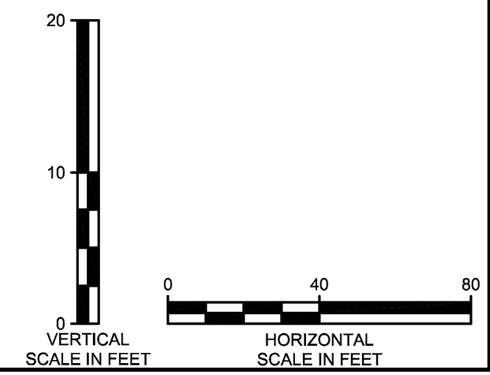
FILE	SCALE
112G00771GS02-1	AS NOTED
FIGURE NUMBER: FIGURE 3-1	REV: 0 / DATE: 12/08/11

112G00771/0620/112G00771GS02-2.DWG 12/08/11 MKB



LEGEND

S43SG04	SOIL GAS SAMPLE
S43MIP22	MEMBRANE INTERFACE PROBE
S43SB09	SOIL BORING
S43MW04	MONITORING WELL
S43TW08	GROUNDWATER GRAB SAMPLE
(PROJECTED 5' S)	PROJECTED DISTANCE AND DIRECTIONS TO CROSS SECTION LINE
	GROUND SURFACE (APPROXIMATED TO BE FLAT) DITCH WITH STANDING WATER
	GEOLOGIC CONTACT (DASHED WHERE INFERRED)
	BOREHOLE
S43TW08	GROUNDWATER GRAB SAMPLE
S43SB09	SOIL SAMPLE
S43MW05	MONITORING WELL SCREEN
TD = 40' BGS	TOTAL DEPTH
	SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND GRAVEL
	CLAY OR SILT WITH VARYING AMOUNTS OF SAND
	BASAL CLAY



TETRA TECH

GEOLOGIC CROSS SECTION B – B'
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

FILE	SCALE
112G00771GS02-2	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 3-2	0 / 12/08/11

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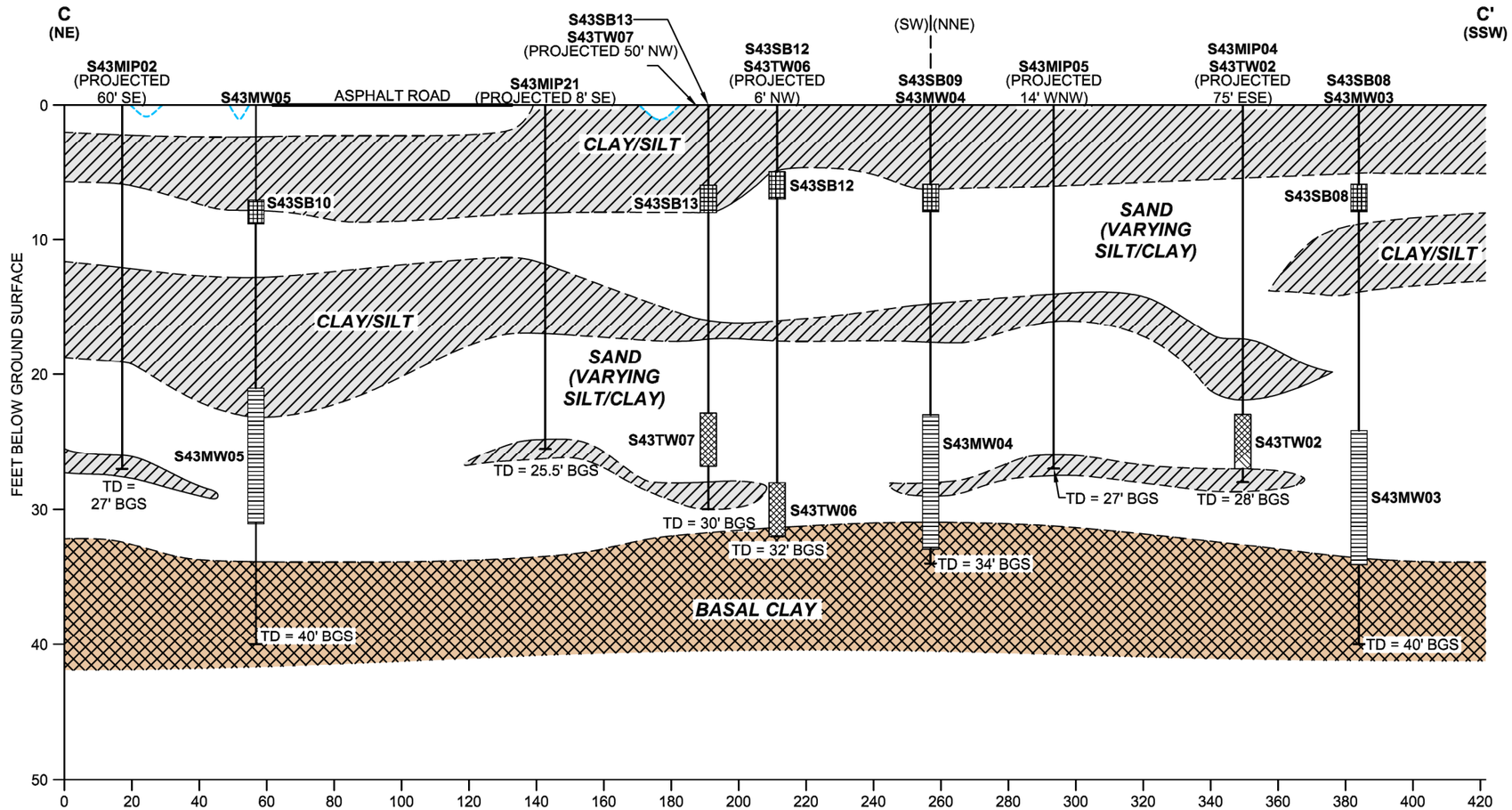
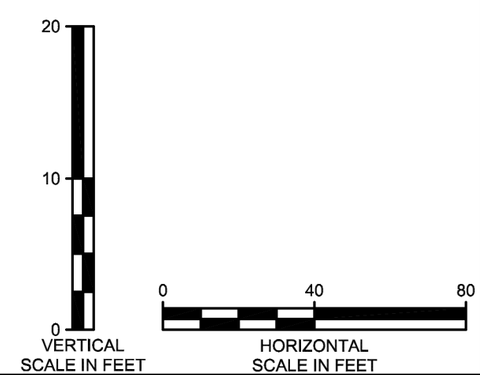


LEGEND

S43MIP04	MEMBRANE INTERFACE PROBE
S43SB09	SOIL BORING
S43MW04	MONITORING WELL
S43TW06	GROUNDWATER GRAB SAMPLE
(PROJECTED 5' S)	PROJECTED DISTANCE AND DIRECTIONS TO CROSS SECTION LINE
	GROUND SURFACE (APPROXIMATED TO BE FLAT) DITCH WITH STANDING WATER
	GEOLOGIC CONTACT (DASHED WHERE INFERRED)
	BOREHOLE
S43TW06	GROUNDWATER GRAB SAMPLE
S43SB09	SOIL SAMPLE
S43MW04	MONITORING WELL SCREEN
TD = 40' BGS	TOTAL DEPTH
	SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND GRAVEL
	CLAY OR SILT WITH VARYING AMOUNTS OF SAND
	BASAL CLAY



TETRA TECH

GEOLOGIC CROSS SECTION C – C'
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

FILE 112G00771GS02-3	SCALE AS NOTED
FIGURE NUMBER FIGURE 3-3	REV 0 / DATE 12/08/11

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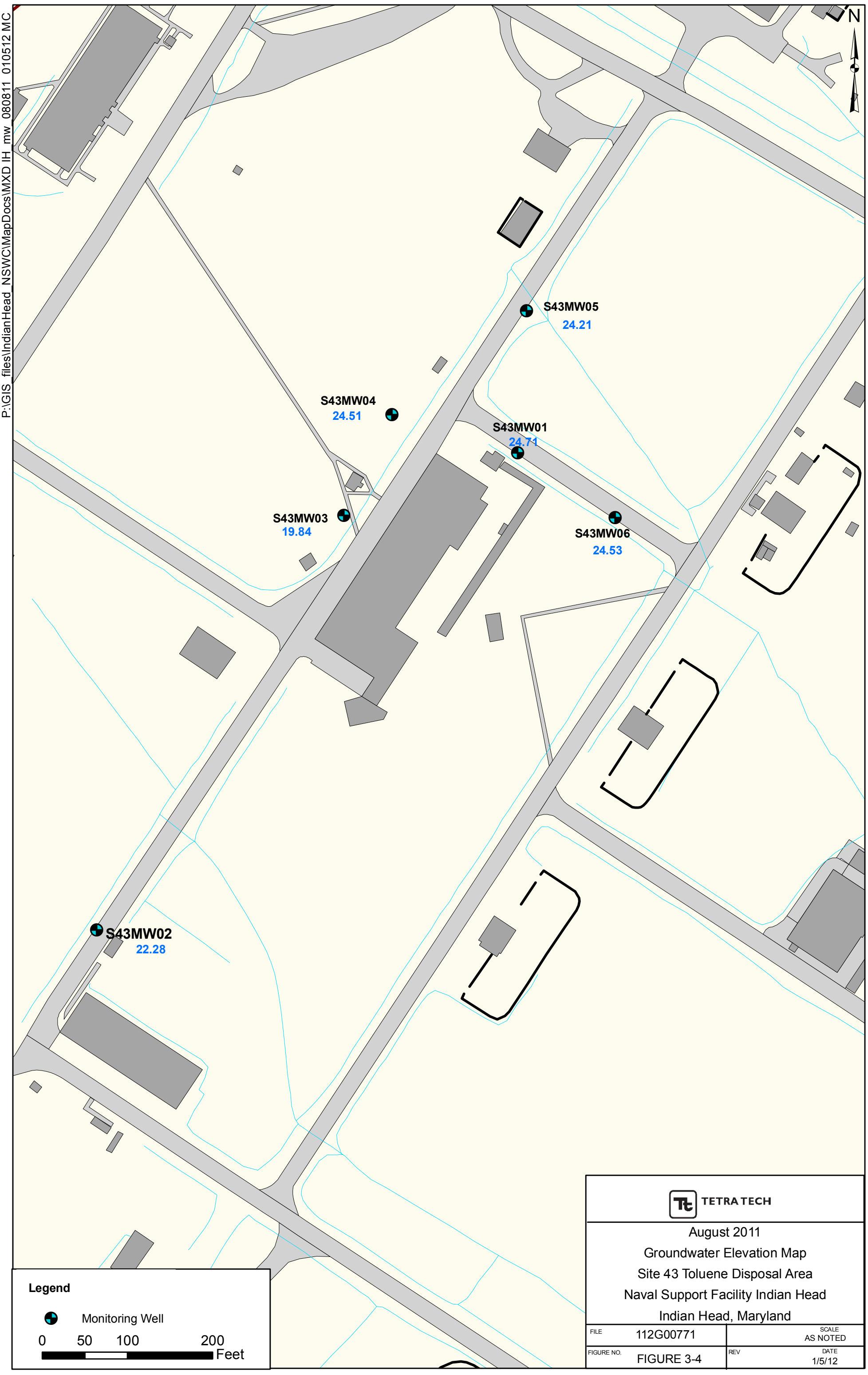
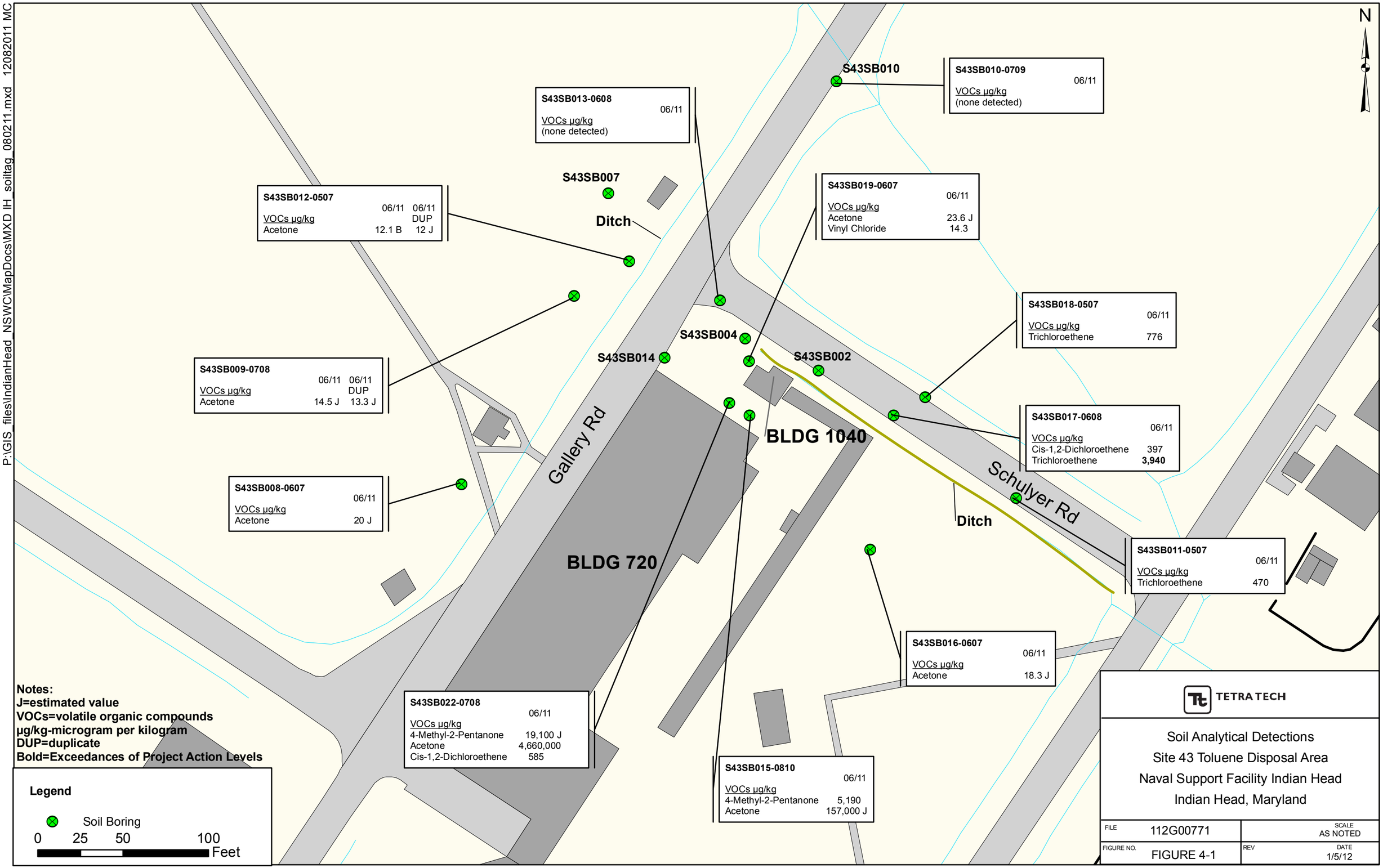


TETRA TECH

August 2011
Groundwater Elevation Map
Site 43 Toluene Disposal Area
Naval Support Facility Indian Head
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 3-4	REV	DATE 1/5/12

P:\GIS_files\IndianHead_NSWC\MapDocs\MXD IH_soiltag_080211.mxd 12082011 MC



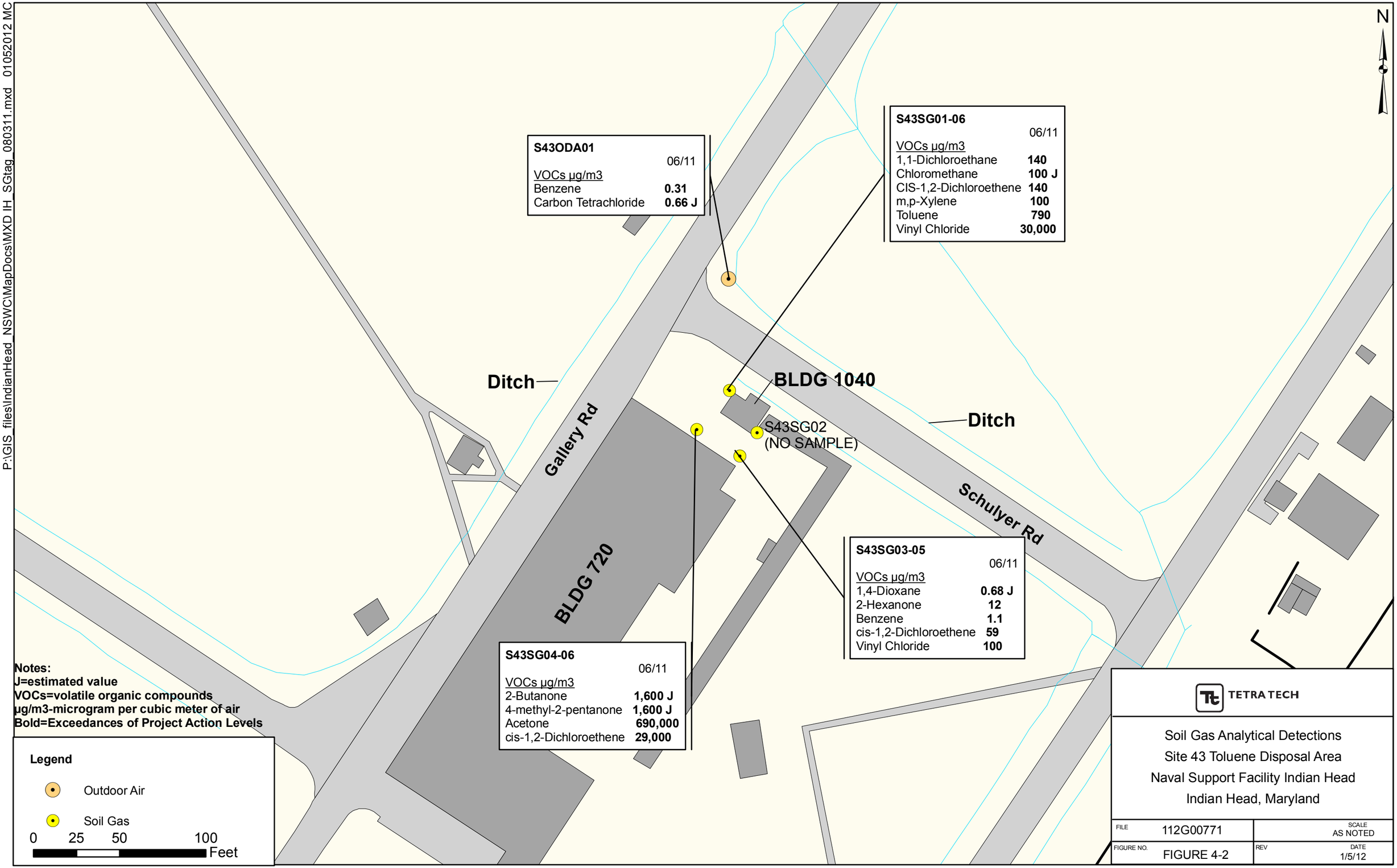
Notes:
J=estimated value
VOCs=volatile organic compounds
µg/kg-microgram per kilogram
DUP=duplicate
Bold=Exceedances of Project Action Levels

TETRA TECH

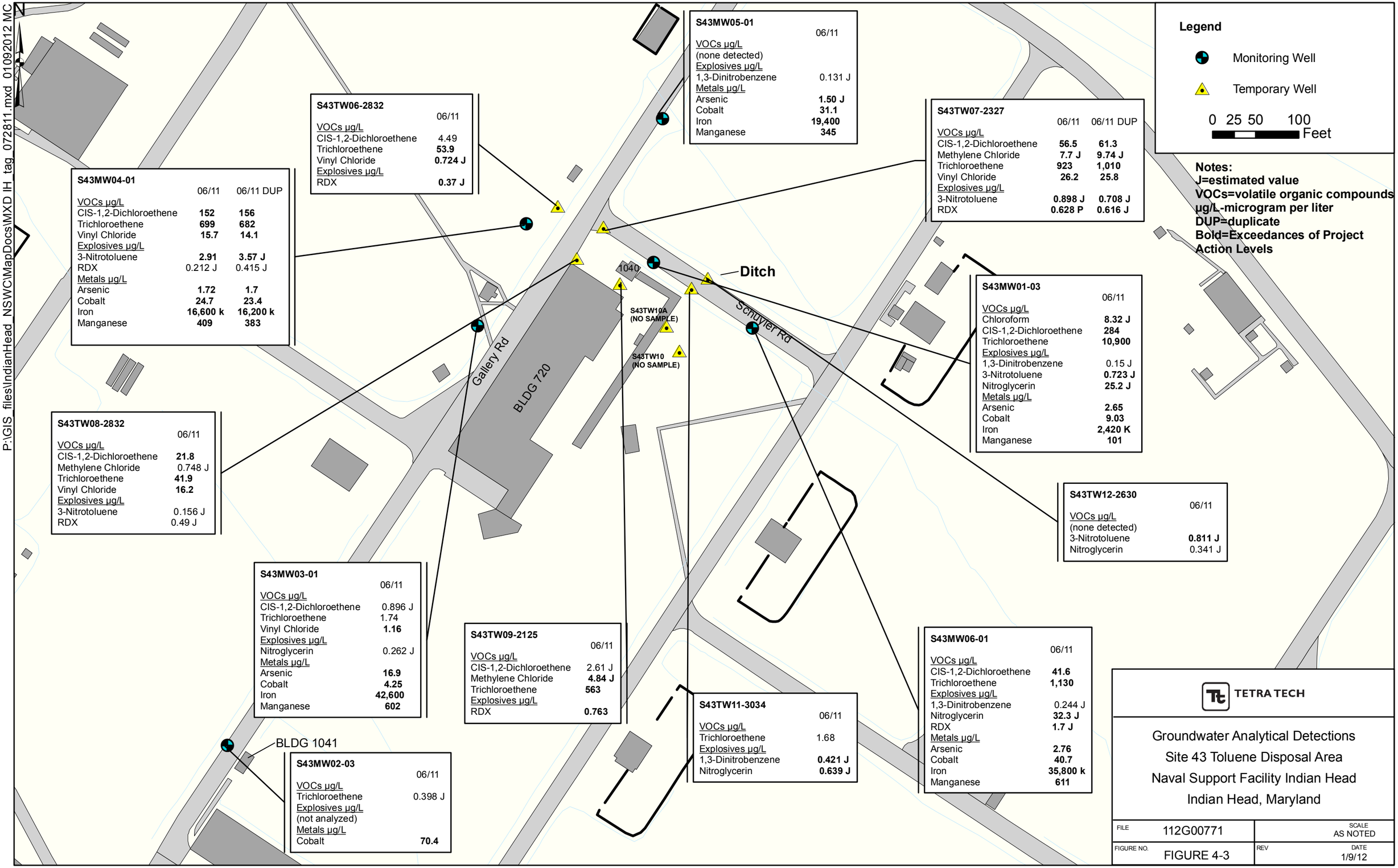
Soil Analytical Detections
Site 43 Toluene Disposal Area
Naval Support Facility Indian Head
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 4-1	REV / DATE	1/5/12

P:\GIS_files\IndianHead_NSWC\MapDocs\MXD IH_SGtag_080311.mxd 01052012 MC



P:\GIS_files\IndianHead_NSWC\MapDocs\MXD IH_tag_072811.mxd 01092012 MC



TETRA TECH

Groundwater Analytical Detections
Site 43 Toluene Disposal Area
Naval Support Facility Indian Head
Indian Head, Maryland

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 4-3	REV	DATE 1/9/12

APPENDICES

APPENDIX A
BORING LOGS

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6626DT

BORING No.: SB08/MW03
DATE: 6-4-11
GEOLOGIST: J. Birketh
DRILLER: Gene Burke

	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1130	S-1			4.75/5		med stiff	Brn	Silt some clay tr. F. sand		moist	0	0	0	0
						↓								
											0	0	0	0
						stiff	Brn gray	Silt and Clay		Moist				
		5									0	0	0	0
1138	S-2			4.5/5		med dense to loose	Brn	F. sand some silt and M. sand		moist	0	0	0	0
							light Brn	Same as above						
					▽		Brn	↓ ↓		1140 *S43SB08-0608 clay stringer 8' bgs	0	0	0	0
										wet				
		10				stiff	Gray	Clay some VF sand		wet	0	0	0	0
1143	S-3			3.5/5				↓ ↓		wet	0	0	0	0
						very stiff	Brn	Clay some silt and F. sand		moist	0	0	0	0
		15				stiff	Brn	VF-F sand some silt tr. M sand		wet	0	0	0	0
1150	S-4			2.5/5		Dense	Brn	F-M sand tr. some clay		Wet	0	0	0	0
						Dense	Brn	F sand some clay and M sand		wet				
								↓ ↓			0	0	0	0
						loose	Brn	F-M sand tr clay						
		20				slightly stiff	Gry Brn	Clay and F-M sand (50/50)		Wet	0	0	0	0
1208	S-5			3/5		loose	Brn	F-M sand tr. silt and clay		very wet sample	0	0	0	0
						loose	Brn Gray	F-C sand some F-M, rock frags tr. silt		very wet	0	0	0	0
		25						↓ ↓			0	0	0	0

* 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: Continuous macrocore (1" Φ in 2 Φ sleeve) to 30' bgs
Discrete soil sampling below 30' w/ control rods and 2" Φ cutting shoe 5' long

Converted to Well: Yes (X) No ~~XX~~ Well I.D. #: S43MW03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB08/MW03
DATE: 6-4-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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**
1230	S-6			3.5?/5				F-C sand some F-L Rock frags		very wet sample slot o F slough	0	0	0	0
										recovery hard to determine				
											0	0	0	0
		30				med stiff	Gray	clay tr F sand		Gray clay in shoe	0	0	0	0
1338	S-7			2/5		med dense	Gray	MC sand and F-M pebbles tr. silt and F sand		1305 pull sampler (discrete) but detached from string in hole	0	0	0	0
										Switch to 5' discrete sampler				
											0	0	0	0
	~~S-8~~	35						? ?		not enough recovery				
1410	S-8			1.5/5		stiff	Blk	Organic rich clay tr. silt (fossil grass)		wet	0	0	0	0
											0	0	0	0
								? ?						
		40												
					EOB 40' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0

Converted to Well: Yes X No _____ Well I.D. #: S43MW03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: GeoPROBE 6620DT

BORING No.: SB09/MW04
DATE: 6-4-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

Time	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
0905	S-1			3.5/5		Med stiff	Brn Gray	Silt some clay tr. organics		moist	0	0	0	0
						stiff	Dk Gray Brn	Silt some clay tr. VF. sand						
						stiff	Brn Gray	Silt some VF. sand tr. clay		moist	0	0	0	0
						stiff	Gray	" same as above						
		5						↓		moist	0	0	0	0
0910	S-2			4/5		stiff	Gray	Silt some V. F sand tr. clay		0910	0	0	0	0
						Med stiff	Gray	F. sand some clay		S43SB09-0608 Moist to wet				
					▽			F. sand some clay tr. M. sand			0	0	0	0
						Med stiff	Gray Brn	F. sand tr. to some clay		wet				
		10						↓ ↓			0	0	0	0
0915	S-3			5/5		m-stiff	Brn Gray	Same as above		wet	0	0	0	0
						stiff	Gry	Silt some F. sand tr. clay		wet to moist	0	0	0	0
						stiff	Brn	Silt some clay tr. F. sand		tr. Blk stain in g				
		15						F. sand some clay		moist	0	0	0	0
							Brn	Clay some F. sand		wet				
0922	S-4			3/5		↓	↓	↓ ↓		wet	0	0	0	0
						↓	↓	↓ ↓			0	0	0	0
						Med dense	gray	F-M Sand tr. clay and C. sand		wet				
		20				loose	gray	M-C sand tr. silt and pebble		wet	0	0	0	0
0927	S-5			3.5/5				↓ ↓		wet	0	0	0	0
											0	0	0	0
		25						↓ ↓			0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes (X) No ~~XX~~ Well I.D. #: S43MW04

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprbe

BORING No.: SB09/MW09
DATE: 6-4-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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**
0937	S-6			5/5		loose	Gray	M-C sand some pebbles		wet	0	0	0	0
								↓ ↓						
											0	0	0	0
						very stiff	Gray	Clay tr. silt		wet				
		30				loose	Gray	M-C sand tr. pebbles		wet.	0	0	0	0
1050	S-7			1/4		loose	Gray	M-C sand		1025 pullout first attempt but the point did not release	0	0	0	0
								Organic rich clay tr. silt						
						med stiff	Blk			move 1' over wet				
								↓ ↓			0	0	0	0
		35			EOB 34' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: Continuous 1" macrocores in 2" sleeve to 30' bgs
Discrete 4' x 2" macrocores below 30' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes (X) No ~~X~~ Well I.D. #: S43MW009

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB10 MW05
DATE: 6-3-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1500	S-1			4.5/5		very loose	light Brn	F sand some M-C sand and silt		dry	5.8	0	0	0
						Med loose	DK Brn	F-C sand some clay and large gravel		damp	0	0	0	0
						med stiff		Rock Fragments and F-C sand and clay			1.3	0	0	0
						very stiff	Brn Gray	Clay some silt tr. F sand		damp				
		5						↓ ↓ ↓ ↓			0	0	0	0
1510	S-2			4/5		Very stiff	Brn Gray	Clay some silt some F sand		moist	0	0	0	0
						Med stiff	Brn Gray	Clay and silt some F. sand		moist to wet	0	0	0	0
					⊠	Med dense	Gray Brn	F-M sand some silt		wet				
		10						↓ ↓ ↓		1510 S43SB010-0709	0	0	0	0
1515	S-3			4/5			Gry Brn	F-M sand some silt tr. pebbles		wet	0	0	0	0
								↓ ↓			0	0	0	0
						very stiff	Gray Brn	Silt some clay tr. F sand		wet				
		15					Brn	Silt some clay			0	0	0	0
1520	S-4			3/5		very stiff	Brn	Silt some clay		wet	0	0	0	0
								↓ ↓			0	0	0	0
						med stiff	Gry Brn	Clay some silt tr. F. sand		wet				
		20				very stiff	Brn	Silt (50/50) and clay			0	0	0	0
1530	S-5			4/5		med stiff	Gry Brn	Clay some silt and F-M sand		wet	0	0	0	0
								↓ ↓			0	0	0	0
								M-C sand tr F. gravel		wet				
		25						↓ ↓			0	0	0	0

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore to 30' bgs (1"ϕ core 2" sleeve)
Discrete macrocores to 40' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes X No ____ Well I.D. #: S43MW05

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG:

BORING No.: SB10 MW05
DATE: 6-3-11
GEOLOGIST: Jacob Birkett
DRILLER: 6-4-11 Corey Gamwell

	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**
Time 1540	S-6			3/5		loose	Gray	M-C sand tr. F. gravel		wet	0	0	0	0
											0	0	0	0
RESTART 6-4-11 0900		30				stiff	Gray	Silt some clay / M-C sand tr. F. gravel		wet	0	0	0	0
	S-7			1/5	EOB KS 30' bgs	~~MED STIFF~~ MED DENSE	~~DARK~~ GRAY	COARSE/MED SAND LT GRAY TR FINE SAND	SW		0	0	0	0
		35				MED STIFF	DARK GRAY	CLAY SOME SILT TR F SAND			0	0	0	0
0920	S8			2.5/5										
		40									0	0	0	0
								TD 40' BGS						

* When rock coring, enter rock brokeness.

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

Remarks: 0-30' BGS 6-3-11 JB
30-40' BGS 6-4-11 KS

Drilling Area Background (ppm): 0

Converted to Well: Yes X No _____ Well I.D. #: S43 MW05

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB 11 /MW06
DATE: 6-4-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1522	S-1			4/5		Very loose	light Brn	VF-C sand some large pebbles		dry	0	0	0	0
						loose	Brn	VF-F sand some M pebbles tr. clay		moist				
						very stiff	Brn DK Gray	Silt some clay tr. F. sand		damp	0	0	0	0
						↓	↓							
		5				dense	Gray	F. sand some clay ~~Clay some silt tr. F. sand~~		damp	0	0	0	0
1526	S-2			4/5		mi dense	Gray	F. sand some clay		moist	0	0	0	0
						stiff	~~Brn~~	Clay some F. sand		moist				
						dense	Brn	F. sand some clay	X	Collect (1526) S43SB011-0709 and Duplicate	1.4	0	0	0
						↓	Brn Gry	↓						
		10				↓	Gry	↓			8.2	0	0	0
1531	S-3			3/5		m. stiff	Gry Brn	F. sand and clay (50/50)		wet	18	0	0	0
						loose	DK Brn Brn	F-M sand tr. silt						
						slightly stiff	Brn	clayey (40/60) F. sand tr. M sand		wet	0.3	0	0	0
								↓ ↓						
		15				loose	Brn	F-M sand some C. sand tr. silt		wet	1.3	0	0	0
1545	S-4			3/5		loose	Brn Gry	M sand some C. sand tr. silt		wet	1.9	0	0	0
							Gry	F-C sand some pea pebbles tr. silt						
								↓ ↓			1.3	0	0	0
		20				very stiff	Gry	Clay tr. VF sand		wet	0	0	0	0
1557	S-5			4.5/5		very stiff	Gry	Clay tr. VF. sand		wet	0.8	0	0	0
											1.4	0	0	0
		25				loose	Gray	M-C sand tr. silt		wet	0	0	0	0

* 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: Continuous macrocore to 30' bgs (1" ϕ core in 2" sleeve)

Converted to Well: Yes X No ____ Well I.D. #: S43MW06

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB 11/MW06
DATE: 6-4-11 and 6-12-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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**
6-12-11 1425	S-6			2.5/4		M. dense	Gry	F-C sand some F-M pebbles tr. silt		wet	0	0	0	0
											0	0	0	0
		30												
				8		M. dense	Gray	F-C sand some F-M pebbles tr. silt		wet				
											0	0	0	0
1455	S-7			3/4										
		35				Stiff	DK Gray	organic rich clay		Shelby Tube (1510) S43SB011-3335	0	0	0	0
					EOB 36' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: Discrete soil sampling (macrocores 2"x4') from 28-36' bgs

Drilling Area Background (ppm): 0

Converted to Well: Yes X No _____ Well I.D. #: S43MW06

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG:

BORING No.: SB12/TW06
DATE: 6-11-11
GEOLOGIST: J. Birkett
DRILLER: George Sarta

	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1050	S-1			3/5		Med St. Ff	Brn/Gray	Clay some silt and F sand tr. C. sand		Moist to wet	0	0	0	0
						Very stiff	Gray/Brn	Silt tr. to some F. sand		Hit rock that				
										prevent full recovery at ~1' bgs	0	0	0	0
										moist to dry				
		5									0	0	0	0
1053	S-2			4.5/5		Stiff	Gray Brn	F. sand some silt tr. clay		Moist (105)	0	0	0	0
					▽					543 SB012-0507				
						Dense	Gray Brn	F. sand tr. to some silt		wet	0	0	0	0
		10									0	0	0	0
~~1104~~	S							Skip over 10-28' bgs interval						
								No sampling						
		15												
		20												
		25												

* When rock coring, enter rock brokeness.

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

Remarks: Continuous (5'x2") macrocore to 10' bgs
Discrete (4'x2") macrocore below 28' bgs

Drilling Area Background (ppm): 0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG:

BORING No.: SB12/TW06
DATE: 6-11-11
GEOLOGIST: Jacob Birkett
DRILLER: George Sorta

	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**
								No sampling till 28'bgs						
1109	S-3			4.5/5		Dense	Gray	M-C sand tr. silt		wet	0	0	0	0
		30												
										wet	0	0	0	0
		32				Stiff	DKGray	Organic rich clay						
					EOB 32'bgs									
		35												

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB13 / TW07
DATE: 6-3-11
GEOLOGIST: J. Birkett
DRILLER: Corey Gammel

Time	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1110	S-1			5/5		Loose	Blk	Crushed asphalt			0	0	0	0
						Stiff	Dk gray	Silt (50%) and clay tr. F. sand		moist mottled				
							to Brn				0	0	0	0
		5				Stiff		Silt and clay some F. sand		Moist to wet	0	0	0	0
1115	S-2			3/5	▽			Silt and clay some F. sand		S43SB0130608				
										wet (Time 1120)	0	0	0	0
						Stiff								
						M. Dense	Gry	F-M sand some clay		Wet	0	0	0	0
		10				M. Dense	Gray and Brn	F-M sand tr. clay						
1120	S-3			5/5		Stiff	Brn Org	F sand some clay		Moist	0	0	0	0
						Stiff	Gray Org	~~Silt~~ Clay some silt and F. sand		wet				
						Med Stiff	Gray	F. sand some clay		wet	0	0	0	0
						Stiff	Gray Org	Clay some silt and F. sand						
		15				Loose	Gray	F-M sand some clay tr. F-M gravel		wet	0	0	0	0
1125	S-4			2/5		loose	Gray Brown	M-C sand some M gravel tr. clay		wet				
						Stiff	Brn	Clay some F-M sand			0	0	0	0
								M-C sand?		loss sample				
											0	0	0	0
		20								wet				
1130	S-5			4/5	X	Very loose	Brn	M-C sand and gravel tr. clay		wet	0	0	0	0
											0	0	0	0
						loose/Med Stiff	Brn	F-C sand some clay		wet				
		25				very loose	Gray	M-C sand and F-M gravel			0	0	0	0

* 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: 5' macro sample w/ 1" sample taken within 2 in macro core liner not discrete

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB13/TW07
DATE: 6-3-11
GEOLOGIST: Jacob Birkett
DRILLER: Corey Gammel

Time	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**
1040	S-6			4.5/5		loose	Gray	F-M sand tr. clay and F. gravel		wet	0	0	0	0
											0	0	0	0
						Med Stiff	Gray	Clay some silt		wet				
		30									0	0	0	0
					EOB 30' bgs									
		35												

* When rock coring, enter rock brokeness.

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

Remarks:

Drilling Area Background (ppm): 0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprob 6620DT

BORING No.: SB14 / TW 8
DATE: ~~4-6-11~~ 6-4-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1715	S-1			4/5		loose	Blk Brn	Crushed Rock and F(sand/silt)		moist	0.7	0	0	0
						med stiff	Brn Gray	Clay tr. silt and F. sand						
						Stiff	Blk	↓ ↓			36.4	0	0	0
						↓	Gray	Silt some clay and F. sand		moist (odor)				
		5				↓	↓				52.4	0	0	0
1720	S-2			5/5		↓	↓	Silt some clay and F. sand		moist	80	0	0	0
						stiff	Gray							
						m. dense	Brn Gray	clayey (40/60) F. sand tr. silt		moist to wet	31	0	0	0
					▽			↓ ↓		S435SB014-0709 w/MS/MSD				
		10						↓ ↓		wet	36	0	0	0
								Push down with						
								discrete sampler to						
								28-32' interval						
		15												
								↓						
		20												
		25												

* 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: Continuous soil core to 10' bgs
Discret soil sampler from 28' bgs to 7

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620 DT

BORING No.: S14 / TW 8
DATE: 6-4-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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**
1750	S-3	28		2.5/4		M dense	gray	F-C sand some pebble tr. silt		liner crushed in extruder wet	0.4	0	0	0
		30								clay stringer at 30.5' bgs	0	0	0	0
		32									0	0	0	0
1820				2.5/4		stiff	dk gray	organic rich clay tr. F sand		wet	0	0	0	0
		35									0	0	0	0
		36												
					EOB 36' bgs					set TW8 From 28-30' bgs				

* 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: See previous page

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB 15 /TWO
DATE: 6-3-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

Time	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1253	S-1			4/5		loose	Blk	Crushed asphalt			2.4	0	0	0
						loose	Blk	F-C sand some F-M gravel		moist				
						loose	Brn	F-C sand some round pebble		moist to wet	0.4	0	0	0
						very Stiff	Blk Gray	Clay some silt		dk blk organic rich layer (organics)				
		5				very stiff	Gray Brn	Clay tr. silt		moist	0.0	0	0	0
1300	S-2			3/5		very stiff	Gray Brn	Silt tr. clay and F. sand		2ft slough	9.8	0	0	0
					▽	stiff	Gray Brn	Silt some F. sand and clay		Fuel/solvent odor	6.3	0	0	0
						↓	↓	↓		S43 SB15-0810				
		10								moist to wet time 1305				
1305	S-3			3/5		med dense	Brn Gray	F. sand some clay		wet				
											3.5	1.3	0	0
						very Stiff	Brn Gray	Clay some silt		wet				
											1.5	0.7	0	0
		15				med dense	Gray Blk	F-M sand tr. silt		wet				
1315	S-4			2/5		very loose	Brn	F-C sand some F-L gravel		wet				
										large gravel 1.5" ϕ	17	0	0	0
											25	0.6	0	0
		20				loose		F-C sand tr. small gravel		wet				
1317	S-5			2.5/5		very loose	Gray	M-C sand		wet	0	0	0	0
											0.3	0	0	0
		25								clay in shoe	0	0	0	0

* 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): 0-0.6

Remarks: Continuous macrocores 28' bgs (1" ϕ cutting shoe with 2" ϕ x 5' macrocore sleeve

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB15/TW09
DATE: 6-3-11
GEOLOGIST: Jacob Birkett
DRILLER: Cory Gammel

Time	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**
1323	S-6			0.5/3		Stiff	Gray	Silt (50/50) and Clay			1.3	0	0	0
											0	0	0	0
					EOB 28' bgs									
		30												
		35												

* 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 X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB16/TW10
DATE: 6-5-11
GEOLOGIST: Jacob Birkelt
DRILLER: Tom

	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**
1000	S-1			5/5		loose	DK Brn	Top soil w/organics		moist	0	0	0	0
						Stiff	Brn Gray	Silt some F. sand and clay		dry				
											0.2	0	0	0
						Stiff	DK Gray	Clay some silt		moist				
		5				Stiff	Gray	Clay some silt and F sand			0.2	0	0	0
1011	S-2			5/5				↓ ↓		Moist	0.1	0	0	0
					▽	Stiff	Gray	Silt some clay and F. sand		moist to wet S43SB016-0608	0.1	0	0	0
										VOC From JB ~~5-7~~ 7-7.5'				
		10					Gray	~~F. sand some clay~~ clayey F. sand (40/60) JB		wet	0.1	0	0	0
1018	S-3			3/5				↓ ↓		wet	0.1	0	0	0
						Dense	Gray Brn	F. sand some clay tr. pebbles						
										wet	0.1	0	0	0
1						Stiff	light Brn	Clay some silt tr. F. sand						
		15				Stiff	Gry to DK Gray	Clay some organics tr. F. sand		wet (wood fragments)	0.1	0	0	0
1022	S-4			4/5		med stiff	Gry	Clay some F. sand		wet	0.1	0	0	0
						med stiff	Gray	Clay some F-M sand		wet	0.1	0	0	0
		20						↓ ↓		wet	0.1	0	0	0
1031				4/5		med. stiff	Gray	Clay tr. to some F sand			0.1	0	0	0
								↓ ↓		wet	0.2	0	0	0
						M. dense	gray	M-C sand and clay some m. gravel		wet				
		25				very stiff	gray	Silt some clay and F. sand		moist wet	0.1	0	0	0

* 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): 0.1

Remarks: Continuous 1" Φ macrocore in 2" Φ x 5' sleeve to 30' bgs
Discrete from 30 soil sample

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 6620DT

BORING No.: SB 16/TW 10
DATE: 6-5-11
GEOLOGIST: Jacob Birkett
DRILLER: Tom

	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**
1040	S-6			3/5		stiff	Grav	Clay tr to some F sand		wet	0.2	0	0	0
										wet	0.1	0	0	0
						dense	Gray	M-C sand tr. F. sand and silt						
		30								wet	0.1	0	0	0
					No Sample									
								JB 6-5-11 ~~M-C sand tr. F sand and silt~~		wet				
1155	S-7	32		3/4		dense	grav	M-C sand tr. F. sand and gravel			0.1	0	0	0
		35				stiff		organic rich clay tr. F. Sand		wet	0.1	0	0	0
		36												
					EOB 36' bgs									
								Set TW10 from 29-33' bgs						

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0.1

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822 DT

BORING No.: SB17/TW11
DATE: 6-10-11
GEOLOGIST: J. Birkett
DRILLER: Gene Burke

Time	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1006	S-1			4/5		loose	Brn	M sand some gravel tr. clay		moist	0.3	0	0	0
						loose	tan	rock Frag S and F-M sand						
						very stiff	Brn/Gray	Clay tr. to some silt		moist	1.2	0	0	0
						m. dense/stiff	Brn gr	Clay some F. Sand		Moist				
		5				m. dense	Gray	F. sand some clay ~~F. sand some clay~~ JB		moist to wet	1.7	0	0	0
1010	S-2			4/5		m. stiff	Gray Brn	Clay some F. sand			13.5	0	0	0
										1010 S435B017-0608				
					▽	m dense		F. sand tr. clay		moist to wet	12.7	0	0	0
						stiff	Gray	Clay some F. sand		wet				
		10				sl. dense	Gray/Brn	F. sand tr. to some clay		wet	13.5	0	0	0
1014	S-3			4/5		↓	Brn/Gray	↓		wet	25.7	0	0	0
						m. stiff	Brn	F. sand some clay						
							Brn	Silt some F. sand tr. silt			5.7	0	0	0
						stiff		↓						
		15				m. dense	Brn	M-C sand tr. silt		wet				
1020	S-4			1.5/5		m. dense	Brn	M-C sand tr. silt and pebbles		wet	5.2	0	0	0
										Grain size S435B017-1517				
											3.1	0	0	0
		20												
1033	S-5			0.5/5		very loose	Gray	Sand (could be mostly slough)		wet Poor recovery all sample came out of sleeve				
						stiff	Gray	Clay (at very bottom)		wet				
		25												

* 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: Continuous macrocore (4" x 5' sleeve w/ 1" core inside to 25' bgs)
Discrete sampler after 25' bgs (4" x 2" cores

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB17/TW11
DATE: 6-10-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1057	S6	25		3.5/4		M stiff	Gray			Gene mentioned point might not have relaxed	0	0	0	0
						Dense	Gray	F-C sand tr. silt and pebbles		at 25' bgs wet				
											0	0	0	0
		30									0	0	0	0
1125										Wet	0	0	0	0
		32			?—									
	S7			3/4	Contact	very stiff	Blk/DK Gry	Organic Rich Clay		Fossil leaves	0	0	0	0
										Set TW 11 From 30-34				
		35								Drillers notes	0	0	0	0
		36								point didn't release until ~35' bgs				
		37									0	0	0	0
					EOB 37' bgs									

* 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: See previous page

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Groundzero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB18/TW12
DATE: 6-10-11
GEOLOGIST: Jacob Birkeff
DRILLER: Gene Burke

Time	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
1328	S-1			3/5		loose	Blk	Crushed asphalt		moist	12.7	0	0	0
						loose	blk	F-M Sand tr. gravel		moist				
						loose	Brn	Crushed rock and F-M sand some silt		Moist rock core	0	0	0	0
						very stiff	Gray/Brn	Silt some clay tr. F. sand		Moist				
		5				↓		↓		(1338) S435B018-0507	0	0	0	0
1332	S-2			3/5		m.dense	Gry/Brn	F. sand some silt		moist to wet	0	0	0	0
					S2					wet				
	S-										0	0	0	0
										pebble				
		10									0	0	0	0
	~~S-3~~							No samples until 28-32' interval						
		15												
	~~S-4~~													
		20												
	~~S-5~~													
		25												

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore to 10' bgs (5'x2" sleeves)
Discrete soil sampling starting at 28' bgs

Drilling Area Background (ppm): 0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB 13 / TW 12
DATE: 6-10-11
GEOLOGIST: Jacob Birkett
DRILLER: Gene Burke

	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-6							No soil cores until 22' bgs						
								↓ ↓						
1500	S3			0/4				No recovery		point didn't				
		30								release (S.C. Sand?)				
								↓ ↓			0	0	0	0
										(1600) Grain Size 34358018-3234				
1600	S-4			4/4		dense	gray	M sand Som C. sand tr. silt		wet	0	0	0	0
								↓ ↓						
		35				very stiff	dk gray Blk	Organic rich clay		wet	0	0	0	0
					TD 36' bgs									

* When rock coring, enter rock brokeness.

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

Remarks: See previous page

Drilling Area Background (ppm): 0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB 19 / SG01
DATE: 6-11-11
GEOLOGIST: J. Birkett
DRILLER: George

Time	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**
0940	S-1			2/5		loose/M.dense	Brn	Top soil and organics some clay		Moist	0.6	0	0	0
						stiff	Brn/Gray	Silt some clay tr. F. sand and pebbles		Moist				
											0.3	0	0	0
										moist to wet				
		5				Med stiff	Brn	Clay some silt tr. F. sand		charcoal piece	0.5	0	0	0
0943	S-2			4.5/5						moist	0.3	0	0	0
					▽	very stiff	Gray	F. sand some silt tr. clay		0945 S435B019-0607				
										moist to wet	0.9	0	0	0
						M. dense	Gray	F. sand tr. silt		wet				
		10									0.5	0	0	0
0950	S-3			4/5		dense	Red Brn	F sand some M sand tr. silt			27.6	0	0	0
											44.6	0	0	0
						stiff	Brn	Silt some F. sand and clay			37.3	0	0	0
						No lithology logged				0953 S435B019 Insd. 2-13.5				
		15												
					EOB 15' bgs									
		20												
		25												

* When rock coring, enter rock brokeness.

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

Remarks: Continuous Macrocore (5' x 2")

Drilling Area Background (ppm): 0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Indian Head Site 43
PROJECT NUMBER: 112G00771
DRILLING COMPANY: Ground Zero
DRILLING RIG: Geoprobe 7822DT

BORING No.: SB22/SG04
DATE: 6-11-11
GEOLOGIST: J. Birkett
DRILLER: George Sorto

Time	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	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
0857	S-1			2/5		loose	Blk	Crushed asphalt		dry	2.7	0	0	0
						dense		F sand and gravel some M-C sand						
											5.0	0	0	0
						very stiff	gray	Silt trace to some F sand		moist				
		5									33.5	0	0	0
0900	S-2			4/5						odor				
						stiff	gray Brn	Silt some F. sand		0902 S4BSB022-0708	65.3	0	0	0
					▽					moist to wet				
								Silt and F. sand somewhat		wet	93.1	0	0	0
		10												
0907	S-3			3/5							63.5	0	0	0
										0908 S4BSB022-Inside-63.5				
										Bottom 2 feet cut for sample not logged				
		15												
					EOB 15' bgs									
		20												
		25												

Sample not logged

* When rock coring, enter rock brokeness.

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

Remarks: Continuous macrocore (5' x 2" sleeve) to TD

Drilling Area Background (ppm): 0

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

APPENDIX B
SOIL SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S435B008-0608
Sample Location: SB08/MW03
Sampled By: J. Birke
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 1140 Method: Hand trowel Monitor Reading (ppm): 0	6-8' bgs	Brn - light Brn	F. sand some silt and M. sand moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	yes	
Bulk Density, Effective Porosity	2 4oz jar	yes	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

water table ~8' bgs
VOCs taken from 7-8' bgs

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S435B008-0607
Sample Location: SB08/MW03
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1725 Method: Terra Core Monitor Reading (ppm): 0	6-7' bgs	light Brn Brn	F. sand some silt and M. sand mois

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~2~~ 4 ~~40mL glass w/ H_2SO_4~~ ~~2~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	—	
Perchlorate	1 - 4oz jar	—	
Shelby Tube	Shelby Tube	—	
Grain Size	1 - 4oz jar	—	
Bulk Density, Effective Porosity		—	

OBSERVATIONS / NOTES:

5' W of original boring
Water table ~7' bgs
Resampled from the original sample collected on June 4, 2011

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S43SB009-0608
Sample Location: SB09 / MW04
Sampled By: J. Birke
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 0910 Method: Hand trowel Monitor Reading (ppm): 0	6-8' bgs	Gray	F sand some clay tr. M. sand moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no ~~yes~~ JB 6-22-11	
Bulk Density, Effective Porosity	1 4 oz jar	no	
TAL Metals, Total CN, TOC	1 4 oz jar	yes	

OBSERVATIONS / NOTES:

Water level ~7.5' bgs
VOCs taken from 6.5-7.5' bgs

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: 5435B009-0708
Sample Location: SB09 / MW09
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1710 Method: Terra Corr Monitor Reading (ppm): 0	7-8' bgs	Gray	F. sand some clay tr. M. sand moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 ~~40mL~~ glass w/NaHSO4 1 ~~8~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	—	
Perchlorate	1 - 4oz jar	—	
Shelby Tube	Shelby Tube	—	
Grain Size	1 - 4oz jar	—	
Bulk Density, Effective Porosity			

OBSERVATIONS / NOTES:

Collected 5' SE of MW04
Resampled from the original sample collected on June 4, 2011

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.: 1710
—	5435B009-0708 -D

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S43SB010-0709
Sample Location: SB010
Sampled By: JB
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-3-11 Time: 1510 Method: Hand trowel Monitor Reading (ppm): 0	7-9' bgs	Brn Gray	F-M sand some silt wet (7.5-9) Clay and silt some F sand (7-7.5)

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no ~~yes~~ JB 6-7-11	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	4 oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S43SB011-0709
Sample Location: SB11/MW06
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 1526 Method: Hand trowel Monitor Reading (ppm): 0	7-9' bgs	Brn gray	F. sand some clay Moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	yes	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8.5' bgs

VOCs taken from 7.5-8.5' bgs

MAP:

Circle if Applicable:

MS/MSD: —

Duplicate ID No.: 1526
S43SB011-0709-D

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S43SB011-0507
Sample Location: SB011
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1358 Method: Terra Core Monitor Reading (ppm): 1.4	5-7	Brn and Gray	F. sand some clay moist moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~2 40mL glass w/ NaHSO4~~ 1 ~~2~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Total Oxidant Demand (13-15' bgs)	1 2 inch x 2 inch uncut macrocore sleeve	yes	
↳ Time 1415			

OBSERVATIONS / NOTES:

resampled VOCs to replace the original sample on 6-4-11

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Sample ID: S435B012-0507

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

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

Sample ~~ID No.~~ Location: SB12/TW06
Sample Location: <
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-11-11 Time: 1055 Method: Hand trowel Monitor Reading (ppm): 0	5-7' bgs	Gry Brn	F. sand some silt tr. clay moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 40mL glass w/NaHSO4 1 ~~3~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S435B012-0507-D (1055)

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S43SB130608
Sample Location: SB13/TW07
Sampled By: K. Simpson
C.O.C. No.:

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

GRAB SAMPLE DATA:

Date: 6-3-11	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1120	6-8' bgs	Dk gray to Brn	Silt and clay some F. sand
Method: Hand Trowel			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar amber	ye	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity	~~1 4oz jar~~ JB 6-3-11	~~yes~~ 6-3-11 no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

Water Table ~ 7' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S435B014-0707
Sample Location: SB014 / TW08
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-4-11 Time: 1720 Method: Hand trowel Monitor Reading (ppm): 80-3.6	7-9' bgs	Brn Gray	(40/60) Clayey F. sand tr. silt moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	6 ~~8~~ - 40mL glass w/5 mL MeOH	yes	
Explosives	2 ~~1~~ - 4oz jar	yes	
Perchlorate	2 ~~1~~ - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	2 4 oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs
VOCs taken from 7.5-8.5' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
yes	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S435B015-0810
Sample Location: SB015
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-3-11 Time: 1300 Method: Hand trowel Monitor Reading (ppm): 69.3	8-10' bgs	Grav Brn	Silt some F. sand and clay fuel/solvent odor, moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4 oz jar	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S435B016-06-08
Sample Location: SB016 / TW10
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-5-11 Time: 1011 Method: Hand trowel Monitor Reading (ppm): 0.1	6-8' bgs	~~Clay some silt and F. sand 6-7' bgs~~ JB 6-5-11 ~~Silt~~ gray	Clay some silt and F. sand 6-7' bgs moist Silt some clay and F. sand 7-8' bgs moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
TAL Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

takes VOCs from 7-7.5' bgs
water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S435B016-0607
Sample Location: SB16/TW10
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-12-11 Time: 0930 Method: TerraCore Monitor Reading (ppm): 0.5	6-7' bgs	Gray	Clay some silt and F. Sand moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~1 - 40mL glass w/5 mL MeOH~~ 2 - 40mL glass w/ NaHSO4	Yes	
Explosives	1 - 4oz jar	No	
Perchlorate	1 - 4oz jar	No	
Shelby Tube	Shelby Tube	No	
Grain Size	1 - 4oz jar	No	
Bulk Density, Effective Porosity		No	

OBSERVATIONS / NOTES:

Resampled from the original sample collected on June 5, 2011

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S43SB017-0607
Sample Location: SB017 / TW11
Sampled By: J. Birke #
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1010 Method: Hand trowel Monitor Reading (ppm): 13.5	6-8'	Gray Brn	6-7' Clay some F, sand moist 7-8' F, sand tr, clay moist

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	SB 6-10-11 NO	
Grain Size	2 - 4oz jar (in M-C sand)	yes	
Bulk Density, Effective Porosity		NO	
TAL Metals, Tot. CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

water table ~8' bgs
VOCs taken ~7.5' bgs (1020)
Grain size taken from 15-17' bgs in M-C sand

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: 5435B018-0507 ~~SB18/TW12~~ JB 6-10-11
Sample Location: SB18/TW12
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1338 Method: Hand trowel Monitor Reading (ppm): 0	5-7' bgs	Gray/Brn	F. sand some silt moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	~~2 40mL glass w/ NaHSO4~~ 1 - 40mL glass w/5 mL MeOH	yes	
Explosives	1 - 4oz jar	yes	
Perchlorate	1 - 4oz jar	yes	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Tal Metals, Total CN, TOC	1 4oz jar	yes	

OBSERVATIONS / NOTES:

Water Level ~ 7' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: 5435B018-3234
Sample Location: SB18/TW12
Sampled By: J. Birkelt
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-10-11 Time: 1600 Method: Hand trowel Monitor Reading (ppm): 0	32-34' bgs	Gray	M. Sand some C. Sand tr. silt wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	3 - 40mL glass w/5 mL MeOH	no	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	2 ~~1~~ - 4oz jar	yes	
Bulk Density, Effective Porosity		no	

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: Indian Head Site 43
Project No.: 112G00771

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

Sample ID No.: S43SB019-0607
Sample Location: SB019 /SG01
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-11-11 Time: 0945 Method: Hand trowel Monitor Reading (ppm): 0.9	6-7' bgs	Gray	F, sand some silt tr. clay moist to wet

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/ 5 mL H_2SO_4 ~~1 - 40mL glass w/5 mL MeOH~~	yes	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Total Oxidant Demand (13-15' bgs) ↳ Time 0953	1 2 foot uncut liner	yes	

OBSERVATIONS / NOTES:

Water table ~ 7' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

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

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

Sample ID No.: S435B022-0708
Sample Location: SB22/SG04
Sampled By: J. Birkett
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6-11-11 Time: 0902 Method: Hand trowel Monitor Reading (ppm): 653	7-8' bgs	gray/Brn	Silt some F. sand moist to wet strong odor

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
VOCs (Terracore)	2 - 40mL glass w/ NaHSO4 ~~1 - 40mL glass w/5 mL MeOH~~	yes	
Explosives	1 - 4oz jar	no	
Perchlorate	1 - 4oz jar	no	
Shelby Tube	Shelby Tube	no	
Grain Size	1 - 4oz jar	no	
Bulk Density, Effective Porosity		no	
Total Oxidant demand (13-15' bgs) ↳ Time 0908	2 foot uncut liner	yes	

OBSERVATIONS / NOTES:

Water table ~8' bgs

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

APPENDIX C
GROUNDWATER GRAB AND LOW FLOW PURGE DATA SHEETS

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43 TW006-2832
Sample Location: TW06
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-11-11 JB Time: ~~1255~~ 1305								
Method: Low Flow - Peristaltic	gray	4.97	0.120	18.81	383	6.46	0.0	49

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-11-11								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: Geoprobe rods	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 32								
Static Water Level (WL): —								
One Casing Volume(gal/L):								
Start Purge (hrs): 1217								
End Purge (hrs): 1255								
Total Purge Time (min): 38								
Total Vol. Purged (gal/L): 5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	no
MEE	HCl	3 - 40mL glass vials	no
Sulfide	Zn Acetate	1 - 250mL poly bottle	no
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	no

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 3.2 ppm
Nitrate
Nitrite
D.O. 1.0 ppm

Negative Oil red O dye detection for DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

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

WELL ID.: TW06
DATE: 6-11-11

Time (Hrs.)	~~Water Level~~ Color (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1217	Start purge (Sandy Slurry Brn)									
1226	Grayish Tan	400	6.25	0.152	Out of range	6.52	21.08	-6	0.0	
1231	" "	500	6.20	0.129	" "	6.23	19.82	9	0.0	
1236	" "	500	6.13	0.122	" "	10.55	18.95	4	0.0	
1241	" "	500	5.81	0.117	" "	11.36	18.36	11	0.0	
1246	" "	500	5.56	0.115	840	11.52	18.54	24	0.0	
1251	Gray	500	5.17	0.114	755	10.08	18.41	42	0.0	
1256	~~Collect Sample~~ JB 6/11	500	5.00	0.145	487	9.58	19.09	56	0.0	
1301	Gray	500	4.97	0.120	383	6.46	18.81	49	0.0	
1305	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43TW007-2327
Sample Location: TW007 SB
Sampled By: J. B KS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6-3-11								
Time: 1410								
Method: Low Flow - Peristaltic	light gray	5.00	0.197	19.52	Too turbid	3.07	0.0	22

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6-3-11								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): 0								
Well Casing Diameter & Material								
Type: 1" S.S. Geoprobe Rods	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 27								
Static Water Level (WL): ~6.5								
One Casing Volume(gal/L):								
Start Purge (hrs): 1330								
End Purge (hrs): 1410								
Total Purge Time (min): 40								
Total Vol. Purged (gal/L): 6 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	yes
MEE	HCl	3 - 40mL glass vials	yes
Sulfide	Zn Acetate	1 - 250mL poly bottle	yes
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.4 mg/L
Nitrate
Nitrite
D.O

No oil red dye detection

Circle if Applicable:

MS/MSD	Duplicate ID No.:
	S43TW007-2327-D

Signature(s):

LOW FLOW PURGE DATA SHEET

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

WELL ID.: TW07
DATE: 6-3-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1230										won't start
	Prime line w/ check valve									(sediment heavy)
1340	Gray sand	water/50%								very tubid (gray)
1345	–	500	5.83	0.235	Too turbid	5.01	21.21	-22	0.0	gray 2 gal
1353	–	500	5.36	0.197	" "	4.50	20.09	2	0.0	
1400		500	5.04	0.197	" "	4.14	19.55	20	0.0	light gray
1408	–	500	5.00	0.197	" "	3.07	19.52	22	0.0	6 gal
1410	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

TW08

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43TW082832
Sample Location: TW08
Sampled By: KS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6.5.11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1010	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	GRAY	5.28	0.132	19.2	>900	3.76	0	2

PURGE DATA:

Date: 6.5.11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.								
Type: 1" STEEL TW	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 32								
Static Water Level (WL): —								
One Casing Volume (gal/L):								
Start Purge (hrs): 0935								
End Purge (hrs): 1010								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 2.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	1 - 250mL poly bottle	✓
Filtered Metals	HNO3 .45	1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
Explosives	--	2 - 1L Amber glass	✓
Filtered Perchlorate	-- .2	1 - 250mL poly bottle	✓
~~Anions (Cl-, NO3, NO2, SO4)~~, Alkalinity	—	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass~~ vials	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly~~ bottle	—
~~Dissolved TOC (Field~~ Filtered)	~~H2SO4~~	~~2 - 40mL glass~~ vials	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.2 mg/L
~~Nitrate~~
~~Nitrite~~

~1" SCREEN POINT TW
0.041 GA/FT

RED O DYE - NO OIL NOTED

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

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

WELL ID.: TW08
DATE: 6·5·11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ~~ppt~~	Comments START PURGE
0935	NA	200								GRAY, NO ODOR
0945	↓	↓	5.93	0.180	>900	3.25	20.2	-7	0	
0955	↓	↓	5.62	0.143	>900	3.16	19.4	-8	0	
1005	↓	↓	5.32	0.133	>900	2.19	19.8	-1	0	
1010	↓	↓	5.28	0.133	>900	3.76	19.2	2	0	

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43 TW0092125
Sample Location: TW09
Sampled By: KS
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6·3·11	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Time: 1535								
Method: Low Flow - Peristaltic	LT GRAY	5.61	0.230	19.5	930	4.46	0	-14

PURGE DATA:

Date: 6·3·11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 1" STEEL TW	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 25								
Static Water Level (WL): ~8								
One Casing Volume(gal/L):								
Start Purge (hrs): 1515	~4 gal							
End Purge (hrs): 1535								
Total Purge Time (min): 20								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	—
Total Metals	HNO3	1 - 250mL poly bottle	—
Filtered Metals	HNO3	1 - 250mL poly bottle	—
Total CN	NaOH	1 - 250mL poly bottle	—
Explosives	--	2 - 1L Amber glass	—
Filtered Perchlorate	--	1 - 250mL poly bottle	—
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	—
MEE	HCl	3 - 40mL glass vials	—
Sulfide	Zn Acetate	1 - 250mL poly bottle	—
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.0 mg/L
Nitrate
Nitrite

NO OIL DETECTED WITH RED O DYE
SCREEN 21-25' BGS

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [illegible]

LOW FLOW PURGE DATA SHEET

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

WELL ID.: TW09
DATE: 6·3·11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~or ppt~~	Comments START PURGE*
1515	~~15.15~~	200								GRAY - SEWER ODOR
1520		‖	6.07	0.237	529	4.88	20.1	-49	0	TURB = 529
1525	NA		5.99	0.231	905	4.74	18.9	-27	0	
1530			5.77	0.229	940	5.37	18.5	-21	0	
1535		↓	5.61	0.230	830	4.46	18.5	-14	0	

SIGNATURE(S): [illegible]

* PURGED 4 GAL PRIOR TO STARTING READINGS

PAGE 2 OF 2

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43TW102933
Sample Location: TW10
Sampled By: KS
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: / Time:	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Method: Low Flow - Peristaltic								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.								
Type: 1" STEEL WELL POINT	See Low Flow Purge Sheet for D							
Total Well Depth (TD): 29								
Static Water Level (WL): —								
One Casing Volume (gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

DRY - NO SAMPLE

6.5.11

K. SIMPSON

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative		ected
VOCs	HCl		
Total Metals	HNO3		
Filtered Metals	HNO3		
Total CN	NaOH	1 - 250mL poly bottle	
Explosives	--	2 - 1L Amber glass	
Filtered Perchlorate	--	1 - 250mL poly bottle	
~~Anions (Cl-, NO3, NO2, SO4), Alkalinity~~	~~--~~	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass~~ vials	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly~~ bottle	—
~~Dissolved TOC (Field Filtered)~~	~~H2SO4~~	~~2 - 40mL glass~~ vials	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron =
Nitrate
Nitrite

4' SCREEN POINT ~1"
0.041 GA/FT

RED O DYE

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): KS

LOW FLOW PURGE DATA SHEET

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

WELL ID.: S43 TW 10
DATE:

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~or ppt~~	Comments START PURGE

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: No Sample S43TW010-2832
Sample Location: TW 10/SB16
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date:	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time:	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	—	—	—	—	—	—	—	—

PURGE DATA:

Date:	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type:	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):	No Sample, Zone dry							
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	N
Total Metals	HNO3	1 - 250mL poly bottle	O
Filtered Metals	HNO3	1 - 250mL poly bottle	
Total CN	NaOH	1 - 250mL poly bottle	
Explosives	--	2 - 1L Amber glass	S
Filtered Perchlorate	--	1 - 250mL poly bottle	a
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	m
MEE	HCl	3 - 40mL glass vials	pl
Sulfide	Zn Acetate	1 - 250mL poly bottle	e
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron =
Nitrate
Nitrite

No Sample

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

LOW FLOW PURGE DATA SHEET

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

WELL ID.: TW 10
DATE: 6-11-11 + 6-12-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
6-11-11	1420 Dry, no	water	seen on	tubing,	moist	sand at	end			
	For 6-12-11	will move	TW-10	closer	to original	TW-10	location.	where geol	ogy taken	
6-12-11	0945	Start pump,	no water,	pull out	tubing, look	for evidence	of water	but tubing	moist w/	sand on outside
	Interval dry	no water,	Thirdtry	at TW	10, no sa	mple co	llected			

SIGNATURE(S): [signature]

PAGE___OF___

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

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

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

Sample ID No.: S43 TW11 3034
Sample Location: TW11
Sampled By: KS
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6·10·11 KS	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: ~~1525~~ 1325	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	GRAY	5.31	0.112	19.8	718	2.97	0	9

PURGE DATA:

Date: 6·10·11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.	WELL	POINT - GEO PROBE						
Type: 1" STEEL TW	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 34								
Static Water Level (WL): NA								
One Casing Volume (gal/L):								
Start Purge (hrs): 1235								
End Purge (hrs): ~~1525~~	1325	KS						
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 7.0	MEASURED							

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs ✓	HCl	3 - 40mL glass vials	✓
Total Metals ✓	HNO3	1 - 250mL poly bottle	✓
Filtered Metals ✓	HNO3	1 - 250mL poly bottle	✓
~~Total CN~~ TOTAL CN	NaOH	1 - 250mL poly bottle	✓
Explosives ✓	--	2 - 1L Amber glass	✓
Filtered Perchlorate ✓	--	1 - 250mL poly bottle	✓
~~Anions (Cl-, NO3, NO2, SO4), Alkalinity~~	~~—~~	~~1 - 250mL poly bottle~~	~~—~~
~~MEE~~	~~HCl~~	~~3 - 40mL glass vials~~	~~—~~
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly bottle~~	~~—~~
~~Dissolved TOC (Field Filtered)~~	~~H2SO4~~	~~2 - 40mL glass vials~~	~~—~~

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 3.6 MG/L
~~Nitrate~~
~~Nitrite~~
RED DYE - NO OIL NOTED

1" SCREEN = 0.041 GA/FT

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): [illegible]

LOW FLOW PURGE DATA SHEET

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

WELL ID.: S43 TW11
DATE: 6.10.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~ppt~~	Comments GRAY HIGH SOLIDS
1235	NA	500	—	—	—	—	—	—	—	NO ODOR
1245	↓	↓	6.06	0.169	>900	4.91	20.5	-11	0	
1255	↓	↓	6.10	0.130	>900	3.66	19.6	-32	0	
1305	↓	↓	5.50	0.121	>900	4.03	19.3	3	0	
1300	↓	200	5.42	0.113	>900	4.03	19.2	10	0	
1315	↓	↓	5.22	0.113	829	4.07	18.9	14	0	
1325	↓	↓	5.31	0.112	718	2.97	19.0	9	0	
										SAMPLED
			1325 END PURGE/SAMPLE							
			TURB @		1345 =		654			
					END	OF	SAMPLING			

SIGNATURE(S): [illegible]

PAGE 2 OF 2

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

26-30

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

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

Sample ID No.: S43 TW12 ~~3035~~ KS
Sample Location: TW12
Sampled By: K. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

6-11-11

SAMPLING DATA:

Date: 6-10-11 KS	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0955	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	CLR/TAX	5.19	0.110	18.5	799	4.16	0	18

PURGE DATA:

Date: 6-10-11 KS	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.	SCREEN X 4'							
Type: 1" STEEL DPT	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 34								
Static Water Level (WL):								
One Casing Volume (gal/L):								
Start Purge (hrs): 0905								
End Purge (hrs): 0955								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 8								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	—
Total Metals	HNO3	1 - 250mL poly bottle	—
Filtered Metals	HNO3	1 - 250mL poly bottle	—
Total CN	NaOH	1 - 250mL poly bottle	—
Explosives	--	2 - 1L Amber glass	—
Filtered Perchlorate	--	1 - 250mL poly bottle	—
~~Anions (Cl, NO3, NO2, SO4), Alkalinity~~	~~--~~	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass vials~~	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly bottle~~	—
~~Dissolved TOC (Field Filtered)~~	~~H2SO4~~	~~2 - 40mL glass vials~~	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 3.0 MG/L
~~Nitrate~~
~~Nitrite~~

DRY - PULLED SCREEN UP TO 26-30' TD
WILL TRY & PURGE 6.11.11

RED O DYE - NO OIL NOTED

SURGED (ALL) TWs WITH TUBING 1ST 10 MIN. - TUBING SET 1' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): [signature]

LOW FLOW PURGE DATA SHEET

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

WELL ID.: S43 TW12
DATE: 6.10.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity ~~% or ppt~~	Comments START PURGE
0905	NA	500								GRAY HIGH SOLIDS
0915			6.07	0.188	>900	4.21	19.3	-10	0	
0925			5.42	0.133	>900	3.34	18.2	-15		
0935			5.13	0.117	>900	3.24	18.8	5		CLEARING
0945		200	5.19	0.113	859	3.80	18.8	16		
0955			5.19	0.112	799	4.16	18.5	18		SAMPLED

SIGNATURE(S): [illegible]

APPENDIX D
MONITORING WELL CONSTRUCTION LOGS AND DEVELOPMENT RECORDS

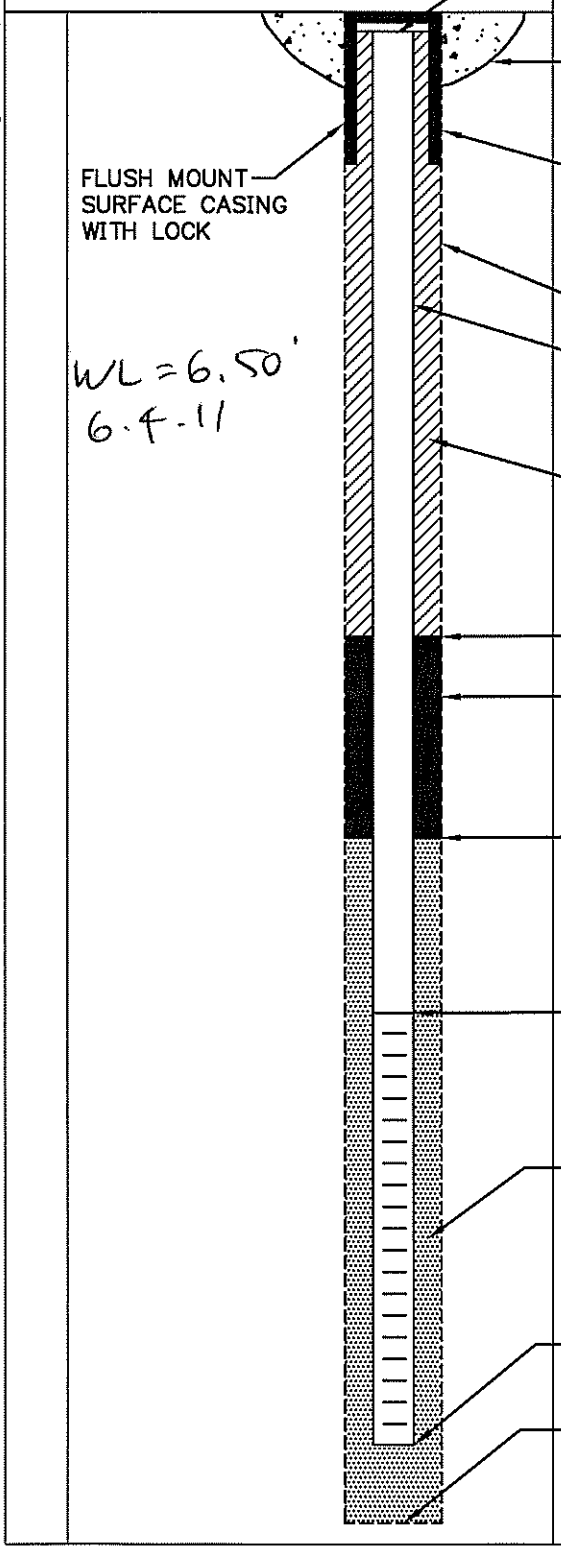
WELL NO.: S43MW03

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

GEOPROBE 7822DT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER S43MW03 C. GAMWELL
PROJECT NO. 12600771	BORING S43SB08	DRILLING METHOD HSA
DATE BEGUN 6.4.11	DATE COMPLETED 6.4.11	
FIELD GEOLOGIST KEITH SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: _____ BGS

TYPE OF SURFACE SEAL: CONCRETE 2x2' PAD

TYPE OF PROTECTIVE CASING: _____

I.D. OF PROTECTIVE CASING: _____

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 PVC

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: 19'

TYPE OF SEAL: BENTONITE CHIPS

ELEVATION/DEPTH TOP OF SAND: 21'

ELEVATION/DEPTH TOP OF SCREEN: 24'

TYPE OF SCREEN: SCH 40 -2" PVC

SLOT SIZE x LENGTH: 0.010 x 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE ~~IN BEDROCK~~: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 34'

ELEVATION / DEPTH BOTTOM OF SAND: 35'

ELEVATION/DEPTH BOTTOM OF HOLE: 35'

BACKFILL MATERIAL BELOW SAND: NA

ACAD:FORM_MWFM.dwg 07/20/99 INL

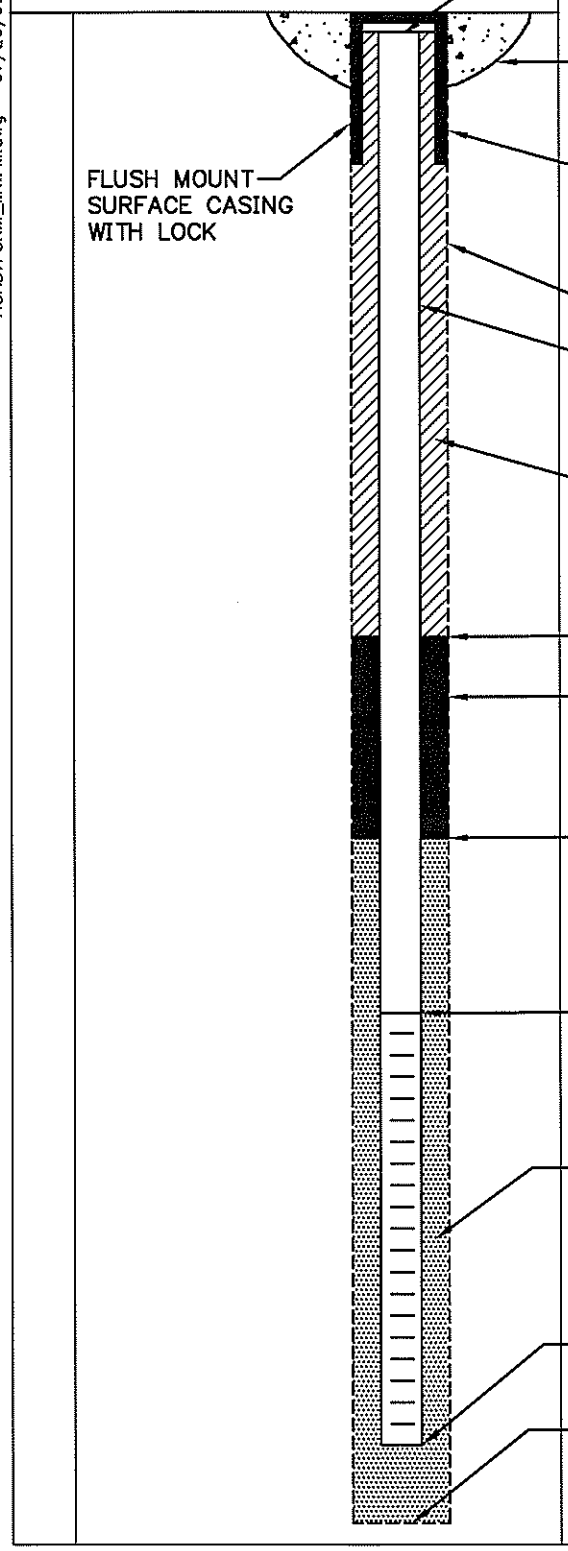
WELL NO.: S43MW04

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

GEOPROBE 7822 DT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER COREY GAMMELIN
PROJECT NO. 112G00771	BORING SB43-09	DRILLING METHOD HSA
DATE BEGUN 6.5.11	DATE COMPLETED 6.5.11	
FIELD GEOLOGIST KEITH SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: BGS

TYPE OF SURFACE SEAL: CONCRETE 2X2' PAD

TYPE OF PROTECTIVE CASING:

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 - 2" FLUSH JOINT PVC

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: (2')/ 17' BGS

TYPE OF SEAL: BENTONITE CHIPS

ELEVATION/DEPTH TOP OF SAND: 19 /

ELEVATION/DEPTH TOP OF SCREEN: 23 /

TYPE OF SCREEN: SCH 40 - 2" PVC

SLOT SIZE x LENGTH: 0.010 X 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE IN BEDROCK: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 33 /

ELEVATION / DEPTH BOTTOM OF SAND: 33 /

ELEVATION/DEPTH BOTTOM OF HOLE: 33 /

BACKFILL MATERIAL BELOW SAND: NA

ACAD: FORM_MWFM.dwg 07/20/99 INL

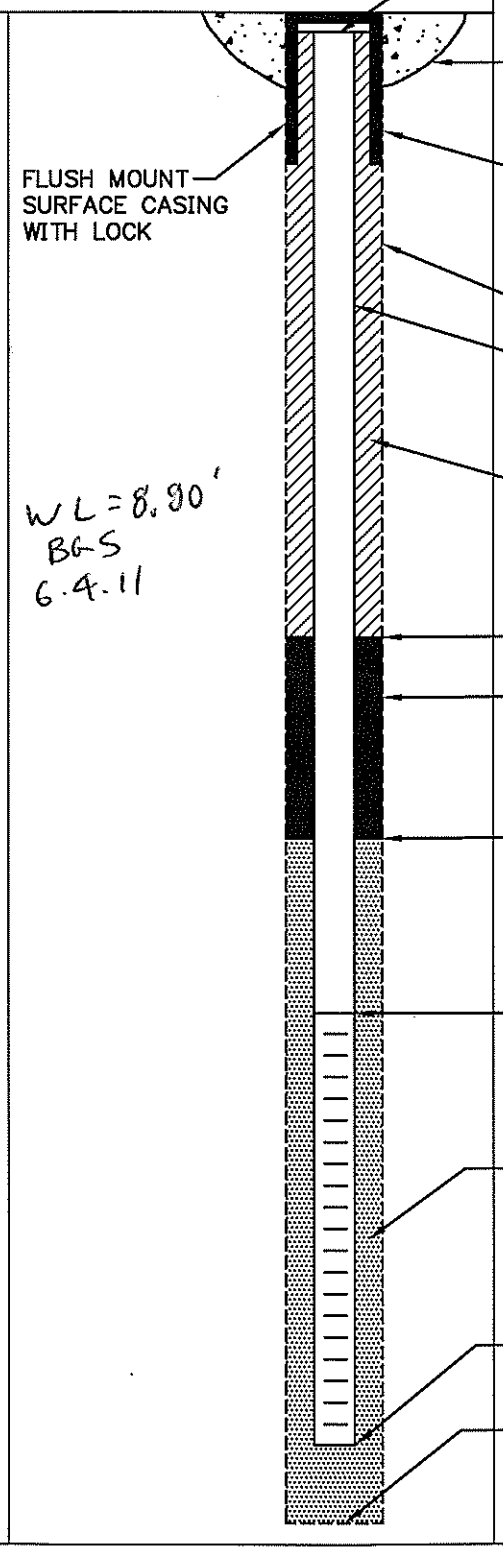
WELL NO.: 543 MW05

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

GEOPROBE 7822 DT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER COREY CAMPBELL
PROJECT NO. 112G00771	BORING 543 SB 10	DRILLING METHOD HSA
DATE BEGUN 6.4.11	DATE COMPLETED 6.4.11	
FIELD GEOLOGIST KEITH SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: _____

ALL BGS ↓

TYPE OF SURFACE SEAL: CONCRETE 2x2' PAD

TYPE OF PROTECTIVE CASING: _____

I.D. OF PROTECTIVE CASING: _____

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 FLUSH JOINT PVC

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: 16 /

TYPE OF SEAL: BENTONITE/~~CEMENT GROUT~~ KS CHIPS

ELEVATION/DEPTH TOP OF SAND: 18 /

ELEVATION/DEPTH TOP OF SCREEN: 21 /

TYPE OF SCREEN: SCH 40 - 2" PVC

SLOT SIZE x LENGTH: 0.010 X 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE ~~IN BEDROCK~~: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 31 /

ELEVATION / DEPTH BOTTOM OF SAND: 40 /

ELEVATION/DEPTH BOTTOM OF HOLE: 40 /

BACKFILL MATERIAL BELOW SAND: — NA

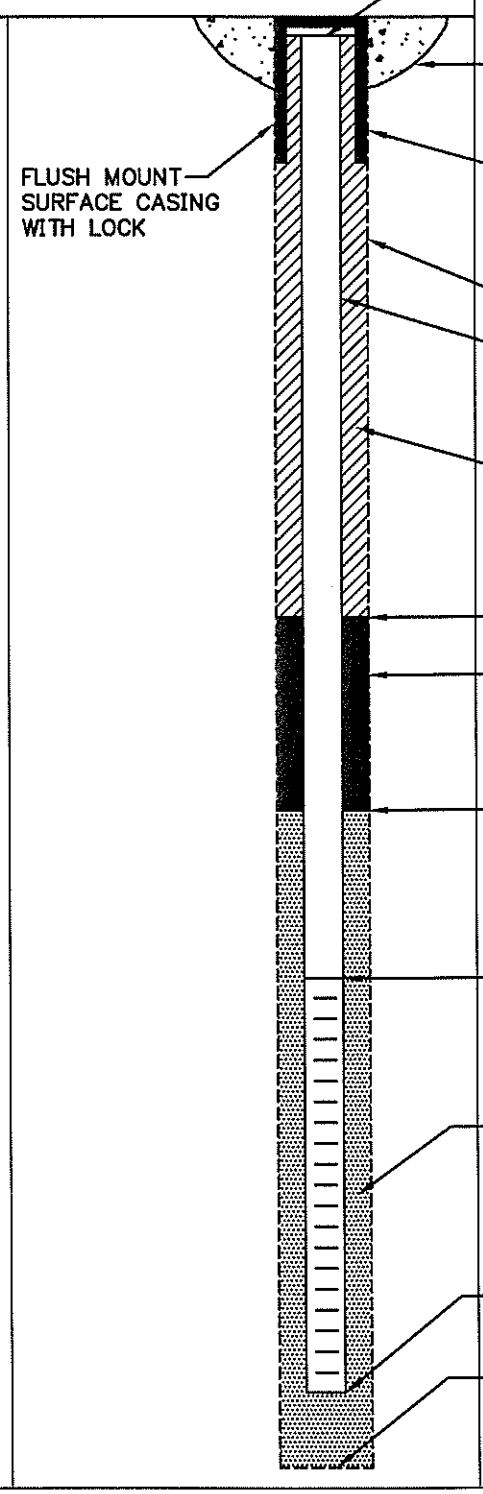
ACAD: FORM_MWFM.dwg 07/20/99 INL

WELL NO.: SB3MW06

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT INDIAN HEAD	LOCATION SITE 43	DRILLER COREY CAMWELL
PROJECT NO. 112G00771	BORING SB 11	DRILLING METHOD HSA
DATE BEGUN	DATE COMPLETED	
FIELD GEOLOGIST K. SIMPSON		DEVELOPMENT METHOD GRUNDFOS PUMP
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: BGS

TYPE OF SURFACE SEAL: CONCRETE 2X2 PAD

TYPE OF PROTECTIVE CASING:

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 6" OD HSA

TYPE OF RISER PIPE: SCH 40 PVC - FLUSH JOINT

RISER PIPE I.D.: 2" PVC

TYPE OF BACKFILL/SEAL: BENTONITE/CEMENT GROUT

ELEVATION/DEPTH TOP OF SEAL: 13 /

TYPE OF SEAL: BENTONITE CHIPS

ELEVATION/DEPTH TOP OF SAND: 15 /

ELEVATION/DEPTH TOP OF SCREEN: 17 /

TYPE OF SCREEN: SCH 40-2" PVC

SLOT SIZE x LENGTH: 0.010 X 10'

TYPE OF SAND PACK: #1 QUARTZ

DIAMETER OF HOLE IN BEDROCK: 6" OD HSA

ELEVATION / DEPTH BOTTOM OF SCREEN: 27 /

ELEVATION / DEPTH BOTTOM OF SAND: 29 /

ELEVATION/DEPTH BOTTOM OF HOLE: 29 /

BACKFILL MATERIAL BELOW SAND: — NA

ACAD:FORM_MWFM.dwg 07/20/99 INL

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

RE DEVELOP EXIST WELL + REPLACED PAD

Well: S43 MW 01
Site: 43
Date Installed:
Date Developed: 6-12-11
Dev. Method: PUMP SURGE
Pump Type: 12V WHALE

Depth to Bottom (ft.):
Static Water Level Before (ft.): 6.90
Static Water Level After (ft.): 7.30
Screen Length (ft.):
Specific Capacity:
Casing ID (in.): 2" PVC FLUSH MT

Responsible Personnel: K. SIMPSON
Drilling Co.: —
Project Name: SITE 43
Project Number: 112G00771

2 GPM PUMP RATE

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.)
1446	?	0	6.90	—			—	GRAY TO BRN
1450		8	6.90	18.1	5.61	0.236	480	LT SEWAGE ODOR
1457		32	7.31	18.1	4.91	0.184	752	
1507		52	7.30	16.6	4.45	0.182	94	CLEARING
1515		68	7.30	16.8	4.39	0.177	64	— ✓
1520	0	78	—				—	SURGED AGAIN AT END

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: MW03
Site: Site 43
Date Installed:
Date Developed: 6-12-11
Dev. Method: whale pump/Hand surge
Pump Type: whale pump

Depth to Bottom (ft.): 34
Static Water Level Before (ft.): 14.56
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Birkett
Drilling Co.: Ground Zero
Project Name: Indian Head Site 43
Project Number: 112G00771

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.)
1030	Start dev		24.05	20.04	7.93	0.384	Out of Range	Brown sandy *out of Range is 3800 NTU
1035		10 gal	24.93	20.65	8.60	0.294	" "	Brown sandy
1040		20 gal	25.62	19.28	9.11	0.246	" "	Brown
1045		35 gal	25.50	18.40	8.51	0.239	Out of Range	Surged screen after
1055		50 gal	26.04	17.96	7.11	0.234	215	Tan Surged after
1100		55 gal	Stop dev, need another drum					
1213	Start re-dev	60 gal	23.42	21.54	9.21	0.334	Out of Range	Surged before reading
1221		75 gal	24.29	20.63	8.79	0.222	" "	tan
1228		85 gal	25.23	20.20	7.40	0.221	178	tan/clear
1240		100 gal	26.23	19.49	11.21	0.383	79.3	tan/clear
1245		105 gal	Stop dev.					

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

SITE 43

Site: INDIAN HEAD
Well: MW04
Date Installed: 6.5.11
Date Developed: 6.12.11
Dev. Method: SURG/ PUMP
Pump Type: 12V WATER

Depth to Bottom (ft.): 35.00
Static Water Level Before (ft.): 9.89
Static Water Level After (ft.): 22.78
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2" PVC - STICK-UP

Project Name: SITE 43
Project Number: 112G06771
Site Geologist: K. SIMPSON
Drilling Co.: GROUND ZERO

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.)
1030	0.1	0	9.89					GRAY, LT SULFUR ODOR
1040	0	20	22.60	19.2	6.14	0.265	>900	
1050	↓	40	22.70	16.1	5.82	0.175	>900	
1100	↓	60	22.70	15.9	4.90	0.165	700	CLEARING
1110	↓	80	22.78	16.1	4.80	0.159	534	
1120	↓	100	↓	15.8	4.75	0.157	300	
1125	↓	110	↓	15.8	4.73	0.155	222	2-DRUMS

2 GPM PUMP RATE

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43MW05
Site: Site 43
Date Installed:
Date Developed: 6-11-11
Dev. Method: hand surge
Pump Type: whale pump

Depth to Bottom (ft.): 31
Static Water Level Before (ft.):
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2

Responsible Personnel: J. Birkett
Drilling Co.: Ground Zero
Project Name: Indian Head Site 43
Project Number: 112G00771

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.)
1448	Start development							20 gal already in drum
	Surge entire screen every 5-10 min							
1515		40	—	20.82	5.98	0.106	Out of Range	Stop surging
1523		60	—	19.05	5.94	0.098	741	
1530		80	—	18.43	5.72	0.093	239	
1544		100	—	18.96	5.58	0.098	65.1	

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S43 MW06
Site: 43
Date Installed: 6.5.11
Date Developed: 6.12.11
Dev. Method: SURGE/PUMP
Pump Type: 12V WAATE

Depth to Bottom (ft.): 29
Static Water Level Before (ft.): 6.15
Static Water Level After (ft.):
Screen Length (ft.): 10
Specific Capacity:
Casing ID (in.): 2" PVC FLUSH MT

Responsible Personnel: K. SIMPSON
Drilling Co.: GROUND ZERO
Project Name: INDIAN HEAD
Project Number: 112G0071

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.)
1225	0.1	0	6.15	—	—	—	—	DRY AFTER 2 GAL
								GRAY HIGH TSS
1240		3	9.80					DRY @ 1242
1305		5	11.50	19.8	6.28	0.186	>900	RESTART
1314		10	23.00					SURGING & PUMPING — DRY
1319		12	10.50					RESTART
1320		13						DRY
								DRY
								END DEVELOPMENT

APPENDIX E
MONITORING WELL GROUNDWATER SAMPLE AND LOW FLOW PURGE DATA SHEETS

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43 MW01 03
Sample Location: MW01
Sampled By: K. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6.17.11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1040	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	LT cloudy	5.59	0.288	17.0	52	1.25	0	110

PURGE DATA:

Date: 6.17.11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC FM	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 18.75								
Static Water Level (WL): 6.70								
One Casing Volume (gal/L): 2.0								
Start Purge (hrs): 0930								
End Purge (hrs): 1040								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L): 4.7								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	1 - 250mL poly bottle	✓
Filtered Metals 0.45 uM	HNO3	1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
Explosives	--	2 - 1L Amber glass	✓
Filtered Perchlorate 0.2 uM	--	1 - 250mL poly bottle	✓
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	✓
MEE	HCl	3 - 40mL glass vials	✓
Sulfide	Zn Acetate	1 - 250mL poly bottle	✓
Dissolved TOC (Field Filtered) 0.45 uM	H2SO4	2 - 40mL glass vials	✓

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 1.0 mg/L
~~Nitrate~~
~~Nitrite~~

RED O DYE NO OIL NOTED

PUMP INLET (TUBING) SET 5' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): [illegible]

LOW FLOW PURGE DATA SHEET

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

WELL ID.: MW01
DATE: 6.17.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments START PURGE
0930	6.70	250								CLOUDY NO ODOR
0940			6.21	0.331	263	4.30	19.2	0	0	
0950			5.83	0.318	149	3.23	18.2	89		
1000			5.87	0.304	155	2.91	17.6	111		
1010			5.82	0.313	100	1.43	17.2	102		
1020			5.67	0.304	80	1.28	17.1	108		CLEARING
1030			5.61	0.290	61	1.27	16.9	112		
1040			5.59	0.288	52	1.25	17.0	110		

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43 MW02 03
Sample Location: MW02
Sampled By: K. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1245	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	CLEAR	4.39	0.326	18.5	0.4	2.12	0	350

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material.								
Type: 2" PVC FM	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 21.40								
Static Water Level (WL): 11.00								
One Casing Volume (gal/L): 1.6								
Start Purge (hrs): 1145								
End Purge (hrs): 1245								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 4.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs TCE ONLY	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	COLBALT 1 - 250mL poly bottle	✓
Filtered Metals .45 um	HNO3	ONLY 1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
~~Explosives~~	—	~~2 - 1L Amber glass~~	
~~Filtered Perchlorate .2 um~~	--	~~1 - 250mL poly bottle~~	
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	✓
MEE	HCl	3 - 40mL glass vials	✓
Sulfide	Zn Acetate	1 - 250mL poly bottle	✓
Dissolved TOC (Field Filtered) .45 um	H2SO4	2 - 40mL glass vials	✓

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron =
~~Nitrate~~
~~Nitrite~~ RED O DYE = NO OIL NOTED

PUMP INLET (TUBING) SET 5' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

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

WELL ID.: S43 MW 02
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~Dr ppt~~	Comments START PURGE
1145	11.00	250								CLEAR, NO ODOR
1155	11.06		4.51	0.322	40	2.84	18.7	178	0	
1205	11.06		4.46	0.339	9.4	2.11	18.0	291		
1215			4.44	0.323	1.7	2.20	18.6	322		
1225			4.39	0.326	1.3	2.16	18.6	341		
1231			4.38	0.326	0.9	2.14	18.6	352		
1245			4.39	0.326	0.4	2.12	18.5	350		

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43MW00301
Sample Location: S43MW03
Sampled By: J Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1357	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	clear	5.84	0.278	17.65 ~~4.52~~ JB	4.02	0.99	0.0	-28

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 36.72								
Static Water Level (WL): 16.14								
One Casing Volume(gal/L):								
Start Purge (hrs): 1300								
End Purge (hrs): 1357								
Total Purge Time (min): 57								
Total Vol. Purged (gal/L): 5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	9 ~~8~~ - 40mL glass vials	yes
Total Metals	HNO3	3 ~~1~~ - 250mL poly bottle	yes
Filtered Metals	HNO3	3 ~~1~~ - 250mL poly bottle	yes
Total CN	NaOH	3 ~~1~~ - 250mL poly bottle	yes
Explosives	--	6 ~~2~~ - 1L Amber glass	yes
Filtered Perchlorate	--	3 ~~1~~ - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	no
MEE	HCl	3 - 40mL glass vials	no
Sulfide	Zn Acetate	1 - 250mL poly bottle	no
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	no

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 5.0 ppm
Nitrate
Nitrite

Oil Red O dye: No indication of DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
Yes	

Signature(s):

LOW FLOW PURGE DATA SHEET

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

WELL ID.: S43MW03
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1300	~~PK~~ 16.14									
1305	16.40	300	6.06	0.192	53.6	2.44	16.86	-11	0.0	clear
1310	16.45	300	6.04	0.219	8.35	1.68	16.62	-24	0.0	
1315	16.47	300	6.02	0.234	2.77	1.40	16.82	-27	0.0	
1320	16.50	300	5.98	0.247	1.29	1.21	16.91	-29	0.0	
1325	16.52	300	5.98	0.258	0.00	1.13	16.95	-30	0.0	
1330	16.55	300	5.96	0.278	0.00	1.07	17.21	-31	0.0	
1335	16.57	300	5.93	0.287	0.38	0.99	17.29	-30	0.0	
1340	16.56	300	5.87	0.280	0.38	0.97	17.59	-28	0.0	2 3/4 gal
1345	16.56	300	5.87	0.280	2.60	0.98	17.64	-28	0.0	
1350	16.56	300	5.84	0.263	4.01	0.98	17.65	-28	0.0	
1355	16.56	300	5.84	0.278	4.02	0.99	17.65	-28	0.0	
1357	Collect sample									

SIGNATURE(S): [signature]

PAGE 1 OF 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43 MW00401
Sample Location: S43MW04
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 0918	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	Clear	4.53	0.211	15.86	0.50	1.28	0.0	115

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 9.51								
One Casing Volume(gal/L):								
Start Purge (hrs): 0825								
End Purge (hrs): 0918								
Total Purge Time (min): 53								
Total Vol. Purged (gal/L): 5 1/4 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	yes
MEE	HCl	3 - 40mL glass vials	yes
Sulfide	Zn Acetate+NaOH	1 - 250mL poly bottle	yes
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 2.8 ppm
Nitrate
Nitrite

Oil Red O dye = no indication of DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S43MW00401-D

Signature(s): [signature]

LOW FLOW PURGE DATA SHEET

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

WELL ID.: S43MW04
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
0825	9.51									Start purge
0826	9.73	350	5.06	0.136	0.99	5.09	17.20	146	0.0	clear
0831	9.80	350	4.80	0.159	0.00	2.10	15.77	118	0.0	
0836	9.83	350	4.52	0.171	0.07	1.83	15.59	126	0.0	
0841	9.85	350	4.43	0.173	0.00	1.65	15.54	127	0.0	
0846	9.87	350	4.42	0.161	0.22	1.63	15.54	125	0.0	
0851	9.88	350	4.43	0.159	0.22	1.51	15.59	124	0.0	
0856	9.88	350	4.44	0.159	0.39	1.40	15.63	122	0.0	3 gal
0901	9.86	350	4.47	0.162	1.12	1.35	15.64	119	0.0	
0906	9.85	350	4.51	0.211	0.43	1.30	15.79	117	0.0	4 gal
0911	9.85	350	4.53	0.214	0.39	1.25	15.88	116	0.0	
0916	9.85	350	4.53	0.211	0.50	1.28	15.86	115	0.0	5 gal
0918	Collect sample									

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PAGE 1 OF 1

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43 MW05-01
Sample Location: MW05
Sampled By: R. SIMPSON
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	ORP (mV)
Date: 6.17.11								
Time: 1530								
Method: Low Flow - Peristaltic	LT. CLOUDY	5.30	0.116	17.0	67	1.07	0	64

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date: 6.17.11								
Method: Low Flow - Peristaltic								
Monitor Reading (ppm): —								
Well Casing Diameter & Material. Type: 2" PVC FM	See Low Flow Purge Sheet for Details							
Total Well Depth (TD): 30.50								
Static Water Level (WL): 8.02								
One Casing Volume (gal/l):								
Start Purge (hrs): 1420								
End Purge (hrs): 1530								
Total Purge Time (min): 70								
Total Vol. Purged (gal/l): 4.6								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	✓
Total Metals	HNO3	1 - 250mL poly bottle	✓
Filtered Metals .45 uM	HNO3	1 - 250mL poly bottle	✓
Total CN	NaOH	1 - 250mL poly bottle	✓
Explosives	--	2 - 1L Amber glass	✓
Filtered Perchlorate .2 uM	--	1 - 250mL poly bottle	✓
~~Anions (Cl, NO3, NO2, SO4), Alkalinity~~	--	~~1 - 250mL poly bottle~~	—
~~MEE~~	~~HCl~~	~~3 - 40mL glass vials~~	—
~~Sulfide~~	~~Zn Acetate~~	~~1 - 250mL poly bottle~~	—
~~Dissolved TOC (Field Filtered)~~	H2SO4	~~2 - 40mL glass vials~~	—

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 2.5 mg/L
~~Nitrate~~
~~Nitrite~~
RED O DYE NO OIL NOTED

PUMP INLET (TUBING) SET 5' OFF BTM

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

LOW FLOW PURGE DATA SHEET

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

WELL ID.: MW05
DATE: 6.17.11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % ~~or ppt~~	Comments START PURGE
1420	8.02	250								CLEAR, NO ODOR
1430			5.57	0.117	6.3	2.77	17.1	67	0	
1440			5.24	0.112	8.1	1.34	16.4	84		
1450			5.20	0.113	90	1.19	16.5	83		CLOUDY
1500			5.16	0.115	211	1.13	16.5	84		
1510			5.26	0.115	149	1.10	17.0	76		
1520			5.29	0.115	84	1.08	17.0	69		
1530			5.30	0.116	67	1.07	17.0	64		

SIGNATURE(S): [illegible]

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

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

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

Sample ID No.: S43MW00601
Sample Location: S43MW006
Sampled By: J. Birkett
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 6-17-11	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Time: 1130	(Visual)	(S.U.)	(mS/cm)	(^{0}C)	(NTU)	(mg/l)	(%)	(mV)
Method: Low Flow - Peristaltic	tan tint	5.80	0.290	16.75	610	0.96	0.0	13

PURGE DATA:

Date: 6-17-11	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Method: Low Flow - Peristaltic								
Monitor Reading (ppm):								
Well Casing Diameter & Material:								
Type: 2" PVC	See Low Flow Purge Sheet for Details							
Total Well Depth (TD):								
Static Water Level (WL): 6.67								
One Casing Volume(gal/L):								
Start Purge (hrs): 1029								
End Purge (hrs): 61								
Total Purge Time (min): 1130								
Total Vol. Purged (gal/L): 5 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOCs	HCl	3 - 40mL glass vials	yes
Total Metals	HNO3	1 - 250mL poly bottle	yes
Filtered Metals	HNO3	1 - 250mL poly bottle	yes
Total CN	NaOH	1 - 250mL poly bottle	yes
Explosives	--	2 - 1L Amber glass	yes
Filtered Perchlorate	--	1 - 250mL poly bottle	yes
Anions (Cl-, NO3, NO2, SO4), Alkalinity	--	1 - 250mL poly bottle	yes
MEE	HCl	3 - 40mL glass vials	yes
Sulfide	NaOH Zn Acetate	1 - 250mL poly bottle	yes
Dissolved TOC (Field Filtered)	H2SO4	2 - 40mL glass vials	yes

OBSERVATIONS / NOTES:

Field Test Kits
Ferrous Iron = 4.2 ppm
Nitrate
Nitrite

Oil Red O dye = No indication of DNAPL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

LOW FLOW PURGE DATA SHEET

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

WELL ID.: S43MW06
DATE: 6-17-11

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
1029	6.67	Start purge								
1030	8.23	300	5.92	0.270	17.2	2.19	17.02	11	0.0	clear
1035	8.96	300	5.86	0.271	15.8	1.56	16.95	7	0.0	
1040	9.45	300	5.79	0.311	14.4	1.26	16.79	9	0.0	
1045	9.76	300	5.72	0.341	15.9	1.16	16.70	12	0.0	1 3/4 gal
1050	9.91	300	5.68	0.353	22.0	1.10	16.66	14	0.0	Turbid tan water at 1052
1058	10.10	300	5.59	0.367	2854	1.03	16.65	14	0.0	tan (silty)
1103	9.99	300	5.61	0.361	1505	1.01	16.79	11	0.0	tan (silty)
1108	9.94	300	5.64	0.346	830	1.00	16.69	7	0.0	
1113	9.95	300	5.68	0.334	575	0.99	16.69	3	0.0	3 gal
1118	9.95	300	5.74	0.319	292	0.98	16.70	-3	0.0	
1123	9.96	300	5.76	0.306	214	0.97	16.70	-6	0.0	
1128	9.96	300	5.80	0.290	610	0.96	16.75	13	0.0	
1130	Collect sampler									

SIGNATURE(S): [signature]

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APPENDIX F
GROUNDWATER LEVEL MEASUREMENT SHEET

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head Site 43
Project No.: 112G00771
Location:
Personnel: Keith Simpson, Jacob Birkett
Weather Conditions: 70°F sunny humid
Measuring Device:
Tidally Influenced: Yes ___ No X
Remarks:

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)* screen	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)* 8/2/11	Groundwater Elevation (feet)*	Comments
MW01	6-18-11	0904			6.59	8.27		
MW02		0856			10.94	11.40		
MW03		0845	24-34		15.94	16.66		
MW04		0859	23-33		9.44	11.01		
MW05		0901	21-31		7.76	9.20		
MW06		0906	17-27		7.15	8.31		

* All measurements to the nearest 0.01 foot

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head Site 43
Project No.: 112G00771
Location:
Personnel: ~~Keith Simpson, Jacob Birkett~~ Robert Sok
Weather Conditions: 70°F sunny humid
Measuring Device:
Tidally Influenced: Yes ___ No X
Remarks:

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)* screen	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)* 8/2/11	Groundwater Elevation (feet)*	Comments
MW01	6-18-11	0904			6.59	8.27		
MW02		0856			10.94	11.40		
MW03		0845	24-34		15.94	16.66		
MW04		0859	23-33		9.44	11.01		
MW05		0901	21-31		7.76	9.20		
MW06		0906	17-27		7.15	8.31		

* All measurements to the nearest 0.01 foot

APPENDIX G
SOIL GAS SAMPLING LOG SHEETS

S43 ODA 01

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43 ODA 01
Sample Location: SEE BELOW
Sampled By: KS - JB

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Date: 6·1·11						
Time: 1445						
Method: 6 L SUMMA	<1 MPH	~~N~~ SW KS	85		85	

Summa Canister #	SR# 5705
Filter Type/Flow	~~30 min~~ 8 HRS

Duplicate (if collected): NO

11.5 ML/MIN VALVE (8 HR) w/ 2UM FILTER

Start Time Vacuum	-30+	in Hg	- 1040 AM	—	in Hg
End Time Vacuum	-1	in Hg	1445 PM (4 HRS 5 MIN)	—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1		mL	ppm	
#2 NA OUTDOOR		mL	ppm	
#3 AIR		mL	ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1		mL	ppm	
#2		mL	ppm	
#3		mL	ppm	

LAB FILE # 79439

MODIFIED EPA TO-15 METHOD

Notes:

LITTLE TO NO WIND HOT & HUMID
TO-CAN
CAT# 22107
RESTEK CORP, BELLEFONTE, PA

CAN @ 3.5' OFF GROUND HUNG ON STOP SIGN @ THE NE CORNER OF GALLERY RD & SCHUYLER RD.

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43SG01 06
Sample Location: SG01
Sampled By: K. SIMPSON

SAMPLING DATA:

Date: 6-11-11	Wind speed	Wind Direction	Ambient temperature	Barometric Pressure	Relative Humidity	Other
Time: 1850	(Visual)	(estimated)	(°F)	(in.)	(%)	
Method: 6L SUMMA	2 MPH	SW	81		80	

Summa Canister #	SA#11880
Filter Type/Flow	30 min

Duplicate (if collected)

—	
—	

167 ML/MIN VALVE (½ HR) w/ 2UM FILTER

Start Time Vacuum	~~8~~ -30+	in Hg	1721
End Time Vacuum	~~18~~ -9	in Hg	1850

—	in Hg
—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1	1715	50 mL	2.0 ppm	
#2	1717	50 mL	1.5 ppm	
#3	1719	50 mL	2.1 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1	1716	50 mL	250 ppm	
#2	1718	50 mL	200 ppm	
#3	1720	50 mL	800 ppm	

MODIFIED EPA TO-15 METHOD

Notes:

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: 543 SG-02 06
Sample Location: SG-02
Sampled By: K. SIMPSON

SAMPLING DATA:

Date: 6·12·11 / Time:	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Method: 6 L SUMMA	1-2 MPH	SW	77		60	

Summa Canister #	SR# 433		Duplicate (if collected)	SR#33988	
Filter Type/Flow	30 min			30 MIN	
Start Time Vacuum	-30+	in Hg	1015 ~~0917~~	-30+	in Hg
End Time Vacuum		in Hg			in Hg

167 ML/MIN VALVE (½ HR) w/ 2UM FILTER

NO SAMPLE

PID Readings	Time	Volume	Reading	Comments
#1	0910	50 mL	1.4 ppm	
#2	0912	50 mL	1.5 ppm	
#3	0914	50 mL	2.0 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1	0911	50 mL	5 ppm	
#2	0913	50 mL	7 ppm	
#3	0915	50 mL	3 ppm	

LET DRAW FOR 2 HRS
NO DROP ON VACUUM GAUGE
MODIFIED EPA
TO-15 METHOD

Notes:

DUP ID = ~~SG~~ KS 543 SG-02 06 - D MAY BE IN CLAY
NO MOVEMENT ON GAUGES (SAMPLE/DUP) IN 50 MIN. PULLED RODS TO 5' BGS (ADDITIONAL 6") RETRY

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET** SG-03

KS **Page 1 of 1**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43 SG-03 ~~06~~ 05
Sample Location: SG-03
Sampled By: KS - JB

SAMPLING DATA:

	Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Date: 6.11.11						
Time: 1500						
Method: 6 L SUMMA	SW	<1 MPH	85°		85	

Summa Canister #	S/N# 3731	**Duplicate** (if collected)	—
Filter Type/Flow	30 min		—

167 ML/MIN VALVE (½ HR) w/ 2uM FILTER

Start Time Vacuum	-30+	in Hg	1355	—	in Hg
End Time Vacuum	-1	in Hg	1500	—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1 1352	0	50 mL	0 ppm	
#2 1354	1.0	50 mL	1.0 ppm	
#3 1356	0.8	50 mL	0.8 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1 1353		50 mL	10 ppm	
#2 1355		50 mL	20 ppm	
#3 1357		50 mL	15 ppm	

MODIFIED EPA TO-15 METHOD

Notes:

LITTLE TO NO WIND HOT & HUMID

Tetra Tech NUS, Inc. **SOIL GAS SAMPLING LOG SHEET**

Project Site Name: INDIAN HEAD SITE 43
Project No.: 112G00771

Sample ID No.: S43 SG04 06
Sample Location: SG-04
Sampled By: K. SIMPSON

SAMPLING DATA:

	MPH Wind speed (Visual)	Wind Direction (estimated)	Ambient temperature (°F)	Barometric Pressure (in.)	Relative Humidity (%)	Other
Date: 6.11.11						
Time: 1705						
Method: 6 L SUMMA	1 TO 2	SW	90		85	

Summa Canister #	SR# 34201
Filter Type/Flow	30 min

Duplicate (if collected)

—	
—	

167 ML/MIN VALVE (½ HR) W/ 2 UM FILTER

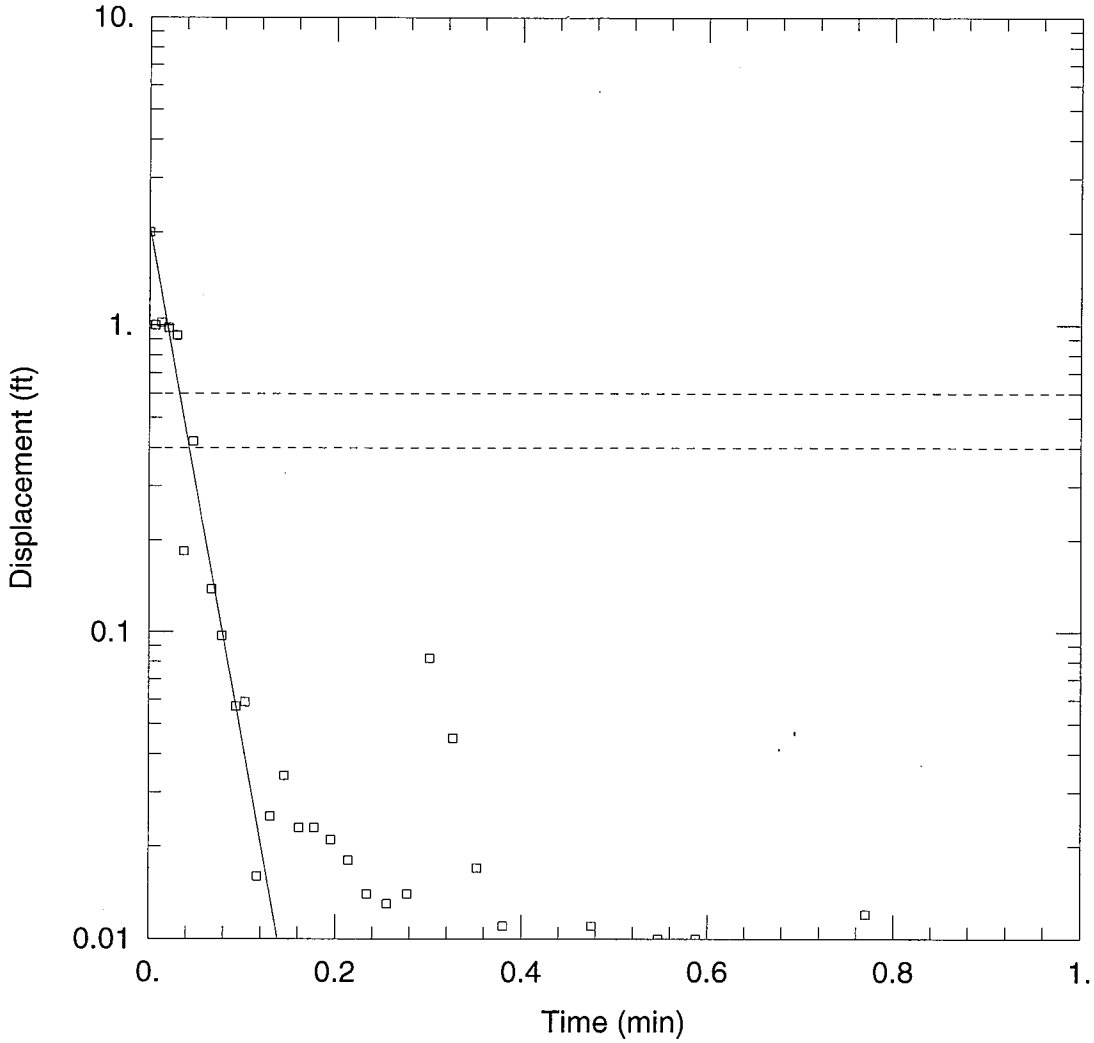
Start Time Vacuum	-30+	in Hg	1522	—	in Hg
End Time Vacuum	-9	in Hg	~~1650~~ 1705 KS	—	in Hg

PID Readings	Time	Volume	Reading	Comments
#1	1514	50 mL	21.5 ppm	
#2	1516	50 mL	46.2 ppm	
#3	1519	50 mL	349.0 ppm	
Helium Check	**Time**	**Volume**	**Reading**	**Comments**
#1	1515	50 mL	1575 ppm	
#2	1517	50 mL	203 ppm	
#3	1520	50 mL	480 ppm	

MODIFIED EPA TO-15 METHOD

Notes:

APPENDIX H
SLUG TEST OUTPUT FORMS



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_1.aqt
Date: 08/02/11 Time: 10:51:01

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 1
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

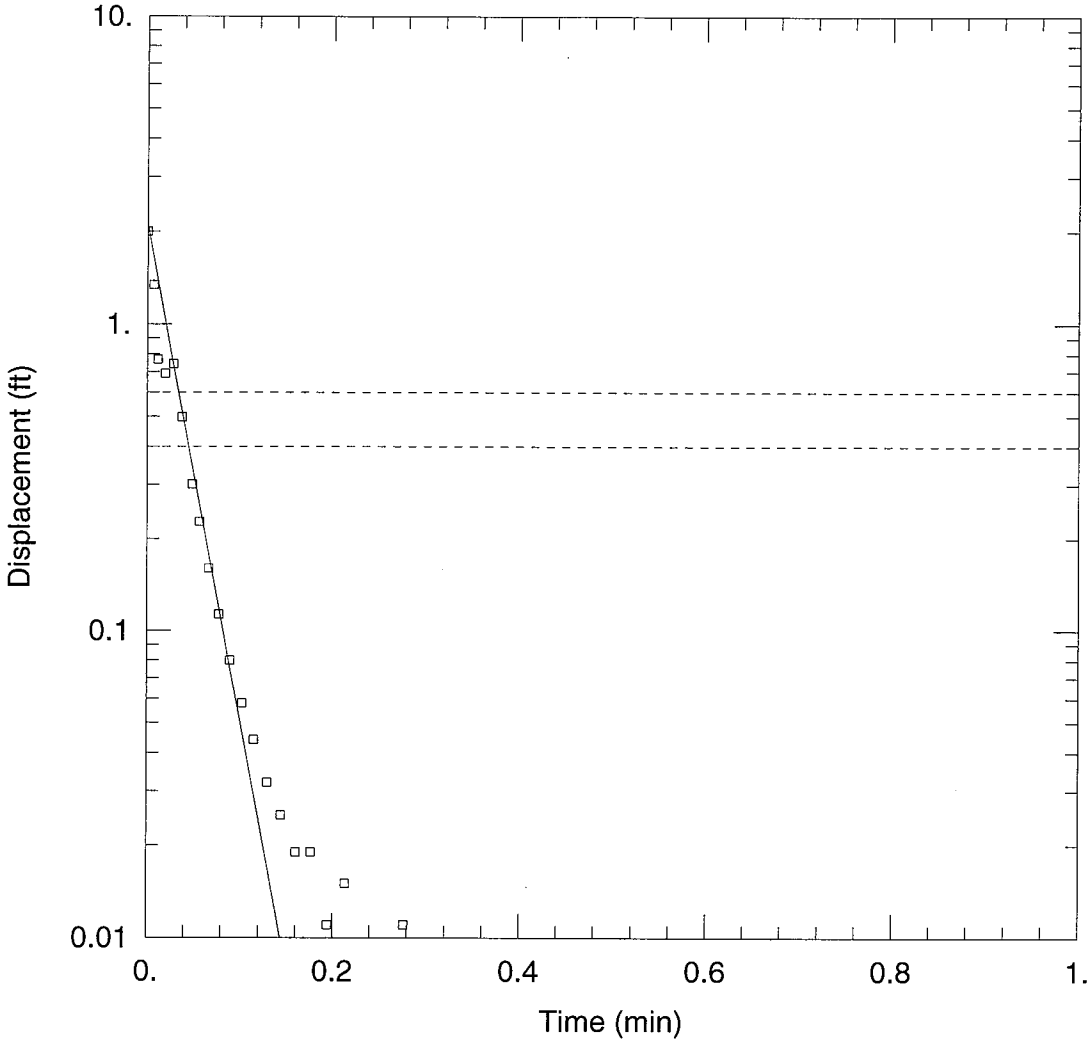
WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 49.03 ft/day
y0 = 2.084 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_1.aqt
Date: 08/02/11 Time: 10:51:12

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 1
Test Date: 6/18/2011

AQUIFER DATA

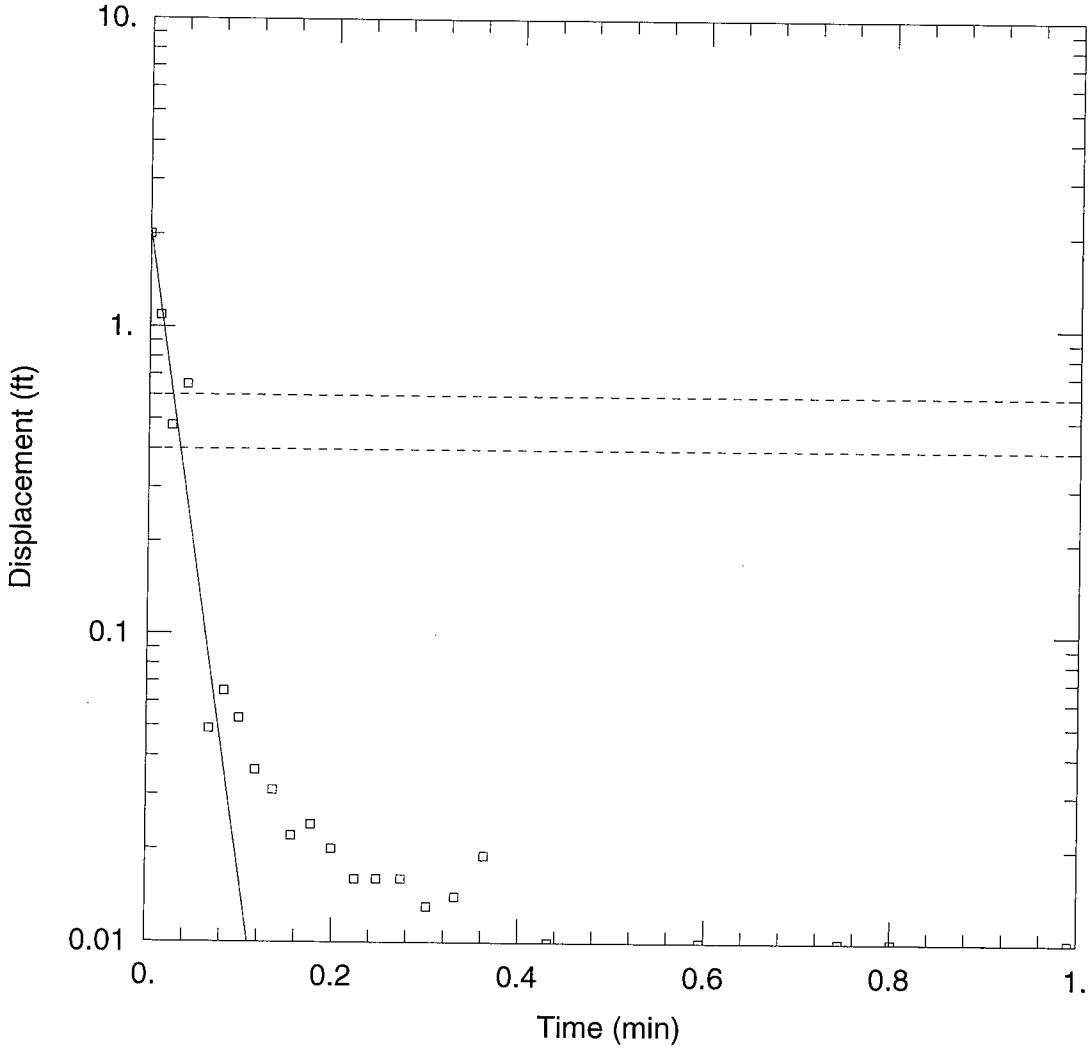
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 47.25 ft/day
y0 = 2.102 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_2.aqt
Date: 08/02/11 Time: 10:47:26

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 2
Test Date: 6/18/2011

AQUIFER DATA

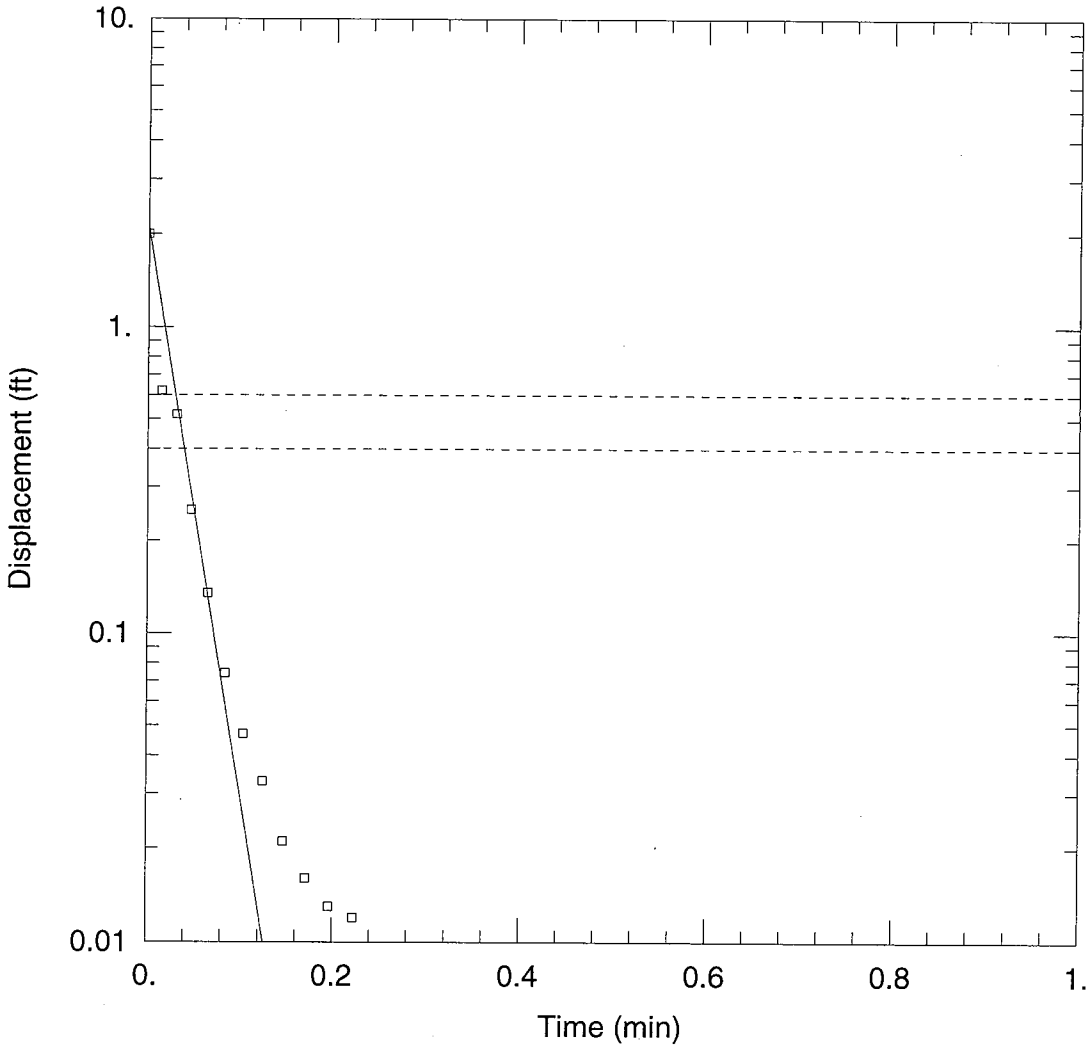
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 61.62 ft/day
y0 = 2.07 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_2.aqt
Date: 08/02/11 Time: 10:52:03

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 2
Test Date: 6/18/2011

AQUIFER DATA

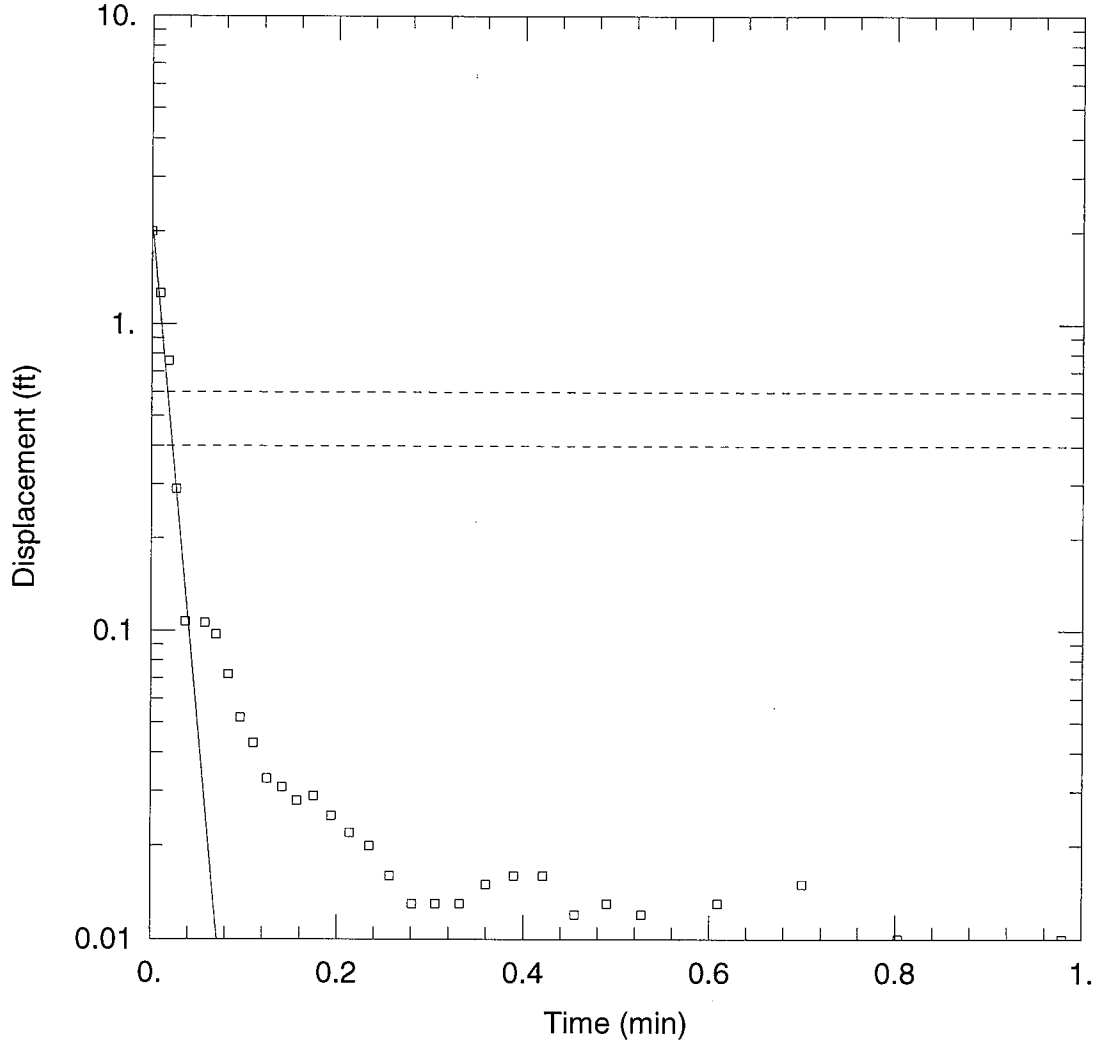
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 53.99 ft/day
y0 = 2.097 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_3.aqt
Date: 08/02/11 Time: 10:52:11

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 3
Test Date: 6/18/2011

AQUIFER DATA

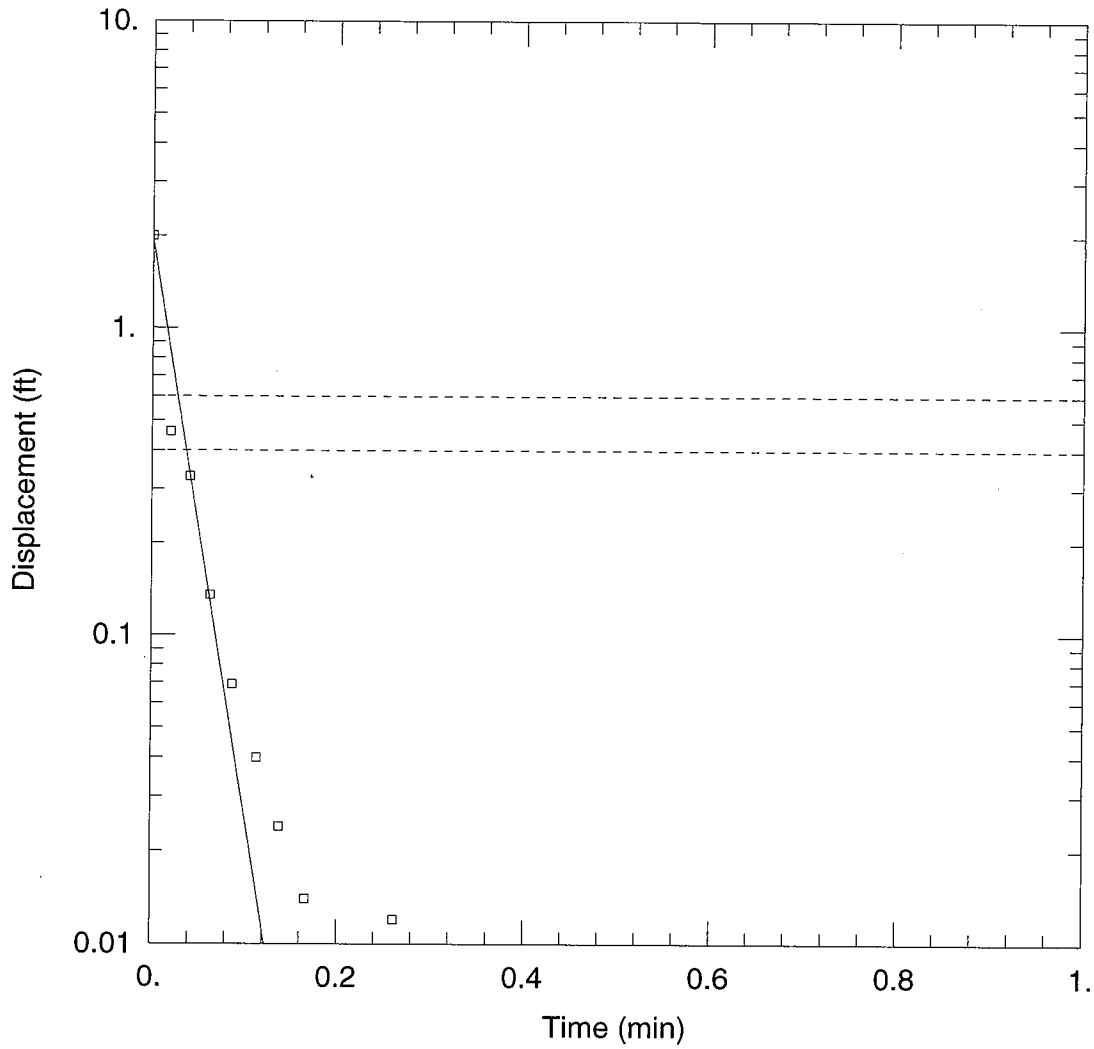
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 95.53 ft/day
y0 = 2.162 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_3.aqt
Date: 08/02/11 Time: 10:52:22

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 3
Test Date: 6/18/2011

AQUIFER DATA

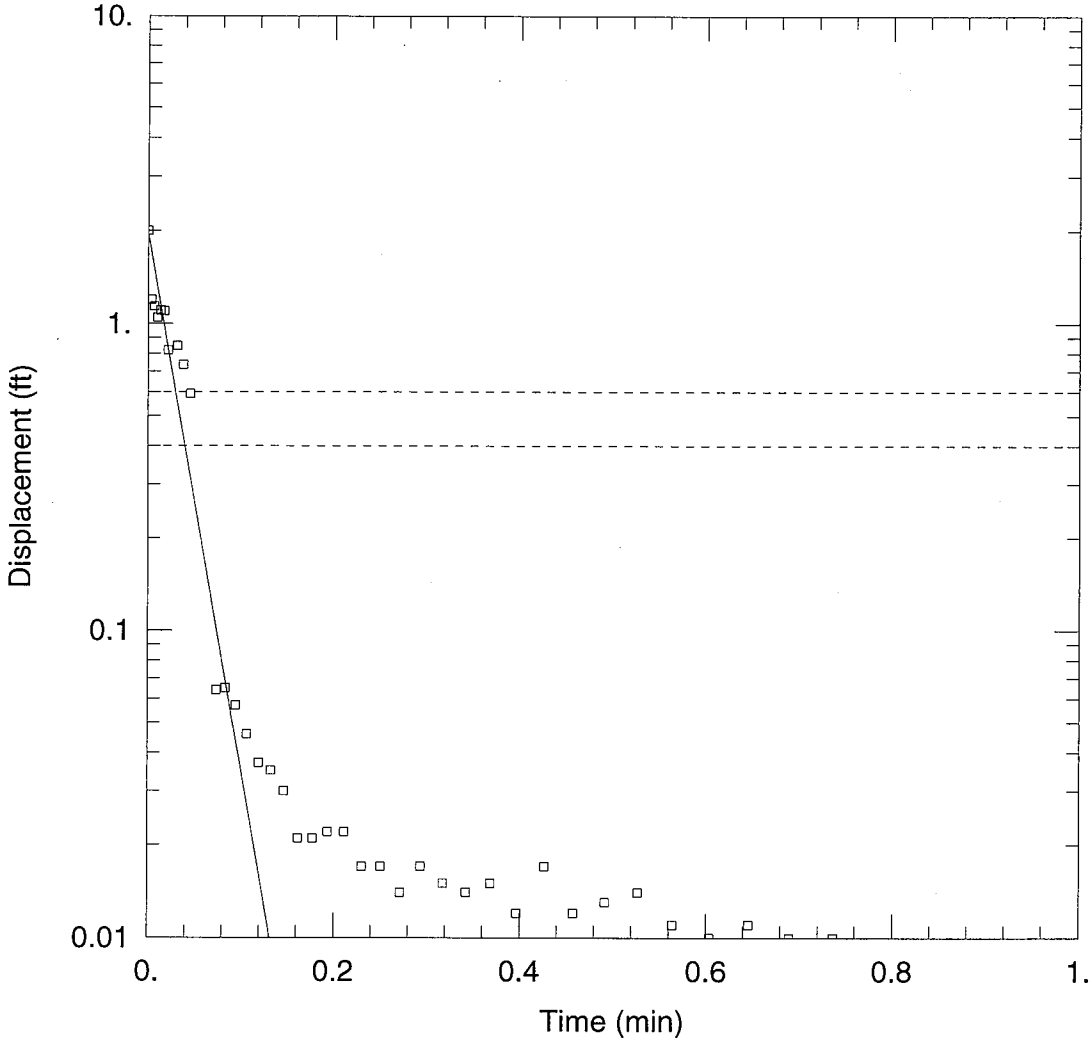
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 54.59 ft/day
y0 = 1.935 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Fall_4.aqt
Date: 08/02/11 Time: 10:47:05

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Falling 4
Test Date: 6/18/2011

AQUIFER DATA

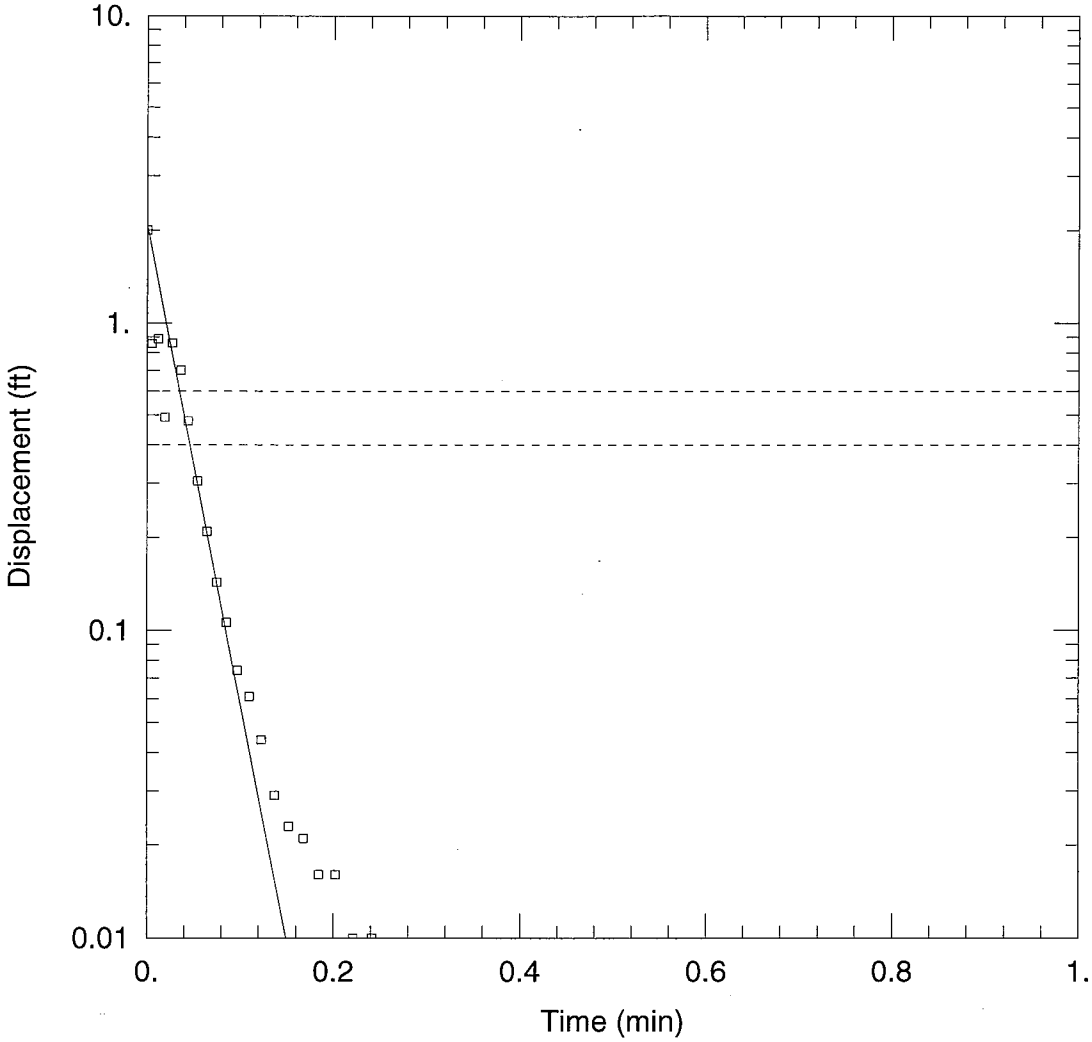
Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 51. ft/day
y0 = 1.957 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW01_Rise_4.aqt
Date: 08/02/11 Time: 10:53:05

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW01 - Rising 4
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 28. ft
Anisotropy Ratio (Kz/Kr): 1.

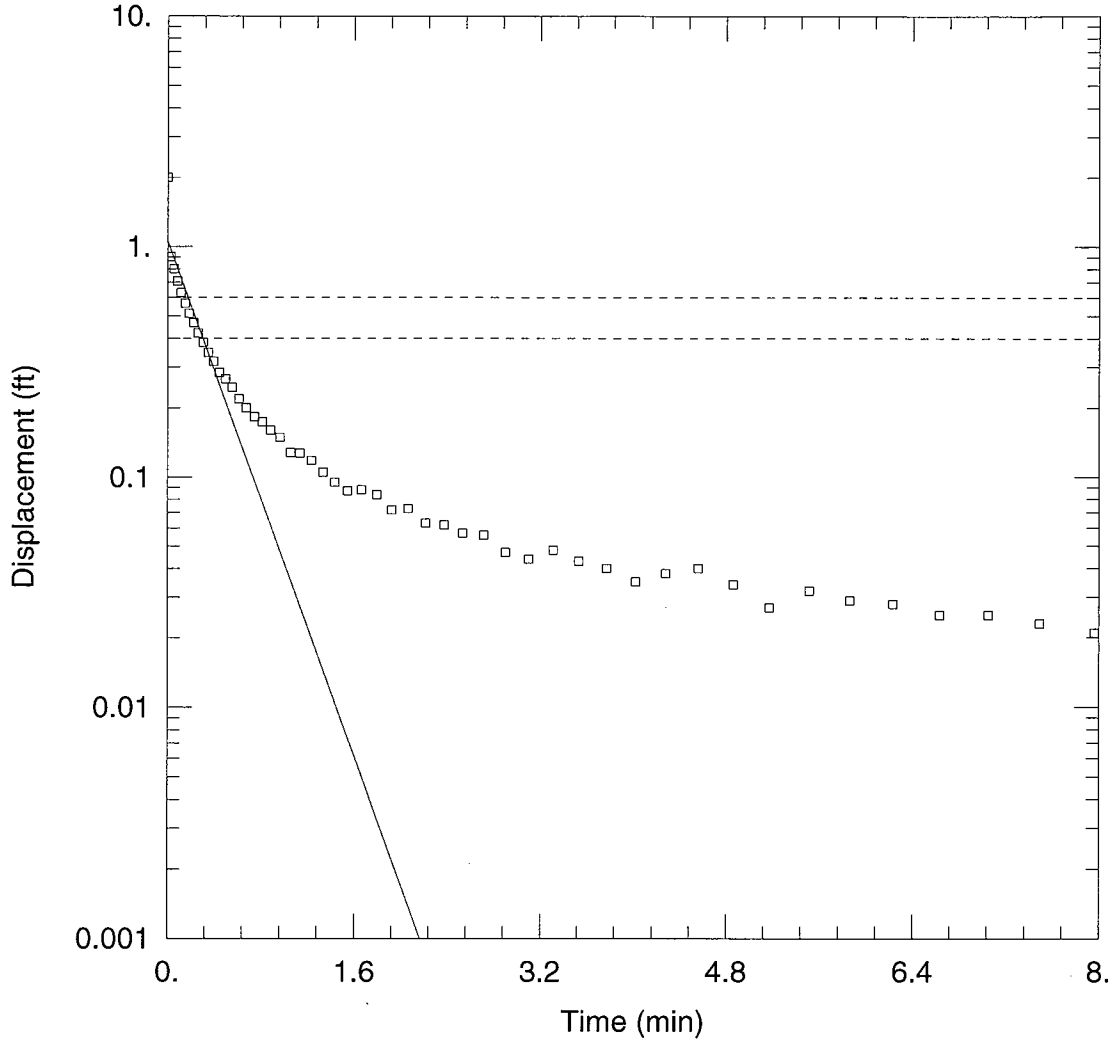
WELL DATA (S43-MW01)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 13. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 45.46 ft/day
y0 = 2.074 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Rise_1.aqt
Date: 08/02/11 Time: 10:46:55

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Rising 1
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

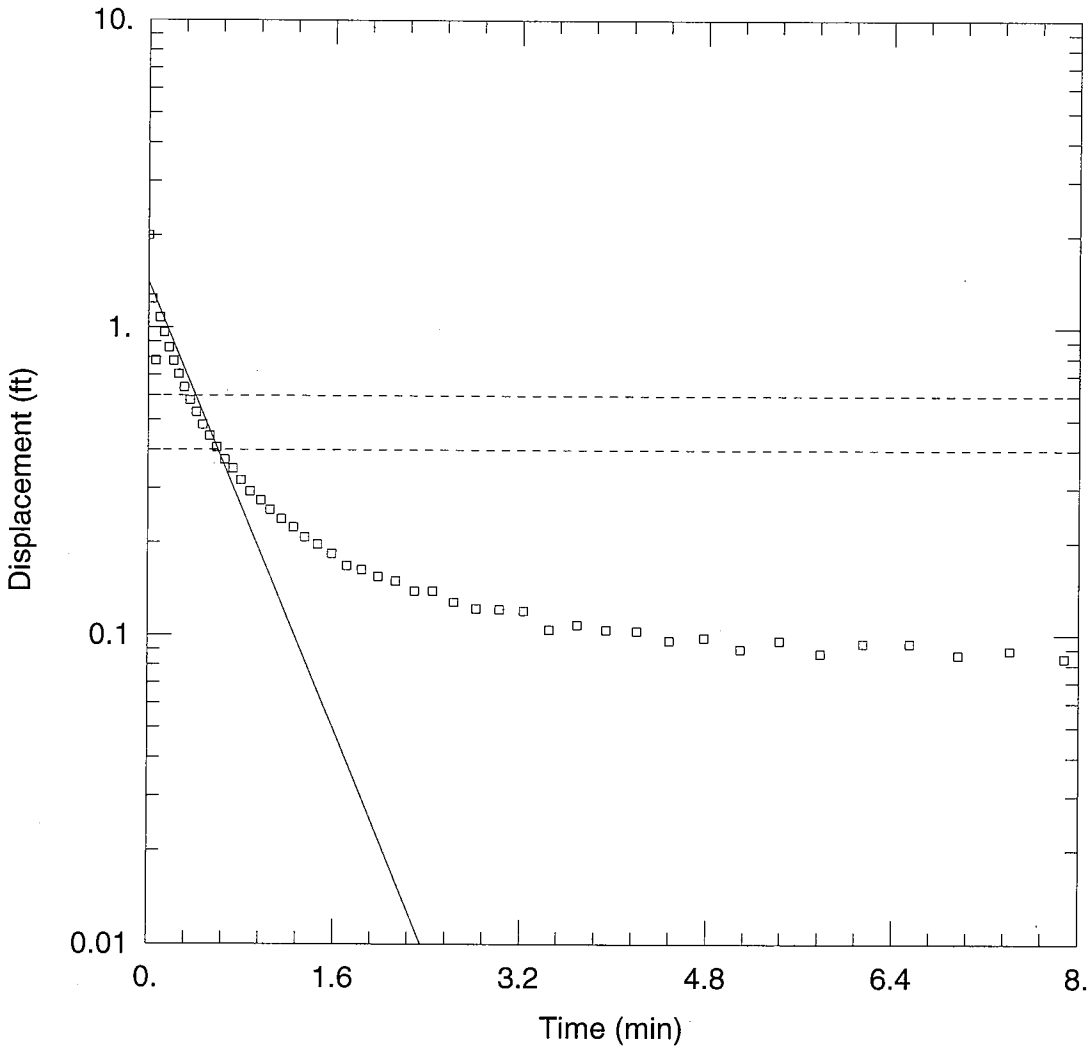
WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.699 ft/day
y0 = 1.051 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Fall_2.aqt
Date: 08/02/11 Time: 10:47:02

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Falling 2
Test Date: 6/18/2011

AQUIFER DATA

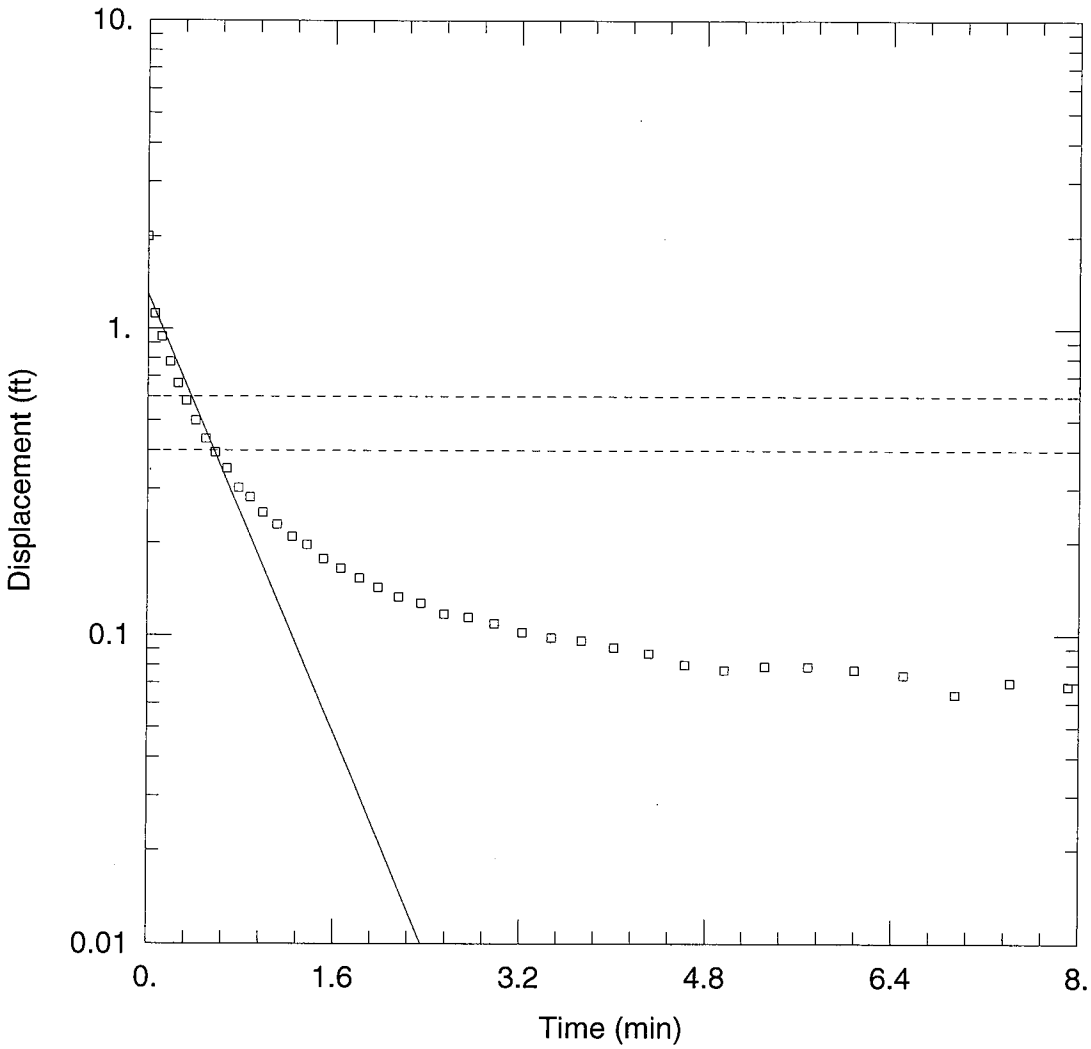
Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.076 ft/day
y0 = 1.412 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Fall_3.aqt
Date: 08/02/11 Time: 10:46:59

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Falling 3
Test Date: 6/18/2011

AQUIFER DATA

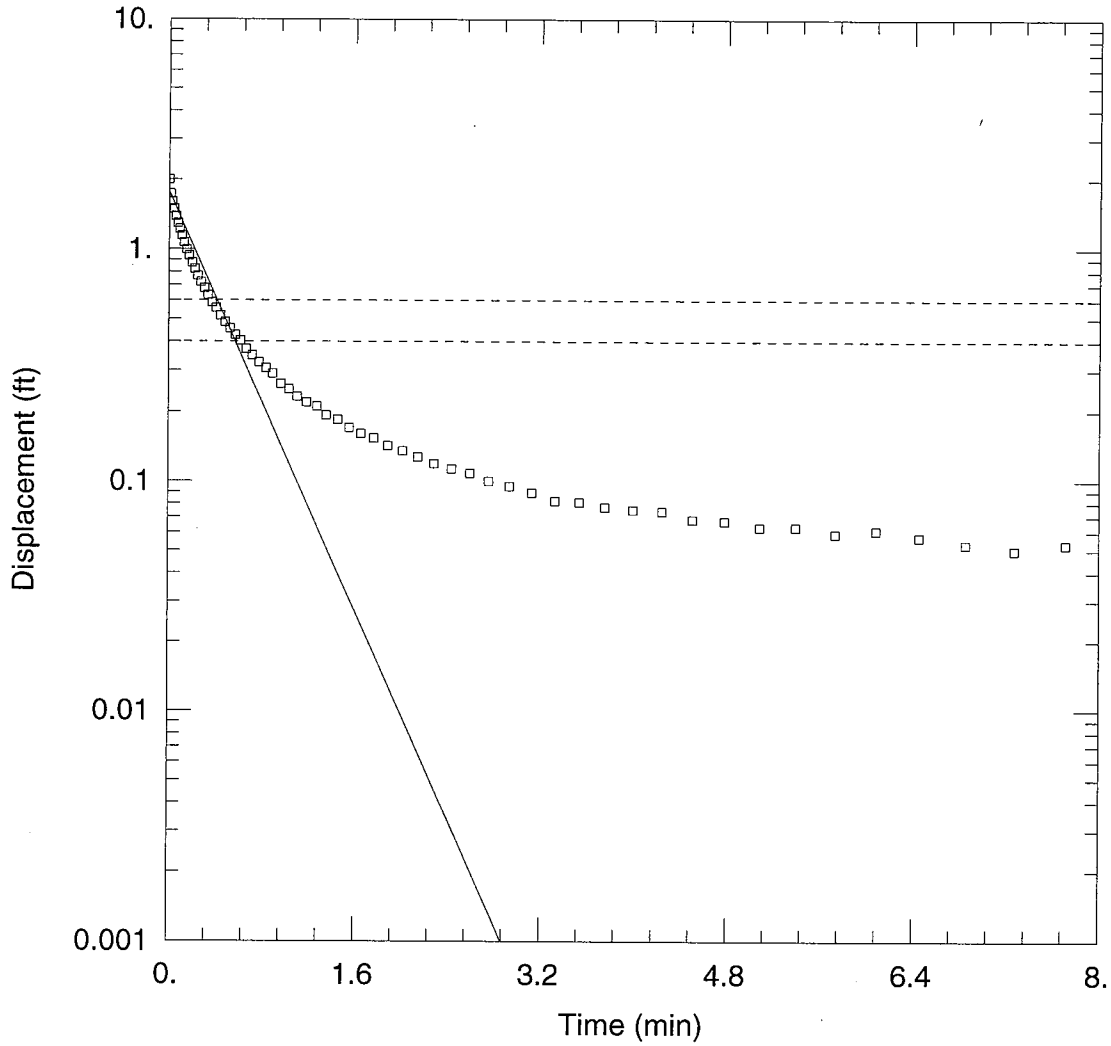
Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.021 ft/day
y0 = 1.296 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW03_Rise_3.aqt
Date: 08/02/11 Time: 10:46:53

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW03 - Rising 3
Test Date: 6/18/2011

AQUIFER DATA

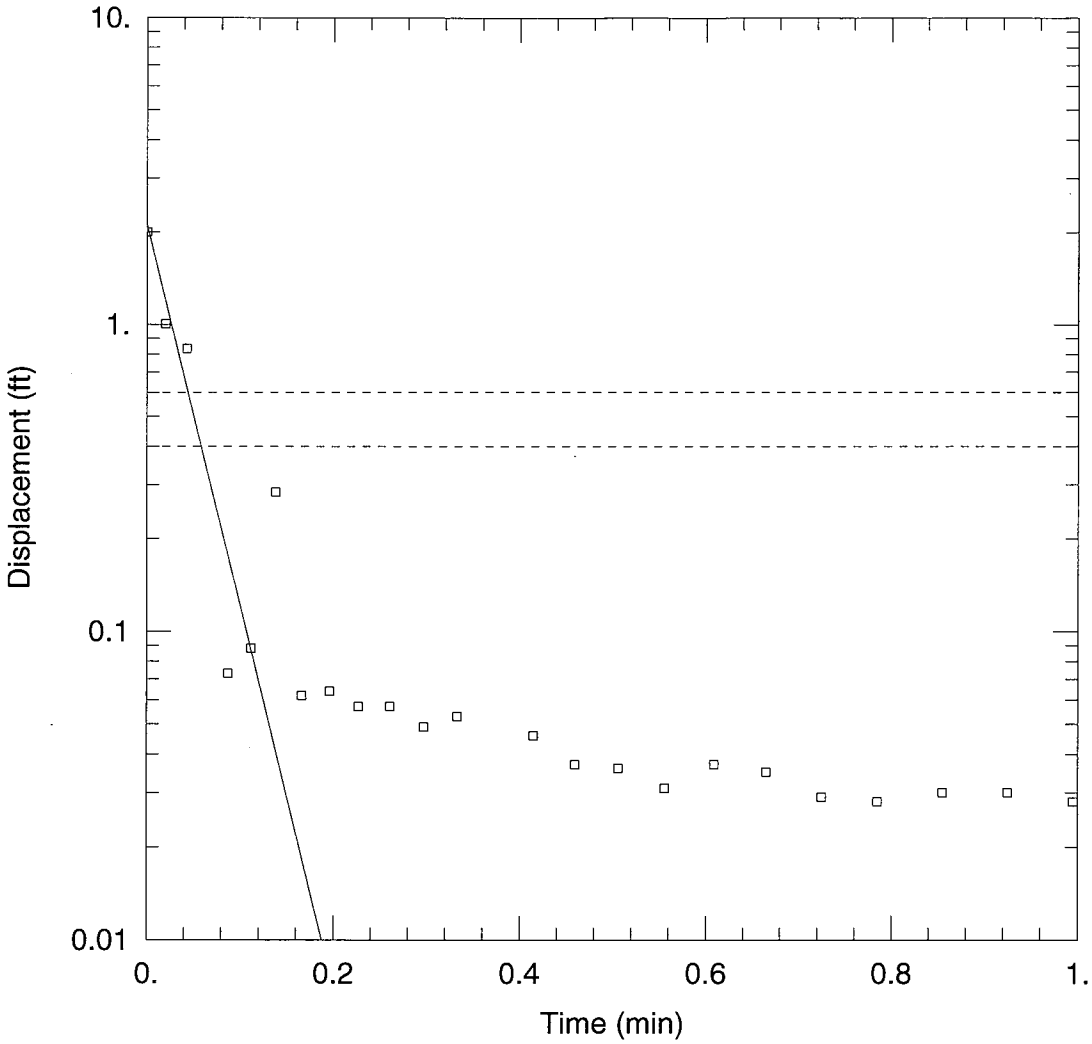
Saturated Thickness: 19. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW03)

Initial Displacement: 2. ft
Total Well Penetration Depth: 18. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 18. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.806 ft/day
y0 = 1.769 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Fall_1.aqt
Date: 08/02/11 Time: 15:18:07

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Falling 1
Test Date: 6/18/2011

AQUIFER DATA

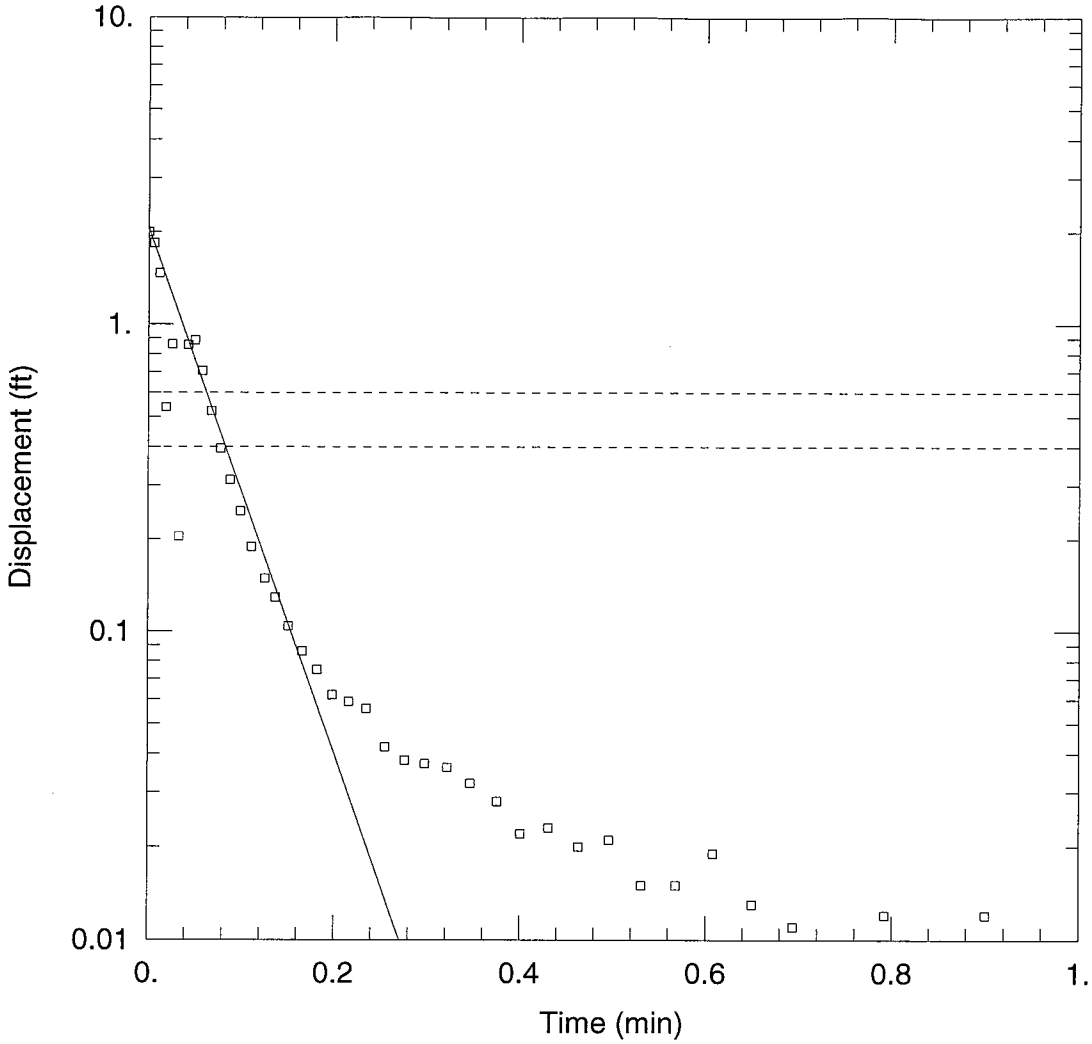
Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 41.89 ft/day
y0 = 2.1 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Rise_1.aqt
Date: 08/02/11 Time: 15:18:57

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Rising 1
Test Date: 6/18/2011

AQUIFER DATA

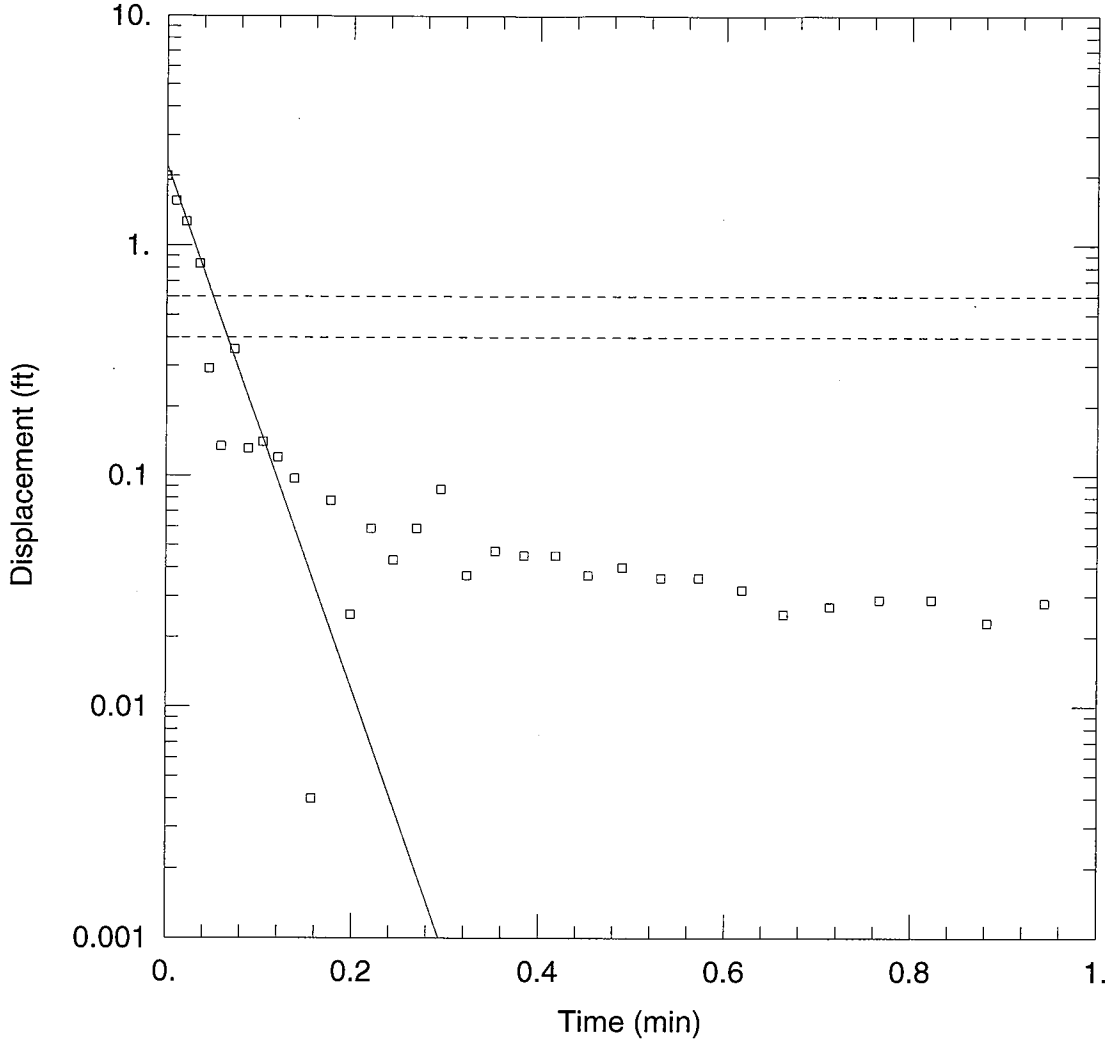
Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 28.89 ft/day
y0 = 2.046 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Fall_2.aqt
Date: 08/02/11 Time: 15:18:23

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Falling 2
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

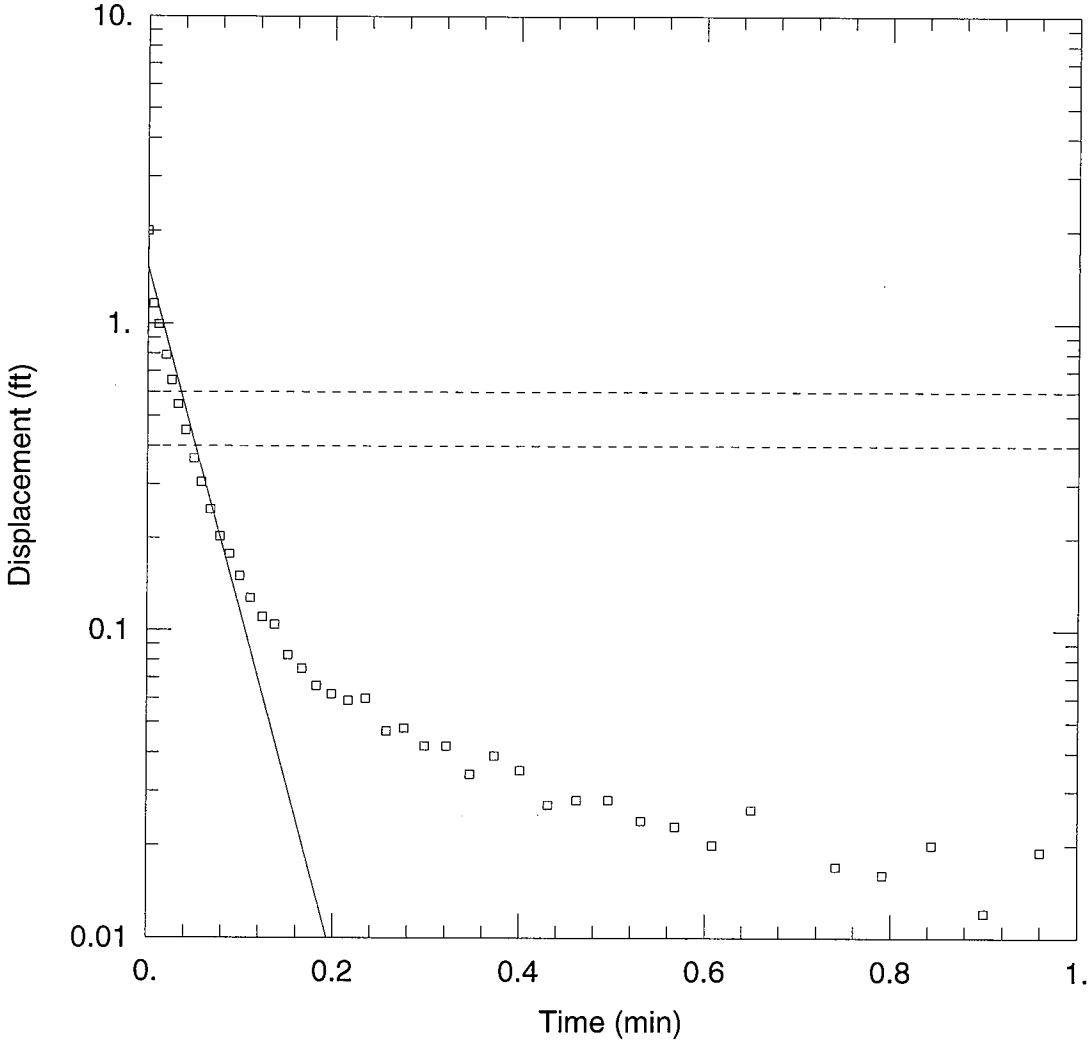
WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 38.61 ft/day
y0 = 2.228 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Rise_2.aqt
Date: 08/02/11 Time: 15:19:10

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Rising 2
Test Date: 6/18/2011

AQUIFER DATA

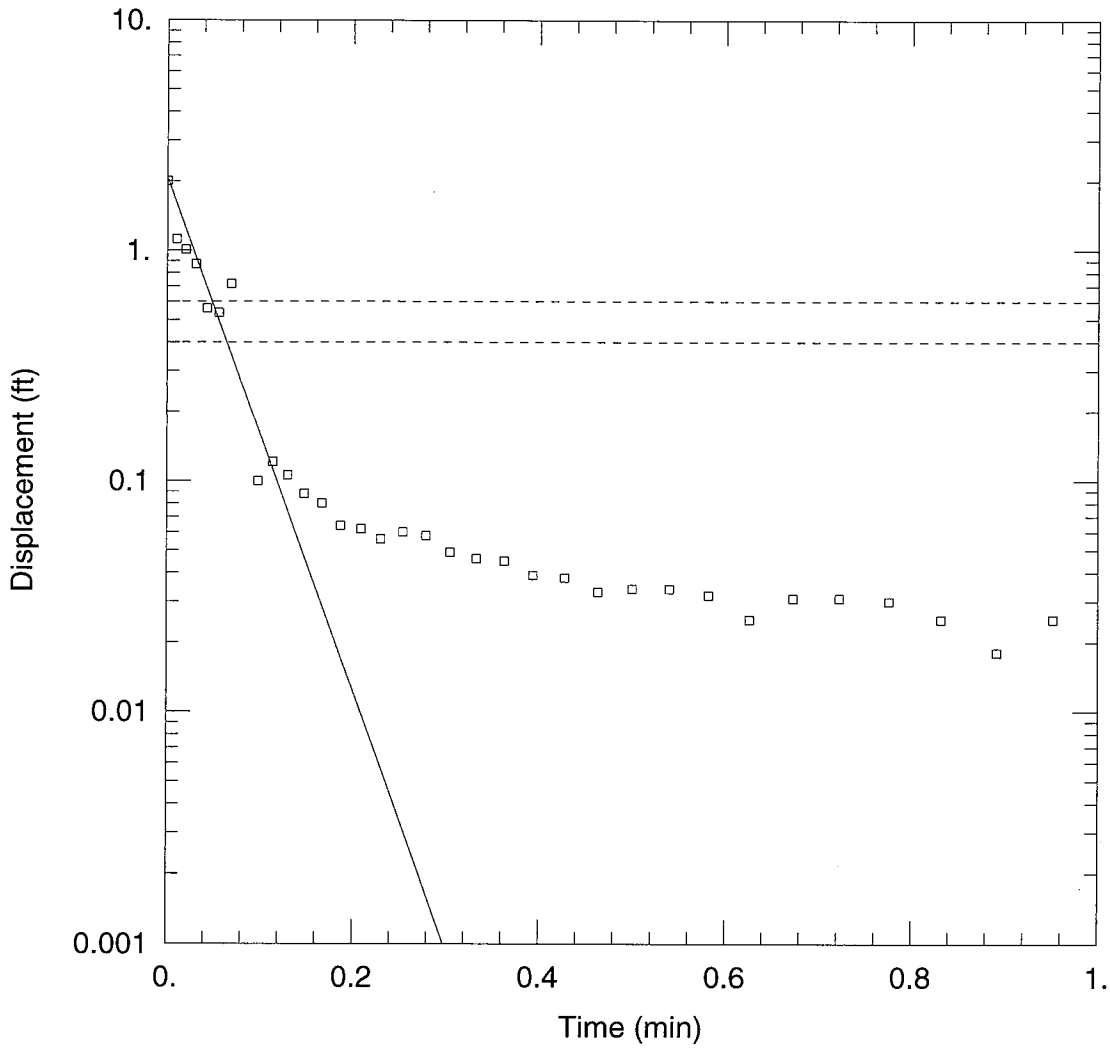
Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 38.13 ft/day
y0 = 1.524 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Fall_3.aqt
Date: 08/02/11 Time: 15:18:41

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Falling 3
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

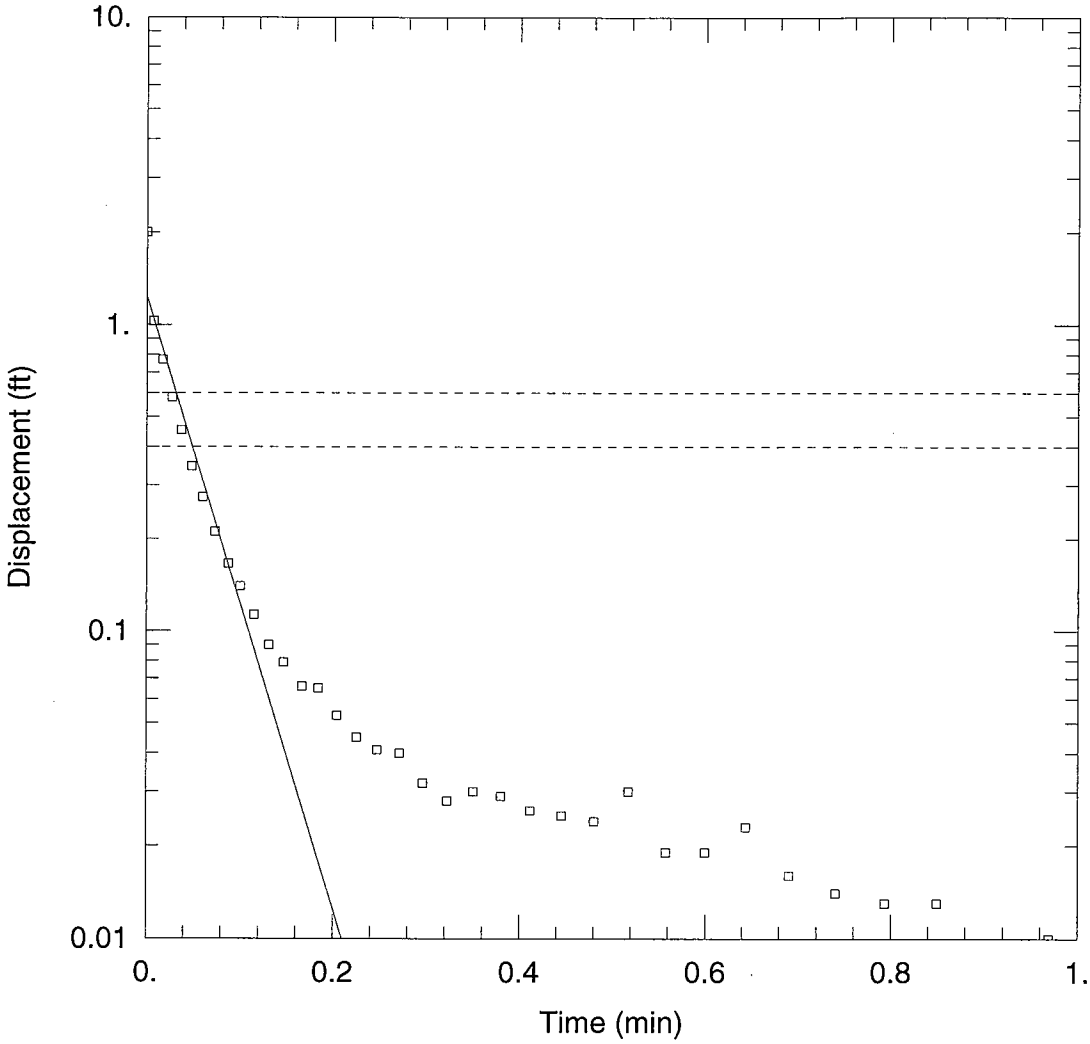
WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 37.63 ft/day
y0 = 2.066 ft



WELL TEST ANALYSIS

Data Set: G:\Indian Head - Rob Sok\AQTESolv Files\S43-MW05_Rise_3.aqt
Date: 08/02/11 Time: 15:19:32

PROJECT INFORMATION

Company: Tetra Tech NUS, Inc.
Client: U.S. Navy
Project: 112G00771
Location: Indian Head - Site 43
Test Well: S43-MW05 - Rising 3
Test Date: 6/18/2011

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (S43-MW05)

Initial Displacement: 2. ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 23. ft
Screen Length: 10. ft
Wellbore Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 33.76 ft/day
y0 = 1.234 ft

APPENDIX I
SURVEY TABLE

Appendix I
Survey Data
Site 43 - Toluene Disposal Area
NSF Indian Head, Maryland

Point Id.	North	East	Elev. @ Gnd	Elev. @ Top Case	Description	Elev. @ Gnd	Elev. @ Top Case
						Local (BASE)	Local (BASE)
IH43_MW01	330542.477	1254738.81	33.218	32.982	mwell	34.218	33.982
IH43_MW01A	330542.591	1254738.766	32.982		sdinv	32.982	0
IH43_MW02	329983.522	1254244.252	34.05	33.677	mwell	34.05	33.677
IH43_MW02A	329983.415	1254244.233	33.677		sdinv	33.677	0
IH43_MW03	330469.721	1254534.708	33.967	36.497	mwell	33.967	36.497
IH43_MW04	330588.308	1254591.08	33.226	35.519	mwell	33.226	35.519
IH43_MW04A	330589.346	1254590.885	35.519		sdinv	35.519	0
IH43_MW05	330710.769	1254749.063	33.855	33.412	mwell	33.855	33.412
IH43_MW05A	330710.835	1254748.959	33.412		sdinv	33.412	0
IH43_MW06	330466.787	1254853.12	33.043	32.838	mwell	33.043	32.838
IH43_MW06A	330466.7	1254853.099	32.838		sdinv	32.838	0
IH43_TW06	330609.119	1254626.888	32.727		twell	32.727	
IH43_TW07	330584.804	1254679.093	33.241		twell	33.241	
IH43_TW08	330549.035	1254648.491	33.353		twell	33.353	
IH43_TW11	330514.18	1254781.634	32.799		twell	32.799	
IH43_TW12	330525.708	1254800.612	33.191		twell	33.191	

								Difference
IH_0314	331132.887	1254587.266	35.479		GPS	36.439		-0.96
IH_1167	330812.523	1255205.355	36.574		GPS	37.559		-0.985
IH_1217	330084.341	1254338.032	32.924		GPS	33.98		-1.056
907	330422.774	1254958.434	33.812		tr			
MAPS51	330598.002	1254645.11	32.919		tr			

Vertical Adjustment difference -1

Notes:

Moody and Associates survey data August 2011

APPENDIX J
QA SAMPLE LOG SHEETS

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: S43TB01-20110603
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-3-11
Time: 1000
Method: Lab prepared

WATER SOURCE:

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

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

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

RINSATE INFORMATION (If Applicable):

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

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40mL glass vial	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

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: S43TB02-20110604
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-4-11
Time: 0830
Method: Lab prepared

WATER SOURCE:

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

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

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

RINSATE INFORMATION (If Applicable):

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

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40mL vials	(YES) / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

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: S43TB03-20110610
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-10-11
Time: 0840
Method: Lab prepared

WATER SOURCE:

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

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

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

RINSATE INFORMATION (If Applicable):

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

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40 mL glass vial	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

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: TB 061311-01
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-13-2011
Time: 1000
Method: Lab prepared

WATER SOURCE:

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

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

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

RINSATE INFORMATION (If Applicable):

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

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	2 40 mL glass vials	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Signature(s):

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: S43 RB01-20110605
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-5-11
Time: 1345
Method: Pour through equipment

WATER SOURCE:

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

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

Product Name: CVS Distilled water
Supplier: CVS Pharmacy
Manufacturer: Roaring Spring ~~Bottl~~ Water Co.
Order Number: 6300 52042111 0 3
Lot Number: 0351 1
Expiration Date: 5-9-2013

RINSATE INFORMATION (If Applicable):

Media Type: Water
Equipment Used: Hardened steel cutting shoe and geoprobe liner
Equipment Type:
[X] Dedicated and
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40ml vials	YES / NO
~~Semivolatiles~~ Explosives	Cool 4°C	2 1L Amber	YES / NO
~~Pesticide / PCB~~ Perchlorate (0.45 Filtered)	Cool 4°C	1 250mL poly	YES / NO
Metals Total	Cool 4°C & HNO_3	1 250mL poly	YES / NO
Cyanide Total	Cool 4°C & NaOH	1 250mL poly	YES / NO
Metals Filtered (0.45 filtered)	4°C HNO_3	1 250mL poly	yes

OBSERVATIONS / NOTES:

Purified by distillation and 0.2-micron filtered and ozonated

2" inner diameter cutting shoe

Poured through liner and shoe into bottle

For filtered samples, used empty CVS distilled bottle to transfer water

Signature(s):

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: S43RB02-20110612
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-12-11
Time: 1550
Method: Direct pour

WATER SOURCE:

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

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

Product Name: CVS Distilled Water
Supplier: CVS Pharmacy
Manufacturer: Roaring Spring Water Co.
Order Number: 6300520421103
Lot Number: 08511
Expiration Date: 5-9-2013

RINSATE INFORMATION (If Applicable):

Media Type: Water
Equipment Used: Temporary Well Stainless Steel Screen
Equipment Type:
[] Dedicated
[X] Reusable

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40 mL vials	(YES) NO
~~Semivolatiles~~ Explosives	Cool 4°C	2 1L amber glass	(YES) NO
~~Pesticide / PCB~~ Perchlorate (0.2 µm Filter)	Cool 4°C	1 250 mL poly	(YES) NO
Metals Total	Cool 4°C & HNO_3	1 250 mL poly	(YES) NO
Cyanide Total	Cool 4°C & NaOH	1 250 mL poly	(YES) NO
Metals Filtered (0.45 filtered)	4°C HNO_3	1 250mL poly	yes

OBSERVATIONS / NOTES:

Purified by distillation and 0.2-micron filtered and ozonated

4'x 1" expendable S.S. screen
Poured over screen into bottle
For filtered samples, used empty CVS distilled bottle to transfer water

Signature(s):

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: S43 FB01 - 20110605
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-5-11
Time: 1405
Method: Direct Pour

WATER SOURCE:

[] Laboratory Prepared
[] Purchased
[X] Other Men's Restroom Building 21 Faucet
[] Tap
[] Fire Hydrant

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

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

RINSATE INFORMATION (If Applicable):

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

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40 mL Vials	YES / NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

water used for decon

Signature(s):

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: S43 FB02-20110605
Sampled By: JB/KS
C.O.C. Number:

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

SAMPLING DATA:

Date: 6-5-11
Time: 1430
Method: Direct Pour

WATER SOURCE:

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

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

Product Name: CVS Distilled water
Supplier: CVS Pharmacy
Manufacturer: Roaring Spring Water Co
Order Number: 6300520421110 3
Lot Number: 08511
Expiration Date: 5-9-2013

RINSATE INFORMATION (If Applicable):

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

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Volatiles	Cool 4°C & HCl	3 40mL vial	(YES) NO
Semivolatiles	Cool 4°C		YES / NO
Pesticide / PCB	Cool 4°C		YES / NO
Metals	Cool 4°C & HNO_3		YES / NO
Cyanide	Cool 4°C & NaOH		YES / NO

OBSERVATIONS / NOTES:

Water used for S43RB01-20110605

Signature(s):

APPENDIX K
CHAIN OF CUSTODY RECORDS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 27271 | PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Indian Head	Rob Sok	757-466-4904	Empirical Labs
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
Jacob Birkett		Keith Simpson		621 MainStream Dr. Suite 270
		CARRIER/WAYBILL NUMBER		CITY, STATE
		FedEx 8686 9317 0641		Nashville TN 37228

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

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P P G P G

PRESERVATIVE USED: HCl MeOH / / / HNO3 HNO3 / / / HCl NaOH ZnAcP H2SO4

	DATE YEAR 2011	TIME	SAMPLE ID 1105047	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOC	VOC	Explosives	Perchlorate	TAL Metals	Total Metals	Filtered Metals	Total CN	Explosives	Filtered Perchlorate	Anions	MTE	Sulfide	TOC	COMMENTS
-01	6-3	1000	S43TB01-20110603	—	—	—	QA	-	2	2														Lab prepared
-02	6-3	1120	S43SB013-0603	SB013	6	8	SO	G	6		3	1	1	1										
-03	6-3	1300	S43SB015-0810	SB015	8	10	SO	G	6		3	1	1	1										
5-04	6-3	1410	S43TW007-2327	TW007	23	27	GW	G	15	3	3				1	1	1	2	1	1	3	1	1	
7-08	6-3	1535	S43TW009-2125	TW009	21	25	GW	G	15	3					1	1	1	2	1	1	3	1	1	
9-10	6-3	1510	S43SB010-0709	SB010	7	9	SO	G	6		3	1	1	1										

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY Jacob Birkett	6-3-11	1730	1. RECEIVED BY FED EX	6-3-11	1800
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reynaldo Talley	6-4-11	1100

COMMENTS

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

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FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 27273 | PAGE 1 OF 1

PROJECT NO: 112G00771	FACILITY: Indian Head Site 43	PROJECT MANAGER Rob Sok	PHONE NUMBER 757-466-4904	LABORATORY NAME AND CONTACT: Empirical Laboratories Brian Richard
SAMPLERS (SIGNATURE) Jacob Birkett		FIELD OPERATIONS LEADER Keith Simpson	PHONE NUMBER 412-352-2264	ADDRESS 621 Mainstream Dr., Suite 270
		CARRIER/WAYBILL NUMBER FedEx 8686 9317 0630		CITY, STATE Nashville, TN 37228

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

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P P G P
PRESERVATIVE USED: HCl MeOH / / / HNO3 HNO3 NaOH / /

	DATE YEAR 2011	TIME	SAMPLE ID 1106067	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: AG VOCs 40mL glass	Soil VOCs 40mL glass	Explosives	Perchlorate	TAL Metals, Total CN, TOC	Total Metals	Filtered Metals	Total CN	Explosives	Filtered Perchlorate	COMMENTS
-01	6-4	0830	S43TB02-20110604	—	—	—	QA	—	2	2										Lab prepared
-02	6-4	0910	S43SB009-0608	SB09	6	8	SO	G	6		3	1	1	1						
-03	6-4	1140	S43SB008-0608	SB08	6	8	SO	G	6		3	1	1	1						
-04	6-4	1526	S43SB011-0709	SB11	7	9	SO	G	6		3	1	1	1						
-05	6-4	1526	S43SB011-0709-D	SB11-D	7	9	SO	G	6		3	1	1	1						Duplicate
-06	6-4	1720	S43SB014-0709	SB14	7	9	SO	G	12		6	2	2	2						Run MS/MSD
-07 -08	6-5	1010	S43TW08 2832	TW08	28	32	GW	G	9	3				1	1	1	1	2	1	
-09	6-5	1011	S43SB016-0608	SB16	6	8	SO	G	6		3	1	1	1						
-10 -11	6-5	1345	S43RB01-20110605	—	—	—	QC	—	9	3					1	1	1	2	1	Perchlorate 0.45 micron Filtered
-12	6-5	1405	S43FB01-20110605	—	—	—	QC	—	3	3										Tapwater at Site
-13	6-5	1430	S43FB02-20110605	—	—	—	QC	—	3	3										Store bought distilled H_2O

1. RELINQUISHED BY Jacob Birkett	DATE 6-6-11	TIME 1600	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY Reginald Talley 3.2°C	DATE 6.7.11	TIME 0900

COMMENTS

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

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FORM NO. TtNUS-001

11

CTO114_002

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 27276 | PAGE 1 OF 2

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Indian Head Site 3	Rob Sok	757-466-4904	Empirical Labs LLC Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Keith Simpson	PHONE NUMBER: 412 352-2264	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8689-3778-3771		CITY, STATE: Nashville, TN 37228

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

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P G G P

PRESERVATIVE USED: HCl, MeOH & NaHSO4 / — / — / — / HNO3 / HNO3 / NaOH / — / —

TYPE OF ANALYSIS: VOC (Aqueous) / VOC (Soil) / Explosives (Soil) / Perchlorate (Soil) / TAL Metals, Total CN, TOC / Total Metals (Aq) / Filtered Metals (Aq) / Total CN (Aq) / Explosives (Aq) / Perchlorate (Aq-Filtered)

110658

	DATE YEAR 2011	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	VOC (Aqueous)	VOC (Soil)	Explosives (Soil)	Perchlorate (Soil)	TAL Metals, Total CN, TOC	Total Metals (Aq)	Filtered Metals (Aq)	Total CN (Aq)	Explosives (Aq)	Perchlorate (Aq-Filtered)	COMMENTS
01	6-10	0840	S43TB03-20110610	QA	—	—	QC	—	2	2										Lab prep'd -01
02	6-10	1010	S43SB017-0608	SB17	6	8	SO	G	6		3	1	1	1						-02, -17
03	6-10	1325	S43TW11-3034	TW11	30	34	GW	G	9	3					1	1	1	2	1	-03
04	6-10	1338	S43SB018-0507	SB18	5	7	SO	G	6		3	1	1	1						-04
05	6-10	1353	S43SB011-0507	SB11	5	7	SO	G	~~6~~ 3 JB		3	~~1~~ JB								-05
06	6-10	1710	S43SB009-0708	SB09	7	8	SO	G	3		3									-06
07	6-10	1710	S43SB009-0708-D	SB09	7	8	SO	G	3		3									Duplicate -07
08	6-10	1725	S43SB008-0607	SB08	6	7	SO	G	6		6									Run MS/MSD -08
09	6-11	0902	S43SB022-0708	SB22	7	8	SO	G	3		3									-09
10	6-11	0945	S43SB019-0607	SB19	6	7	SO	G	3		3									-10
11	6-11	0955	S43TW12-2630	TW12	26	30	GW	G	9	3					1	1	1	2	1	-11, -18
12	6-11	1055	S43SB012-0507	SB12	5	7	SO	G	6		3	1	1	1						-12
17	6-11	1055	S43SB012-0507-D	SB12	5	7	SO	G	6		3	1	1	1						Duplicate -13

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY	6-13-11	1730	1. RECEIVED BY	6-13-11	18:00
2. RELINQUISHED BY			2. RECEIVED BY	DATE 14	
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

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

4/02R
FORM NO. TINUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 27277 | PAGE 2 OF 2

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	Indian Head Site 43	Rob Sok	757-466-4909	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Keith Simpson	PHONE NUMBER: 412-352-2264	ADDRESS: 621 Mainstream Dr. Suite 270
		CARRIER/WAYBILL NUMBER: FedEx 8689-3778-3771		CITY, STATE: Nashville, TN 37228

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

CONTAINER TYPE PLASTIC (P) or GLASS (G): G G G G G P P G P

PRESERVATIVE USED: HCl; 1 NaOH 2 Na_2SO_4; / / / HNO_3; HNO_3; NaOH; / /

TYPE OF ANALYSIS: VOC (Aqueous); VOC (Soil); Explosives (Soil); Perchlorate (Soil); TAL Metals (Total) (Soil); Total Metals (Aq); Filtered Metals (Aq); Total CN (Aq); Explosives (Aq); Perchlorate (Aq-Filtered)

	DATE YEAR	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	VOC (Aqueous)	VOC (Soil)	Explosives (Soil)	Perchlorate (Soil)	TAL Metals (Total) (Soil)	Total Metals (Aq)	Filtered Metals (Aq)	Total CN (Aq)	Explosives (Aq)	Perchlorate (Aq-Filtered)	COMMENTS
14	6-11	1305	S43TW006-2332	TW06	23	32	GW	G	9	3	4*			*	1	1	1	2	1	-14, -19
15	6-12	0930	S43SB016-0607	SB16	6	7	SO	G	3		3									-15
16	6-12	1550	S43RB02-20110612	—	—	—	QC	—	9	3					1	1	1	2	1	Rinsate Blank-16, -20

1. RELINQUISHED BY	DATE 6-13-11 +	TIME 1530	1. RECEIVED BY 4°C	DATE 6-14-11	TIME 09:00
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. TINUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER 27281 PAGE 1 OF 1

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
112G00771	NSF Indian Head	Rob Sok	757-466-4904	Empirical Labs Brian Richard
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER: Keith Simpson	PHONE NUMBER	ADDRESS: 621 Mainstream Dr.
		CARRIER/WAYBILL NUMBER: FedEx 8689-3778-3793		CITY, STATE: Nashville, TN 37228

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

CONTAINER TYPE PLASTIC (P) or GLASS (G): G P P P G P P G P G

PRESERVATIVE USED: HCL, HNO3, HNO3, NaOH, –, –, –, HCL, Zn Acetate NaOH, H2SO4

TYPE OF ANALYSIS: VOC, Total Metals, Filtered Metals, Total CN, Explosives, Filtered Perchlorate, Anions, MEE, Sulfide, Dissolved TOC

	DATE YEAR 2011	TIME	SAMPLE ID 1106198	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS	VOC	Total Metals	Filtered Metals	Total CN	Explosives	Filtered Perchlorate	Anions	MEE	Sulfide	Dissolved TOC	COMMENTS
-01	6-13	1000	TBC61311-01	—	—	—	QC	—	2	2										Lab prepared
-02 -03	6-17	0918	S43MW00401	MW04	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	
-04 -05	6-17	0918	S43MW00401-D	MW04D	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	Duplicate
-06 -07	6-17	1040	S43MW01C03	MW01	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	
-08 -09	6-17	1130	S43MW00601	MW06	—	—	GW	G	16	3	1	1	1	2	1	1	3	1	2	Note
-10 -11	6-17	1245	S43MW02C03	MW02	—	—	GW	G	13	3*	1°	1°	1			1	3	1	2	* TCE only ° Cobalt only
-12 -13	6-17	1357	S43MW00301	MW03	—	—	GW	G	27	9	3	3	3	6	3					RUMS MSD
-14 -15	6-17	1530	S43MW0501	MW05	—	—	GW	G	9	3	1	1	1	2	1					

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
Jacob Birkett	6-17-11	1700			
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME
			Reginald Talley	6.18.11	1100

COMMENTS

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

4/02R
FORM NO. TtNUS-001

11

1106198 Summ Package

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Page 1 of 1

Project Manager: Rob Sok
Collected by: (Print and Sign) Jacob Birkett
Company: Tetra Tech Email:
Address: 5700 Lake Wright Dr. City: Norfolk State: VA Zip: 23185
Phone: 757-466-4904 Fax:

Project Info:
P.O. #:
Project #: 112G00771
Project Name: Indian Head Site 43

Turn Around Time:
☒ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	5430DA01	5705	6-11-11	1445	Modified EPA TO-15	-30+	-1		
02A	5438G0305	3731	6-11-11	1500	Mod. TO 15	-30+	-1		
03A	5435G0406	34201	6-11-11	1705	Mod. TO 15	-30+	-9		
04A	5435G0106	11880	6-11-11	1850	Mod. TO 15	-30+	-9		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	6-13-11 1530	[signature] ATL	6/14/11 0850

Notes: Can #'s 433 and 33988 No sample

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FED EX		NA	GOOD	Yes No None	1106832

Form 1293 rev.11

APPENDIX L
VALIDATION LETTERS AND TABLES

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**AUGUST 26, 2011**
FROM:	**ANN COGNETTI**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOC / OVG / EXP**
NSF INDIAN HEAD, CTO 114, FULL REVIEW
SAMPLE DELIVERY GROUP (SDG) - CTO114_001

SAMPLES: 4/Aqueous/VOC/OVG/EXP

S43TB01-20110603	S43TW007-2327	S43TW007-2327-D
S43TW009-2125		

3/Soil/VOC/EXP

S43SB010-0709	S43SB013-0603	S43SB015-0810

Overview

The sample set for NSF INDIAN HEAD CTO 114, SDG CTO114_001 consists of three (3) aqueous environmental samples, three (3) soil environmental samples and a trip blank. All samples were analyzed for volatile organic compounds (VOCs). The aqueous environmental samples were analyzed for organic volatile gases (OVG). All of the environmental samples were analyzed for explosives (EXP). The field duplicate pair contained within this SDG is S43TW007-2327/ S43TW007-2327-D.

The samples were collected by Tetra Tech on June 3, 2011 and analyzed by Empirical Laboratories. All analyses were conducted in accordance with the SW846 Method 8260B for VOCs, 8330B for explosives, 6850 for perchlorate, RSK-175 for OVG and IAAP for nitroguanidine.

The data contained in this SDG were validated with regard to the following parameters: data completeness, system performance, holding times, GC/MS tuning, initial / continuing calibrations, laboratory method blank results, surrogate spike recoveries, internal standard recoveries, laboratory control sample results, matrix spike/matrix spike duplicate results, compound identification, compound quantitation, field duplicate pair precision and detection limits.

Areas of concern are listed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

Major

- The continuing calibration of instrument MS-VOA6 on June 10, 2011@ 10:59 and June 11, 2011@ 11:24 had relative response factors (RRFs) for acetone less than the 0.05 quality control limit. The nondetected acetone results were qualified as rejected (UR) in the affected soil samples. The positive acetone result in sample S43SB015-0810 was qualified as estimated (J).

- The initial volatile calibration and continuing calibration of instrument MS-VOA4 on June 2 and 15, 2011, 1,4-dioxane had RRFs less than the 0.05 quality control limit. The nondetected 1,4-dioxane results were qualified as (UR) due to this noncompliance. This noncompliance affects all aqueous samples analyzed for VOC.

- The target analyte 1,4-dioxane was not calibrated in instrument MS-VOA6 affecting the soil samples. The laboratory did a library search based upon retention time for the presence/absence of 1,4-dioxane. 1,4-Dioxane was not included in the blank spike. The nondetected 1,4-dioxane results in the soil samples were qualified as rejected (UR).

Minor

- Contaminants were detected in the volatile laboratory blanks associated with batch 1F11002 analyzed on June 11, 2011 @ 13:25 on instrument MS-VOA6.

Contaminant	Maximum Concentration (ug/kg)	Action Level (ug/kg)
Methylene chloride	3.87	38.7

  An action level of 10X the maximum concentration of methylene chloride was established in order to evaluate samples for blank contamination. Sample aliquot, dilution factors and percent solids, if applicable, were taken into account when applying the action level. Positive results less than the action level in the affected samples were qualified as (B).

- The continuing calibration %D for acetone was greater than the 20% quality control limit but was less than 50% on June 10, 2011 @ 7:09 on instrument MS-VOA4. The positive acetone result in the affected aqueous sample S43TW009-2125 was qualified as estimated (J). No action was taken on the nondetected acetone results in the affected aqueous samples.

- The continuing calibration %D for bromomethane was greater than 50% on June 10, 2011 @ 10:59 on instrument MS-VOA6. The nondetected bromomethane results in the affected soil samples S43SB013-0603 and S43SB015-0810 were qualified as estimated (UJ).

- The volatile continuing calibration %Ds for bromomethane and 4-methyl-2-pentanone were greater than the 20% quality control limit but less than 50% on June 11, 2011@ 11:24 on instrument MS-VOA6. The positive 4-methyl-2-pentanone result in diluted sample S43SB015-0810 was qualified as estimated (J). No action was taken on the nondetected bromomethane and 4-methyl-2-pentanone results in the affected soil samples S43-SB010-0709 and the diluted sample S43SB015-0810.

- Due to a high concentration of acetone in sample S43SB015-0810, acetone could not be quantified in the original analysis. Sample S43SB015-0810 was diluted 1000X in the VOC fraction in order to obtain a concentration of 2-butanone, acetone and 4-methyl-2-pentanone within instrument calibration range. The 2-butanone result in the diluted sample was a nondetect. The laboratory did not reanalyze the sample at another dilution. The 2-butanone result was taken from the initial analysis and qualified as estimated (J) due to exceeding the instrument calibration range. The positive acetone and 4-methyl-2-pentanone results were taken from the diluted sample.

- The closing continuing calibration percent differences (%Ds) for methane and ethane exceeded the quality control limit on June 17, 2011 @ 22:16. The positive and nondetected methane and ethane results in the affected samples were qualified as estimated (J) and (UJ), respectively.

- The laboratory control sample (LCS) associated with batch 1F17007 had percent recoveries (%Rs) for methane and ethane greater than the upper quality control limit. The positive methane and ethane results were qualified as estimated (J) in the affected samples.

- The percent recovery (%R) of surrogate 1-chloro-3-nitrobenzene exceeded quality control limits on column 1 in aqueous samples S43TW007-2327, S43TW007-2327-D and S43TW009-2125. The positive results taken from column 1 were qualified as estimated (J) due to conflicting directional bias.

- The relative percent difference (RPD) between columns was greater than 40% quality control limit in the following samples. The laboratory reported the lower positive result. The positive results were qualified as estimated (J).

Sample	Analyte	%RPD	Qualification
S43TW007-2327	3-nitrotoluene	122	J
	4-amino-2,6-dinitrotoluene	62	J
	RDX	174	J
S43TW007-2327-D	3-nitrotoluene	137	J
	4-amino-2,6-dinitrotoluene	63	J
	4-nitrotoluene	120	J
	RDX	171	J
S43TW009-2125	2-nitrotoluene	175	J

Notes

Chloroform was detected in the trip blank.

Contaminant	Maximum Concentration (ug/L)	Action level (ug/L)
Chloroform	0.134	0.67

An action level of 5X the maximum concentration of chloroform was established in order to evaluate samples for blank contamination. Sample aliquot and dilutions were taken into account upon applying the action level. No action was warranted on the nondetected chloroform results in the affected samples.

The volatile continuing calibration %D for several analytes exceeded the 20% quality control limit but less than 50% on instrument MS-VOA6 on June 10, 2011 @ 10:59. The analytes were chloroethane, 1,1-dichloroethane, trans-1,2-dichlroethene, 4-methyl-2-pentanone and methyl tert-butyl ether. No action was taken on the nondetected results of the aforementioned analytes in the affected samples S43SB013-0603 and S43SB015-0810.

The volatile continuing calibration %Ds for several analytes were greater than 20% but less than 50% on June 10, 2011 @ 7:09 on instrument MS-VOA4. The analytes were 2-butanone, chloroethane, chloromethane, 1,2-dibromo-3-chloropropane, dichlorodifluoromethane and methyl acetate. No action was taken on the nondetected results in the affected aqueous samples.

The LCS associated with batch 1F10001 had a %R of chloromethane greater than the upper quality control limit. No action was taken on the nondetected chloromethane results in the affected aqueous samples.

The laboratory control sample duplicate (LCSD) associated with batch 1F10023 had several analytes with %Rs greater than the upper quality control limit. The analytes were bromodichloromethane, bromomethane, carbon tetrachloride, chloroform, dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1,1-trichloroethane and trichloroethene. The LCS %Rs of these analytes and the

relative percent differences (RPDs) were within quality control limits. No action was taken on the nondetected results of the aforementioned analytes in the affected soil samples.

The continuing calibration verification %Ds for 2,4,6-trinitrotoluene exceeded the 20% quality control limits on column 1 on June 9, 2011 @ 12:27, June 10, 2011 @ 18:21 and June 11, 2011 @ 4:07. No action was taken on the nondetected 2,4,6-trinitrotoluene results in the affected aqueous samples. The %Ds on column #2 for 2,4,6-trinitrotoluene were within quality control limits.

The continuing calibration %D for 4-amino-2,6-dinitrotoluene exceeded the 20% quality control limit on column 1 on June 10, 2011 @ 22:16. No action was taken on the positive 4-amino-2,6-dinitrotoluene results in the affected aqueous samples because the positive results were taken from the second column.

The continuing calibration %Ds for 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, nitrobenzene and the already mentioned 2,4,6-trinitrotoluene exceeded quality control limits on June 11, 2011 @4:07. No action was taken on the nondetected 1,3,5-trinitrobenzene, 1,3-dinitrobenzene and nitrobenzene results in the affected aqueous samples.

The continuing calibration %D for 4-amino-2,6-dinitrotoluene exceeded quality control limits on July 11, 2011 @ 4:11 on column 2. No action was taken on the nondetected 4-amino-2,6-dinitrotoluene results in the affected soil samples.

The LCS/LCSD %Rs of nitroglycerin exceeded the upper quality control limit in batch 1F07016 affecting the aqueous samples. No action was taken on the nondetected nitroglycerin results in the affected aqueous samples.

The %R of nitroguandine in LCSs associated with batches 1F15938 and 1F16734 exceeded the upper quality control limits. No action was taken on the nondetected nitroguandine results in the affected samples.

The matrix spike/matrix spike duplicate (MS/MSD) %R of nitroguandine in spiked sample S43TW007-2327 exceeded quality control limits. No action was taken on the nondetected nitroguandine result in spiked sample S43TW007-2327.

The laboratory had to be contacted to correct the form 1s for nitroguandine in several samples. The same results were populated in all of the fields. The laboratory raised the reporting limits due to matrix interference in the samples. The nondetected nitroguandine results were reported to the limit of quantitation.

Sample S43TW007-2327-D was not listed on the chain of custody. The project manager was contacted. Sample S43TW007-2327-D is a field duplicate and should be analyzed in the same fractions as its field duplicate pair.

Nondetected results were reported to the limit of detection (LOD).

Executive Summary

Laboratory Performance: Initial and continuing calibrations RRFs of acetone and 1,4-dioxane were less than the quality control limit resulting in the rejection of nondetected results and qualification of positive acetone results. 1,4-Dioxane soil results were qualified as rejected due to no initial calibration of the instrument for this analyte. Continuing calibration percent differences exceeded quality control limits in the VOC and OVG fractions. The percent recoveries of methane and ethane exceeded quality control limits. The EXP surrogate recovery exceeded quality control limits.

Other Factors Affecting Data Quality: Methylene chloride was detected in a laboratory method blank. The positive 2-butanone result in sample S43SB015-0810 which exceeded instrument calibration range in the original analysis was used for validation purposes.

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Review (9/94) and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

Ann Cognetti

Tetra Tech NUS
Ann Cognetti
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

Appendix A

Qualified Analytical Results

Data Validation Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810			S43SB015-0810RE1		
SDG: CTO114_001	LAB_ID	1106047-08			1106047-02			1106047-03			1106047-03RE1		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.7			84.1			85.0			85.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1,2,2-TETRACHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1,2-TRICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1,2-TRICHLOROTRIFLUOROETHANE		5.62	U		4.6	U		4.87	U				
1,1-DICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,1-DICHLOROETHENE		2.81	U		2.3	U		2.44	U				
1,2,3-TRICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,2,4-TRICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,2-DIBROMO-3-CHLOROPROPANE		5.62	U		4.6	U		4.87	U				
1,2-DIBROMOETHANE		2.81	U		2.3	U		2.44	U				
1,2-DICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,2-DICHLOROETHANE		2.81	U		2.3	U		2.44	U				
1,2-DICHLOROPROPANE		2.81	U		2.3	U		2.44	U				
1,3-DICHLOROPROPANE		2.81	U		2.3	U		2.44	U				
1,4-DICHLOROBENZENE		2.81	U		2.3	U		2.44	U				
1,4-DIOXANE		112	UR	C	92	UR	C	97.4	UR	C			
2-BUTANONE		5.62	U		4.6	U		564	J	L			
2-HEXANONE		2.81	U		2.3	U		16					
4-METHYL-2-PENTANONE		2.81	U		2.3	U					5190	J	C
ACETONE		11.2	UR	C	9.2	UR	C				157000	J	C
BENZENE		2.81	U		2.3	U		2.44	U				
BROMODICHLOROMETHANE		2.81	U		2.3	U		2.44	U				
BROMOFORM		2.81	U		2.3	U		2.44	U				
BROMOMETHANE		5.62	U		4.6	UJ	C	4.87	UJ	C			
CARBON DISULFIDE		2.81	U		2.3	U		2.44	U				
CARBON TETRACHLORIDE		2.81	U		2.3	U		2.44	U				
CHLOROBENZENE		2.81	U		2.3	U		2.44	U				
CHLORODIBROMOMETHANE		2.81	U		2.3	U		2.44	U				
CHLOROETHANE		5.62	U		4.6	U		4.87	U				
CHLOROFORM		2.81	U		2.3	U		2.44	U				
CHLOROMETHANE		5.62	U		4.6	U		4.87	U				
CIS-1,2-DICHLOROETHENE		2.81	U		2.3	U		2.44	U				
CYCLOHEXANE		2.81	U		2.3	U		2.44	U				
DICHLORODIFLUOROMETHANE		5.62	U		4.6	U		4.87	U				
ETHYLBENZENE		2.81	U		2.3	U		2.44	U				

PROJ_NO: 00771	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810			S43SB015-0810RE1		
SDG: CTO114_001	LAB_ID	1106047-08			1106047-02			1106047-03			1106047-03RE1		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.7			84.1			85.0			85.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.81	U		2.3	U		2.44	U				
METHYL ACETATE		5.62	U		4.6	U		4.87	U				
METHYL TERT-BUTYL ETHER		2.81	U		2.3	U		2.44	U				
METHYLENE CHLORIDE		9.47	B	A	6.81	J	P	8.6	J	P			
STYRENE		2.81	U		2.3	U		2.44	U				
TETRACHLOROETHENE		1.65	J	P	2.3	U		2.44	U				
TOLUENE		2.81	U		1.29	J	P	2.44	U				
TOTAL XYLENES		8.43	U		6.9	U		7.31	U				
TRANS-1,2-DICHLOROETHENE		2.81	U		2.3	U		2.44	U				
TRICHLOROETHENE		2.81	U		2.3	U		2.44	U				
TRICHLOROFLUOROMETHANE		5.62	U		4.6	U		4.87	U				
VINYL CHLORIDE		2.81	U		2.3	U		2.44	U				

PROJ_NO: 00771	NSAMPLE	S43TB01-20110603			S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-01			1106047-04			1106047-09			1106047-06		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		10	U		10	U		5	U	
1,1-DICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,1-DICHLOROETHENE		0.5	U		4.5	J	P	4.75	J	P	2.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		1	U		10	U		10	U		5	U	
1,2-DIBROMOETHANE		0.5	U		5	U		5	U		2.5	U	
1,2-DICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,2-DICHLOROETHANE		0.5	U		5	U		5	U		2.5	U	
1,2-DICHLOROPROPANE		0.5	U		5	U		5	U		2.5	U	
1,3-DICHLOROPROPANE		0.5	U		5	U		5	U		2.5	U	
1,4-DICHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
1,4-DIOXANE		10	UR	C	100	UR	C	100	UR	C	10	UR	C
2-BUTANONE		5	U		50	U		50	U		25	U	
2-HEXANONE		2.5	U		25	U		25	U		12.5	U	
4-METHYL-2-PENTANONE		2.5	U		25	U		25	U		12.5	U	
ACETONE		5	U		50	U		50	U		55.6	J	C
BENZENE		0.5	U		5	U		5	U		2.5	U	
BROMODICHLOROMETHANE		0.5	U		5	U		5	U		2.5	U	
BROMOFORM		0.5	U		5	U		5	U		2.5	U	
BROMOMETHANE		1	U		10	U		10	U		5	U	
CARBON DISULFIDE		0.5	U		5	U		5	U		2.5	U	
CARBON TETRACHLORIDE		0.5	U		5	U		5	U		2.5	U	
CHLOROBENZENE		0.5	U		5	U		5	U		2.5	U	
CHLORODIBROMOMETHANE		0.5	U		5	U		5	U		2.5	U	
CHLOROETHANE		1	U		10	U		10	U		5	U	
CHLOROFORM		0.134	J	P	5	U		5	U		2.5	U	
CHLOROMETHANE		0.5	U		5	U		5	U		2.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		56.5			61.3			2.61	J	P
CYCLOHEXANE		0.5	U		5	U		5	U		2.5	U	
DICHLORODIFLUOROMETHANE		1	U		10	U		10	U		5	U	
ETHYLBENZENE		0.5	U		5	U		5	U		2.5	U	

PROJ_NO: 00771	NSAMPLE	S43TB01-20110603			S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-01			1106047-04			1106047-09			1106047-06		
FRACTION: OV	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		5	U		5	U		2.5	U	
METHYL ACETATE		1	U		10	U		10	U		5	U	
METHYL TERT-BUTYL ETHER		0.5	U		5	U		5	U		2.5	U	
METHYLENE CHLORIDE		1	U		7.7	J	P	9.74	J	P	4.84	J	P
STYRENE		0.5	U		5	U		5	U		2.5	U	
TETRACHLOROETHENE		0.5	U		5	U		5	U		2.5	U	
TOLUENE		0.5	U		5	U		5	U		2.5	U	
TOTAL XYLENES		1.5	U		15	U		15	U		7.5	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		5	U		5	U		2.5	U	
TRICHLOROETHENE		0.5	U		923			1010			563		
TRICHLOROFLUOROMETHANE		1	U		10	U		10	U		5	U	
VINYL CHLORIDE		0.5	U		26.2			25.8			2.5	U	

PROJ_NO: 00771 SDG: CTO114_001 FRACTION: OVG MEDIA: WATER	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
	LAB_ID	1106047-04			1106047-09			1106047-06		
	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ETHANE		10.3	J	CE	11.5	J	CE	2	UJ	C
ETHENE		8.89			10.3			2	U	
METHANE		196	J	CE	235	J	CE	46.4	J	CE

PROJ_NO: 00771	NSAMPLE	S43RB01-20110605			S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-10			1106067-07		
FRACTION: EXP	SAMP_DATE	6/5/2011			6/5/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.151	U		0.154	U	
1,3-DINITROBENZENE		0.151	U		0.154	U	
2,4,6-TRINITROTOLUENE		0.151	U		0.154	U	
2,4-DINITROTOLUENE		0.151	U		0.154	U	
2,6-DINITROTOLUENE		0.151	U		0.154	U	
2-AMINO-4,6-DINITROTOLUENE		0.151	U		0.154	U	
2-NITROTOLUENE		0.151	U		0.154	U	
3-NITROTOLUENE		0.151	U		0.156	J	PQU
4-AMINO-2,6-DINITROTOLUENE		0.151	U		0.154	U	
4-NITROTOLUENE		0.151	U		0.146	J	PQU
HMX		0.151	U		0.154	U	
NITROBENZENE		0.151	U		0.154	U	
NITROGLYCERIN		0.377	U		0.385	U	
NITROGUANIDINE		5	UJ	C	5	UJ	C
RDX		0.151	U		0.49	J	QU
TETRYL		0.151	U		0.154	U	

PROJ_NO: 00771 SDG: CTO114_001 FRACTION: EXP MEDIA: SOIL	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810		
	LAB_ID	1106047-08			1106047-02			1106047-03		
	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	81.7			84.1			85.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0396	U		0.0367	U		0.0381	U	
1,3-DINITROBENZENE		0.0396	U		0.0367	U		0.0381	U	
2,4,6-TRINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2,4-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2,6-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2-AMINO-4,6-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
2-NITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
3-NITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
4-AMINO-2,6-DINITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
4-NITROTOLUENE		0.0396	U		0.0367	U		0.0381	U	
HMX		0.0396	U		0.0367	U		0.0381	U	
NITROBENZENE		0.0396	U		0.0367	U		0.0381	U	
NITROGLYCERIN		0.198	U		0.183	U		0.19	U	
NITROGUANIDINE		0.345	U		0.435	U		0.417	U	
RDX		0.0396	U		0.0367	U		0.0381	U	
TETRYL		0.0396	U		0.0367	U		0.0381	U	

PROJ_NO: 00771	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810		
SDG: CTO114_001	LAB_ID	1106047-08			1106047-02			1106047-03		
FRACTION: MISC	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	81.7			84.1			85.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERCHLORATE		2.45	U		2.38	U		2.35	U	

PROJ_NO: 00771	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-04			1106047-09			1106047-06		
FRACTION: MISC	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
PERCHLORATE		0.2	U		0.2	U		0.2	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**September 1, 2011**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SELECT TOTAL AND FILTERED METALS, ALKALINITY, CHLORIDE, CYANIDE, NITRATE-N, NITRITE-N, SULFATE, SULFIDE, AND TOTAL ORGANIC CARBON**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – CTO114-001

SAMPLES: 3/Soil/
S43SB010-0709 S43SB013-0603
S43SB015-0810

3/Water/
S43TW007-2327 S43TW007-2327-D
S43TW009-2125

Overview

The sample set for NSF Indian Head, SDG CTO114-001 consists of three (3) soil environmental samples and three (3) aqueous environmental. This SDG contained one field duplicate pair S43TW007-2327/S43TW007-2327-D.

All samples were analyzed for total select metals, cyanide, and total organic carbon. Water samples were also analyzed for alkalinity, chloride, nitrate-N, nitrite-N, sulfate, and sulfide. Samples S43TW007-2327, S43TW007-2327-D, and S43TW009-2125 were also analyzed for filtered select metals. The samples were collected by Tetra Tech NUS, Inc. on June 3, 2011 and analyzed by Analytical Laboratory Services Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010C. Mercury analyses were conducted using SW846 methods 7471A and 7470. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA 300. Cyanide analyses were conducted using method SM9012A. Sulfide analyses were conducted using method SM4500. TOC analyses were conducted using the Lloyd Kahn method. Alkalinity analyses were conducted using method SM 2320B.

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 / matrix spike duplicate results, field duplicate pair, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- The CRDL standard analyzed on 6/10/11 had a percent recovery < 90% for antimony and arsenic and a percent recovery >110% for selenium. Samples S43SB010-0709, S43SB013-0603, and S43SB015-0810 were affected. Selenium results were not qualified as sample results were non-detected. Positive results <2X CRDL and non-detected antimony and arsenic results were qualified as biased low (L and UL, respectively) or estimated (J) due to conflicting directional bias.

- The CRDL standard analyzed on 6/15/11 had a percent recovery >110% for aluminum and iron and a percent recovery <90% for arsenic and selenium. Samples S43TW007-2327 (total), S43TW009-2125 (total), S43TW009-2125 (filtered), and S43TW007-2327-D (total) were affected. Positive less than 2X CRDL and non-detected arsenic, aluminum, and selenium results were qualified as biased low (L and UL, respectively) or estimated (J) due to conflicting directional bias. Iron results were not qualified as sample results were greater than 2X CRDL.

- The CRDL standard analyzed on 7/11/11 had a percent recovery >110% for arsenic, antimony and cadmium and a percent recovery <90% for nickel. Samples S43TW007-2327(filtered) and S43TW007-2327-D (filtered) were affected. Arsenic results were qualified as either biased high (K) or estimated (J) due to conflicting directional bias. The nickel result for sample S43TW007-2327-D was qualified as estimated (J) due to conflicting directional bias. No validation action was warranted for antimony and cadmium as sample results were either >2X CRDL or non-detected.

- The field duplicate pair S43TW007-2327/S43TW007-2327-D had a relative percent difference or percent difference greater than the quality control limits for aluminum, barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc. Filtered samples S43TW007-2327, S43TW007-2327-D, and S43TW009-2125 were affected. Positive results were qualified as estimated and non-detected results were qualified as estimated (UJ).

- The field duplicate pair S43TW007-2327/S43TW007-2327-D had a percent difference greater than the quality control limits for TOC. Samples S43TW007-2327, S43TW007-2327-D, and S43TW009-2125 were affected. Positive results were qualified as estimated (J).

- Positive results < LOQ but > MDL were qualified as estimated (J).

Notes

The following contaminant was detected in the laboratory calibration blank at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
TOC	0.344 mg/L	1.72 mg/L

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. Only water samples were affected. No validation action was warranted as sample results were greater than the blank action limit.

The CRDL standard analyzed on 6/4/11 had a percent recovery <90% for chloride. Samples S43TW009-2125, S43TW007-2327 and S43TW007-2327-D were affected. No validation action was warranted for chloride as sample results were either >2X CRDL or non-detected.
All soil and dissolved water samples were analyzed at a 2X dilution for metals (except mercury) analyses.

Total water samples were analyzed at a 5X dilution for metals (except mercury)

Sample S43TW007-2327-D was not listed on the chain of custody but was included in the SDG

Executive Summary

Laboratory Performance: CRDL standard non-compliances resulted in the qualification of sample results.

Other Factors Affecting Data Quality: Field duplicate pair non-compliances for aluminum, barium, chromium, cobalt, copper, lead, nickel, vanadium, zinc, and TOC resulted in the qualification of sample results.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(April, 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Megan Carson

Tetra Tech NUS
Megan Carson
Chemist/Data Validator

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

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Data Validation Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	GFAA PDS - GFAA MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (e.g. base-line drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	% Difference between columns/detectors >25% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-04			1106047-09			1106047-06		
FRACTION: M	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF				S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		23700			24300			13900		
ANTIMONY		10	U		10	U		10	U	
ARSENIC		11.7	J	CP	11.8	J	CP	13.8	L	C
BARIUM		295			301			208		
BERYLLIUM		2.53	J	P	2.54	J	P	1.99	J	P
CADMIUM		2.5	U		2.5	U		2.5	U	
CHROMIUM		53.2			53.6			78.5		
COBALT		28.3			29.6			11.4	J	P
COPPER		93.5			98.2			87		
IRON		58200			58300			61300		
LEAD		48.1			48.7			43.4		
MANGANESE		610			618			485		
MERCURY		0.261			0.25			0.0857	J	P
NICKEL		23.1			23.8			15	L	K
SELENIUM		6.25	UL	C	6.25	UL	C	6.25	UL	C
SILVER		2.5	U		2.5	U		2.5	U	
THALLIUM		5	U		5	U		5	U	
VANADIUM		80.2			82.2			64.8		
ZINC		99.3			104			42		

PROJ_NO: 00771	NSAMPLE	S43TW007-2327			S43TW007-2327-D			S43TW009-2125		
SDG: CTO114_001	LAB_ID	1106047-05			1106047-10			1106047-07		
FRACTION: MF	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF				S43TW007-2327					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		11400	J	G	2740	J	G	42.2	J	CGP
ANTIMONY		4	U		4	U		4	U	
ARSENIC		7.17	K	C	2.86	J	CP	7.59	L	C
BARIUM		173	J	G	106	J	G	108	J	G
BERYLLIUM		1.11	J	P	1	U		1	U	
CADMIUM		1	U		1	U		1	U	
CHROMIUM		23.8	J	G	5.59	J	G	2	UJ	G
COBALT		14.7	J	G	7.12	J	G	2.5	J	GP
COPPER		38.9	J	G	9.23	J	G	4	UJ	G
IRON		48200			39900			47200		
LEAD		18.7	J	G	4.78	J	G	1.5	UJ	G
MANGANESE		550			472			475		
MERCURY		0.0825	J	P	0.2	U		0.2	U	
NICKEL		12.7	J	G	5.2	J	CG	8.06	J	G
SELENIUM		2.5	U		2.5	U		2.5	UL	C
SILVER		1	U		1	U		1	U	
THALLIUM		2	U		2	U		2	U	
VANADIUM		38	J	G	9.44	J	G	5	UJ	G
ZINC		42.5	J	G	12.2	J	G	17.4	J	G

PROJ_NO: 00771 SDG: CTO114_001 FRACTION: M MEDIA: SOIL	NSAMPLE	S43SB010-0709			S43SB013-0603			S43SB015-0810		
	LAB_ID	1106047-08			1106047-02			1106047-03		
	SAMP_DATE	6/3/2011			6/3/2011			6/3/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	81.7			84.1			85.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		5970			2180			10600		
ANTIMONY		0.956	UL	C	0.928	UL	C	0.932	UL	C
ARSENIC		0.925	J	CP	0.834	J	CP	2.14	L	C
BARIUM		30.8			19			148		
BERYLLIUM		0.455	J	P	0.295	J	P	0.844		
CADMIUM		0.239	U		0.232	U		0.233	U	
CHROMIUM		10			18.5			13.1		
COBALT		2.54			1.47			4.17		
COPPER		10			7.38			12.9		
IRON		8670			4010			8630		
LEAD		5.99			5.02			11.4		
MANGANESE		11.5			23			10.3		
MERCURY		0.0418	U		0.0368	U		0.0364	U	
NICKEL		5.92			5.26			10.1		
SELENIUM		0.597	U		0.58	U		0.583	U	
SILVER		0.239	U		0.232	U		0.233	U	
THALLIUM		0.478	U		0.464	U		0.466	U	
VANADIUM		12.7			7.53			20.1		
ZINC		16.9			9.98			26.3		

PROJ_NO: 00771	NSAMPLE	S43TW007-2327						S43TW007-2327-D					
SDG: CTO114_001	LAB_ID	1106047-04						1106047-09					
FRACTION: MISC	SAMP_DATE	6/3/2011						6/3/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43TW007-2327			S43TW007-2327		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALKALINITY		27.4						41					
CHLORIDE		41.7						41					
CYANIDE		0.01	U					0.01	U				
NITRATE-N		0.043	J	P				0.1	U				
NITRITE-N		0.1	U					0.1	U				
PERCHLORATE					0.2	U					0.2	U	
SULFATE		11.8						11.2					
SULFIDE		1.82	U					1.85	U				
TOTAL ORGANIC CARBON		1.86	J	G				4.33	J	G			

PROJ_NO: 00771	NSAMPLE	S43TW009-2125					
SDG: CTO114_001	LAB_ID	1106047-06					
FRACTION: MISC	SAMP_DATE	6/3/2011					
MEDIA: WATER	QC_TYPE	NM					
	UNITS	MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALKALINITY		41.8					
CHLORIDE		54					
CYANIDE		0.01	U				
NITRATE-N		0.1	U				
NITRITE-N		0.1	U				
PERCHLORATE					0.2	U	
SULFATE		0.926	J	P			
SULFIDE		2	U				
TOTAL ORGANIC CARBON		3.86	J	G			

PROJ_NO: 00771	NSAMPLE	S43SB010-0709						S43SB013-0603					
SDG: CTO114_001	LAB_ID	1106047-08						1106047-02					
FRACTION: MISC	SAMP_DATE	6/3/2011						6/3/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	81.7			81.7			84.1			84.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.266	U					0.268	U				
PERCHLORATE					2.45	U					2.38	U	
TOTAL ORGANIC CARBON		702	J	P				1100	J	P			

PROJ_NO: 00771	NSAMPLE	S43SB015-0810					
SDG: CTO114_001	LAB_ID	1106047-03					
FRACTION: MISC	SAMP_DATE	6/3/2011					
MEDIA: SOIL	QC_TYPE	NM					
	UNITS	MG/KG			UG/KG		
	PCT_SOLIDS	85.0			85.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.272	U				
PERCHLORATE					2.35	U	
TOTAL ORGANIC CARBON		828	J	P			

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**AUGUST 9, 2011**
FROM:	**MICHELLE L. ALLEN**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TOTAL AND DISSOLVED METALS/CN/TOC/ PERCHLORATE**

NSF INDIAN HEAD, CTO 114
SDG CTO114_002

SAMPLES: 6/Soil/METALS/CN/TOC/PERCHLORATE

S43SB008-0608	S43SB009-0608	S43SB011-0709
S43SB011-0709-D	S43SB014-0709	S43SB016-0608

2/Aqueous/TOTAL AND DISSOLVED METALS/CN/PERCHLORATE

S43TW08 2832	S43RB01-20110605

Overview

The sample set for NSF Indian Head, CTO 114, SDG CTO114_002 consisted of six (6) soil environmental samples, one (1) aqueous environmental sample, and one (1) rinsate blank. All eight (8) samples were analyzed for select metals, cyanide and perchlorate. The six (6) soil samples were analyzed for Total Organic Carbon (TOC). The two (2) aqueous samples were analyzed for dissolved metals. One field duplicate pair was included in the sample delivery group (SDG): S43SB011-0709/S43SB011-0709-D.

The samples were collected by Tetra Tech on June 4 and 5, 2011 and analyzed by Empirical Laboratories. All analyses were conducted in accordance with SW-846 Methods 6010C, 7470A, 7471A, 9012A, 6850 and Lloyd Kahn analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, calibration data, ICP/MS tune, laboratory method/preparation blanks, Interference Check Sample (ICS) results, Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, field duplicate precision, Laboratory Control Sample (LCS) results, laboratory duplicate results, ICP serial dilution results, detection limits and analyte quantitation. Areas of concern are listed below.

Major

No major issues were identified.

Minor

- The low concentration calibration verifications performed on instrument LCMS1 on 06/24/11 @ 16:33 and on 6/25/11 @ 07:29 exceeded the laboratory's 30% quality control limit for the perchlorate analysis. All samples were affected. The positive and non-detected results were qualified as estimated, (J) and (UJ), respectively, due to conflicting directional bias.

- The Contract Required Detection Limit (CRDL) Percent Recovery (%R) for selenium was less than the 90% quality control limit. All soil samples were affected. The non-detected results reported for selenium were qualified as biased low, (UL). The positive results less than 2X CRDL

reported for selenium were qualified as estimated, (J), as a result of conflicting noncompliances.

- The CRDL %Rs for arsenic and selenium were less than the 90% quality control limit affecting the total and dissolved aqueous samples. The non-detected results reported for arsenic and selenium were qualified as biased low, (UL). The positive results less than 2X CRDL reported for arsenic were qualified as estimated, (J), as a result of conflicting noncompliances.

- The CRDL %R for iron was greater than 110% quality control limit affecting the total and dissolved aqueous samples. The positive results less than 2X CRDL for iron were qualified as biased high, (K).

- The Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples had Percent Recoveries (%Rs) less than 10% for the analyte, antimony. The laboratory took corrective action and performed a post digestion spike which yielded an acceptable %R. All the soil samples were affected. The non-detected results reported for antimony in these samples were qualified as biased low, (UL).

- The MS/MSD %Rs for manganese were above the upper quality control limit. In addition, the MSD %Rs for chromium, vanadium, and zinc were above the upper quality control limit. The post digestion spike yielded acceptable %Rs for these analytes. All soil samples were affected. Only positive results were reported for these analytes in the affected samples and the positive results were qualified as biased high, (K), with the exception of the vanadium results. All vanadium results were qualified as estimated, (J), due to conflicting directional bias.

- The Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples had Percent Recoveries (%Rs) less than 10% for the analyte, antimony. The laboratory took corrective action and performed a post digestion spike which yielded an acceptable %R. All the soil samples were affected. The non-detected results reported for antimony in these samples were qualified as rejected, (UR).

- The MS/MSD %Rs for perchlorate were above the upper quality control limit. All soil samples were affected. The positive results reported for perchlorate in samples, S43SB008-0608, S43SB011-0709, and S43SB011-0709-D, were qualified as estimated, (J), due to conflicting directional bias. No action was taken for the affected non-detected results.

- The Relative Percent Differences (RPDs) for arsenic, barium and vanadium were greater than the 50% quality control limit in the field duplicate pair, S43SB011-0709/S43SB011-0709-D. The positive results reported for these analytes were qualified as estimated, (J).

- Positive results reported below the Level of Quantitation (LOQ) but above the Detection Limit (DL) were qualified as estimated, (J).

Notes

The interfering analyte, aluminum, was present in all soil samples at concentrations comparable to the concentration of aluminum in the Interference Check Sample (ICS) solution analyzed on 06/17/11. Cadmium, copper, manganese, and/or zinc were present in the ICS solution at a concentration that exceeded the absolute value of the DL. No validation action was warranted as no interference effects were present.

The interfering analyte, iron, was present in all soil samples at concentrations comparable to the concentration of iron in the Interference Check Sample (ICS) solution analyzed on 06/17/11. Cadmium, copper, manganese, and/or zinc were present in the ICS solution at a concentration that exceeded the

absolute value of the DL. No validation action was warranted as no interference effects were present.

The CRDL %R for cadmium was greater than the 110% quality control limit affecting the soil samples. No validation actions were warranted as all sample results were non-detects.

The CRDL %R for lead was less than the 90% quality control limit. All soil samples were affected. No validation actions were necessary because all sample results were greater than 2X CRDL.

The CRDL %R for aluminum was greater than the 110% quality control limit affecting the total and dissolved aqueous samples. No validation action was warranted as all sample results were either non-detects for were greater than 2X CRDL.

Perchlorate was detected in the duplicate sample, S43SB011-0709-D, but not in the environmental sample, S43SB011-0709. No action was necessary in the field duplicate pair because the difference between the positive and non-detected result was less than 4X the LOQ.

The laboratory stated that LOQ was raised for silver and/or thallium in the soil samples due to interference.

The sample below was analyzed at the following dilution:

Sample	Analyte	Dilution
S43TW08 2832	All Metals except Mercury	5X

Non-detected results were reported to the Limit of Detection (LOD).

Executive Summary

Laboratory Performance: Two low concentration calibration verifications exceeded the quality control limit in the perchlorate fraction, affecting all samples. Several CRDL %Rs were outside the 90 - 110% quality control limits.

Other Factors Affecting Data Quality: The MS/MSD %Rs for antimony were below 10% resulting in the qualification of the soil sample results. High MS/MSD %Rs were noted for chromium, manganese, vanadium, zinc, and perchlorate. Field duplicate imprecision was noted for arsenic, barium and vanadium. Positive results reported below the LOQ but above the DL were estimated.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation" (April 1993), and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech NUS
Michelle L. Allen
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

Appendix A

Qualified Analytical Results

Data Validation Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$ / ICP PDS Recovery Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; e.g. chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43SB008-0608			S43SB009-0608			S43SB011-0709			S43SB011-0709-D		
SDG: CTO114_002	LAB_ID	1106067-03			1106067-02			1106067-04			1106067-05		
FRACTION: M	SAMP_DATE	6/4/2011			6/4/2011			6/4/2011			6/4/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	86.5			83.9			82.7			83.4		
	DUP_OF										S43SB011-0709		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		5890			8690			8040			7100		
ANTIMONY		0.469	UL	D	0.472	UL	D	0.474	UL	D	0.461	UL	D
ARSENIC		1.53	J	G	3.01	J	G	2.25	J	G	5.24	J	G
BARIUM		28.2	J	G	51.1	J	G	39.6	J	G	16.7	J	G
BERYLLIUM		0.361			0.777			0.557			0.613		
CADMIUM		0.117	U		0.118	U		0.119	U		0.115	U	
CHROMIUM		8.03	K	D	15.8	K	D	13.3	K	D	14.5	K	D
COBALT		3.36			5.28			6.12			5.13		
COPPER		4.8			14			8.13			11.6		
IRON		9430			14500			9380			15500		
LEAD		5.34			11.6			9.23			9.19		
MANGANESE		23.3	K	D	16.9	K	D	28.6	K	D	30	K	D
MERCURY		0.0128	J	P	0.0347	U		0.0292	U		0.0383	U	
NICKEL		6.02			10.3			10.4			9.5		
SELENIUM		0.293	UL	C	0.343	J	P	0.223	J	P	0.258	J	P
SILVER		0.117	U		0.118	U		0.119	U		0.115	U	
THALLIUM		0.235	U		0.472	U		0.474	U		0.461	U	
VANADIUM		11.3	J	DG	27.1	J	DG	16.4	J	DG	29.9	J	DG
ZINC		18.8	K	D	35.7	K	D	27.8	K	D	31.4	K	D

PROJ_NO: 00771	NSAMPLE	S43SB014-0709			S43SB016-0608		
SDG: CTO114_002	LAB_ID	1106067-06			1106067-09		
FRACTION: M	SAMP_DATE	6/4/2011			6/5/2011		
MEDIA: SOIL	QC_TYPE	NM			NM		
	UNITS	MG/KG			MG/KG		
	PCT_SOLIDS	85.9			85.1		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		12300			9680		
ANTIMONY		0.448	UL	D	0.454	UL	D
ARSENIC		2.48	J	G	1.19	J	G
BARIUM		115	J	G	55.4	J	G
BERYLLIUM		0.855			0.675		
CADMIUM		0.112	U		0.113	U	
CHROMIUM		15.7	K	D	14.2	K	D
COBALT		5.45			5.29		
COPPER		15.3			10.4		
IRON		10600			8290		
LEAD		13.3			9.87		
MANGANESE		17	K	D	9.75	K	D
MERCURY		0.0133	J	P	0.0388	U	
NICKEL		11.8			9.09		
SELENIUM		0.28	UL	C	0.284	UL	C
SILVER		0.112	U		0.113	U	
THALLIUM		0.392	U		0.454	U	
VANADIUM		20.3	J	DG	12.6	J	DG
ZINC		46.6	K	D	36.2	K	D

PROJ_NO: 00771	NSAMPLE	S43RB01-20110605			S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-10			1106067-07		
FRACTION: M	SAMP_DATE	6/5/2011			6/5/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS						
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		21500		
ANTIMONY		2	U		10	U	
ARSENIC		1.5	UL	C	28.8		
BARIUM		2.5	U		316		
BERYLLIUM		0.5	U		4.11	J	P
CADMIUM		0.5	U		2.5	U	
CHROMIUM		1	U		75.7		
COBALT		2.5	U		132		
COPPER		2	U		91.8		
IRON		37.2	K	C	58500		
LEAD		0.75	U		41.9		
MANGANESE		1.5	U		678		
MERCURY		0.2	U		0.36		
NICKEL		1.5	U		112		
SELENIUM		1.25	UL	C	6.25	UL	C
SILVER		0.5	U		2.5	U	
THALLIUM		1	U		5	U	
VANADIUM		2.5	U		104		
ZINC		2.5	U		312		

PROJ_NO: 00771	NSAMPLE	S43RB01-20110605			S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-11			1106067-08		
FRACTION: MF	SAMP_DATE	6/5/2011			6/5/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS						
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		25	U		2150		
ANTIMONY		2	U		10	U	
ARSENIC		1.5	UL	C	5.84	J	CP
BARIUM		2.5	U		93.7		
BERYLLIUM		0.5	U		2.5	U	
CADMIUM		0.5	U		2.5	U	
CHROMIUM		1	U		9.44	J	P
COBALT		2.5	U		17.8		
COPPER		2	U		9.53	J	P
IRON		15	U		32500		
LEAD		0.75	U		3.72	J	P
MANGANESE		1.5	U		491		
MERCURY		0.2	U		0.2	U	
NICKEL		1.5	U		17.9		
SELENIUM		1.25	UL	C	6.25	UL	C
SILVER		0.5	U		2.5	U	
THALLIUM		1	U		5	U	
VANADIUM		2.5	U		11.9	J	P
ZINC		2.5	U		33.1		

PROJ_NO: 00771	NSAMPLE	S43SB008-0608						S43SB009-0608					
SDG: CTO114_002	LAB_ID	1106067-03						1106067-02					
FRACTION: MISC	SAMP_DATE	6/4/2011						6/4/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	86.5			86.5			83.9			83.9		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.292	U					0.266	U				
PERCHLORATE					3.86	J	CDP				2.38	UJ	C
TOTAL ORGANIC CARBON		1180	J	P				1660					

PROJ_NO: 00771	NSAMPLE	S43SB011-0709						S43SB011-0709-D					
SDG: CTO114_002	LAB_ID	1106067-04						1106067-05					
FRACTION: MISC	SAMP_DATE	6/4/2011						6/4/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	82.7			82.7			83.4			83.4		
	DUP_OF							S43SB011-0709			S43SB011-0709		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.285	U					0.291	U				
PERCHLORATE					2.42	UJ	C				4.84	J	CDP
TOTAL ORGANIC CARBON		1210	J	P				900	J	P			

PROJ_NO: 00771	NSAMPLE	S43SB014-0709						S43SB016-0608					
SDG: CTO114_002	LAB_ID	1106067-06						1106067-09					
FRACTION: MISC	SAMP_DATE	6/4/2011						6/5/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	85.9			85.9			85.1			85.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.294	U					0.265	U				
PERCHLORATE					1.08	J	CDP				2.35	UJ	C
TOTAL ORGANIC CARBON		1030	J	P				1020	J	P			

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**August 31, 2011**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SELECT METALS, CYANIDE AND TOTAL ORGANIC CARBON**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – CTO114-003

SAMPLES:

4/Soil/

S43SB012-0507	S43SB012-0507-D
S43SB017-0608	S43SB018-0507

4/Water/

S43RB02-20110612	S43TW006-2832
S43TW11-3034	S43TW12-2630

Overview

The sample set for NSF Indian Head, SDG CTO114-003 consists of four (4) soil environmental samples and four (4) aqueous samples. This SDG contained one field duplicate pair: S43SB012-0507/S43SB012-0507-D.

All samples were analyzed for select metals and cyanide. Soil results were also analyzed for total organic carbon (TOC). The samples were collected by Tetra Tech NUS, Inc. on June 10th, 11th, and 12th, 2011 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010C. Mercury analyses were conducted using SW846 methods 7471A and 7470. Cyanide analyses were conducted using method SM9012A. TOC analyses were conducted using method SW9060.

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, ICP/MS tune, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike / matrix spike duplicate results, field duplicate precision, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, ICP/MS internal standard recoveries, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- The continuing calibrations analyzed on 7/5/11 at 18:05 and 18:55 had percent recoveries > 110% for iron. All water samples were affected. Iron results were qualified as biased high (K).

- The CRDL standard analyzed on 7/5/11 had a percent recovery >110% for aluminum and percent recoveries <90% for lead and thallium. All water samples were affected. Aluminum results <2X CRDL were qualified as biased high (K). Positive lead results were qualified as biased low (L) and non-detected results were qualified as biased low (UL). Non-detected thallium results were qualified as biased low (UL).

- The interfering analyte aluminum was present in all soil samples at concentrations comparable to the concentrations of aluminum in the interference check sample (ICS) solution. Several analytes namely, antimony, chromium, cobalt, copper lead, manganese, nickel, selenium, silver, thallium, and zinc were present in the ICS solution at a concentration that exceeded the instrument detection limit (IDL). Interference effects exist for selenium and silver in the affected samples. Non-detected silver and selenium results were qualified as biased low (UL).

- The interfering analyte iron was present in sample S43SB012-0507, S43SB012-0507-D, S43SB017-0608, and S43SB018-0507 at concentrations comparable to the concentrations of iron in the interference check sample (ICS) solution. Several analytes namely, antimony, chromium, cobalt, copper lead, manganese, nickel, selenium, silver, thallium, and zinc were present in the ICS solution at a concentration that exceeded the instrument detection limit (IDL). Interference effects exist for selenium and silver in the affected samples. All non-detected silver and selenium results were qualified as biased low (UL).

- Field duplicate pair S43SB012-0507/S43SB012-0507-D had RPD>50% for manganese. All soil samples were affected. Positive results were qualified as estimated (J).

- Positive results < LOQ but > DL were qualified as estimated (J).

Notes

The continuing calibration analyzed on 7/7/11 at 19:14 had a percent recovery >110% for selenium. All soil samples were affected. No validation action was warranted as sample results were non-detected.

The following contaminants were detected in the laboratory calibration blank at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Iron	71.4 ug/L	17.85 mg/kg
Aluminum	68.1 ug/L	17.02 mg/kg

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. All soil samples were affected. No validation action was warranted.

The continuing calibration analyzed on 6/24/11 at 15:22 had a percent recovery > 110% for cyanide. All samples were affected. No validation action was taken because sample results were non-detected.

The matrix spike and matrix spike duplicate had a relative percent difference >20% for cyanide. No validation action was required.

Samples S43TW11-3034 and S43TW12-2630 were analyzed at a 2X for mercury.

Executive Summary

Laboratory Performance: Continuing calibration non-compliances resulted in the qualification of sample results. CRDL standard non-compliances resulted in the qualification of sample results. Interferent standard non-compliances resulted in the qualification of sample results.

Other Factors Affecting Data Quality: Field duplicate non-compliances for manganese resulted in the qualification of sample results.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(April, 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Megan Carson

Tetra Tech NUS
Megan Carson
Chemist/Data Validator

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

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:
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APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Data Validation Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	GFAA PDS - GFAA MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (e.g. base-line drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	% Difference between columns/detectors >25% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: M MEDIA: SOIL	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB017-0608			S43SB018-0507		
	LAB_ID	1106158-12			1106158-13			1106158-02			1106158-04		
	SAMP_DATE	6/11/2011			6/11/2011			6/10/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	84.9			85.9			85.5			84.8		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		10500			8440			7220			7260		
ANTIMONY		0.569	U		0.585	U		0.596	U		0.575	U	
ARSENIC		2.91			2.92			1.28			0.895		
BARIUM		221			165			33.2			25.6		
BERYLLIUM		0.713			0.666			0.545			0.605		
CADMIUM		0.284	U		0.292	U		0.298	U		0.288	U	
CHROMIUM		16.2			13.4			12.7			11.9		
COBALT		6.16			5.32			5.04			4.71		
COPPER		12.1			10.2			6.77			9.81		
IRON		9620			9590			9110			10500		
LEAD		10.7			9.36			8.21			8.1		
MANGANESE		30.9	J	G	18.1	J	G	16.5	J	G	15.4	J	G
MERCURY		0.0376	U		0.036	U		0.0351	U		0.0365	U	
NICKEL		11.2			9.88			8.38			8.97		
SELENIUM		0.569	UL	K	0.585	UL	K	0.596	UL	K	0.575	UL	K
SILVER		0.569	UL	K	0.585	UL	K	0.596	UL	K	0.575	UL	K
THALLIUM		0.455	U		0.468	U		0.477	U		0.46	U	
VANADIUM		18.3			18			17.8			16.7		
ZINC		35.2			33.8			23.1			22.7		

PROJ_NO: 00771	NSAMPLE	S43RB02-20110612			S43TW006-2832			S43TW11-3034			S43TW12-2630		
SDG: CTO114_003	LAB_ID	1106158-16			1106158-14			1106158-03			1106158-11		
FRACTION: M	SAMP_DATE	6/12/2011			6/11/2011			6/10/2011			6/11/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		125			21900			27100			20500		
ANTIMONY		2.5	U		2.5	U		5	U		5	U	
ARSENIC		2.5	U		12.9			43.5			39.2		
BARIUM		1.31	J	P	234			267			243		
BERYLLIUM		1.25	U		2.38			1.98	J	P	1.76	J	P
CADMIUM		1.25	U		1.25	U		2.5	U		2.5	U	
CHROMIUM		0.916	J	P	141			126			239		
COBALT		3.12	U		29.5			32.3			29.6		
COPPER		23.6			99.2			93.7			163		
IRON		234	K	C	52800	K	C	58200	K	C	68500	K	C
LEAD		1.26	L	C	42.6			38.7			32		
MANGANESE		2.82	J	P	811			418			507		
MERCURY		0.2	U		0.125	J	P	0.236			0.206		
NICKEL		0.796	J	P	34			64.9			85.6		
SELENIUM		2.5	U		2.5	U		6.49			2.92		
SILVER		2.5	U		2.5	U		5	U		5	U	
THALLIUM		2	UL	C	2	UL	C	4	UL	C	4	UL	C
VANADIUM		3.12	U		101			91			78.6		
ZINC		12			66			103			129		

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: MF MEDIA: WATER	NSAMPLE	S43RB02-20110612			S43TW006-2832			S43TW11-3034			S43TW12-2630		
	LAB_ID	1106158-20			1106158-19			1106158-17			1106158-18		
	SAMP_DATE	6/12/2011			6/11/2011			6/10/2011			6/11/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		52.2	K	C	3150			373			1340		
ANTIMONY		2.5	U		2.5	U		2.5	U		2.5	U	
ARSENIC		2.5	U		2.97			3.74			4.53		
BARIUM		10	U		93.4			92.2			90.9		
BERYLLIUM		1.25	U		0.386	J	P	1.25	U		1.25	U	
CADMIUM		1.25	U		1.25	U		1.25	U		1.25	U	
CHROMIUM		0.545	J	P	16.3			1.83	J	P	15.3		
COBALT		3.12	U		14.2			3.12	U		2.2	J	P
COPPER		2.5	U		11.9			2.5	U		9.95		
IRON		115	K	C	28300	K	C	23700	K	C	24200	K	C
LEAD		0.75	UL	C	5.6			0.75	UL	C	1.12	L	C
MANGANESE		1.71	J	P	566			270			274		
MERCURY		0.2	U		0.2	U		0.2	U		0.2	U	
NICKEL		2.5	U		8.43			4.4			10.2		
SELENIUM		2.5	U		2.5	U		2.5	U		2.5	U	
SILVER		2.5	U		2.5	U		2.5	U		2.5	U	
THALLIUM		2	UL	C	2	UL	C	2	UL	C	2	UL	C
VANADIUM		3.12	U		14.9			1.54	J	P	5.39		
ZINC		5	U		10.9			2.72	J	P	11.4		

PROJ_NO: 00771	NSAMPLE	S43SB012-0507						S43SB012-0507-D					
SDG: CTO114_003	LAB_ID	1106158-12						1106158-13					
FRACTION: MISC	SAMP_DATE	6/11/2011						6/11/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	84.9			84.9			85.9			85.9		
	DUP_OF							S43SB012-0507			S43SB012-0507		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.883	U					0.873	U				
PERCHLORATE					2.36	UJ	C				2.33	U	
TOTAL ORGANIC CARBON		1260	J	P				1690					

PROJ_NO: 00771	NSAMPLE	S43SB017-0608						S43SB018-0507					
SDG: CTO114_003	LAB_ID	1106158-02						1106158-04					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/10/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	85.5			85.5			84.8			84.8		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.877	U					0.884	U				
PERCHLORATE					2.34	UJ	C				2.36	UJ	C
TOTAL ORGANIC CARBON		588	J	P				1130	J	P			

PROJ_NO: 00771	NSAMPLE	S43RB02-20110612						S43TW006-2832					
SDG: CTO114_003	LAB_ID	1106158-16						1106158-14					
FRACTION: MISC	SAMP_DATE	6/12/2011						6/11/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

PROJ_NO: 00771	NSAMPLE	S43TW11-3034						S43TW12-2630					
SDG: CTO114_003	LAB_ID	1106158-03						1106158-11					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/11/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 7, 2011**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP CTO114_002

SAMPLES: 6 / Soil / Explosives

S43SB008-0608	S43SB009-0608	S43SB011-0709
S43SB011-0709-D	S43SB014-0709	S43SB016-0608

2 / Aqueous / Explosives

S43RB01-20110605	S43TW08 2832

5 / Aqueous / VOC

S43FB01-20110605	S43FB02-20110605	S43RB01-20110605
S43TB02-20110604	S43TW08 2832	

OVERVIEW

The sample set for NSF Indian Head CTO 114 SDG CTO114_002 consisted of six (6) soil environmental samples and five (5) aqueous samples including one (1) rinse blank QC sample, one (1) aqueous trip blank QC sample, and two (2) aqueous field blank QC samples. The samples were analyzed as listed above for explosives and volatile organic compounds (VOC) in this sample delivery group (SDG). One (1) field duplicate pair was contained within this SDG: S43SB011-0709-D / S43SB011-0709.

The samples were collected by TetraTech NUS on June 4 and 5, 2011 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Method 8260B and 8330B analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for 1,4-dioxane for the initial calibration on instrument MS-VOA4 on 06/02/11 and for the continuing calibration verification (CCV) performed on 06/15/11 @ 22:53. All samples were affected. The non-detected results reported for 1,4-dioxane were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV percent difference (%D) was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, dichlorodifluoromethane, methyl acetate, and 4-methyl-2-pentanone for instrument MS-VOA4 on 06/15/11 @ 22:27 affecting samples S43RB01-20110605 and S43TW08 2832. The positive acetone result for sample S43TW08 2832 was qualified estimated, (J). The remaining aforementioned analytes results for samples S43RB01-20110605 and S43TW08 2832 were non-detected and were not qualified.

- The explosive CCV %Ds were greater than the 20% quality control limit for 2,4,6-trinitrotoluene and 4-amino-2,6-dinitrotoluene on instrument HPLC1 on 07/10/11 @ 01:08. The explosive CCV %D was greater than the quality control limit for 4-amino-2,6-dinitrotoluene on instrument HPLC2 on 07/11/11 @ 04:11. Additionally, the explosive CCV %Ds were greater than the 20% quality control limit for 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, nitroglycerin, and tetryl on instrument HPLC2 on 07/11/11 @ 11:32 The affected samples were S43SB008-0608, S43SB009-0608, S43SB011-0709, S43SB011-0709-D, S43SB014-0709, and S43SB016-0608. As the %Ds were not compliant for the analytes 2,4,6-trinitrotoluene and 4-amino-2,6-dinitrotoluene on both columns, the non-detected results for 2,4,6-trinitrotoluene and 4-amino-2,6-dinitrotoluene for all soil samples were qualified estimated, (UJ). The non-detected sample results for nitroglycerin and tetryl were not qualified as the alternate analytical column %Ds were within the quality control limits.

- The matrix spike/matrix spike duplicate (MS/MSD) %Rs were less than the quality control limit for 2-nitrotoluene for spiked sample S43SB014-0709. The non-detected result for 2-nitrotoluene for the sample was qualified estimated, (UJ).

- The explosive analysis relative percent differences (RPD) between the two analytical columns for the positive explosive results were greater than 40% for all sample positive explosives results. The positive explosives results for all samples were qualified estimated, (J). The positive explosives results for the samples were qualified estimated, (J). The C-18 (primary) column results were reported except when the RPD between the analytical columns was greater than 100%, in which case the lower of the two results from the columns was reported. The table below lists the samples and analytes qualified as well as the results for both analytical columns (the results reported are in bold).

Sample	Analyte	C-18	Ultra II Aromax	RPD
S43TW08 2832	3-nitrotoluene	2.24 µg/l	**0.156 µg/l**	174%
	4-nitrotoluene	**0.146 µg/l**	0.893 µg/l	144%
	RDX	**0.490 µg/l**	4.28 µg/l	159%
S43SB009-0608	1,3-dinitrobenzene	0.168 mg/kg	**0.0375 mg/kg**	127%
S43SB011-0709	4-nitrotoluene	**0.0640 mg/kg**	0.0292 mg/kg	75%
S43SB014-0709	4-nitrotoluene	0.0848 mg/kg	**0.0234 mg/kg**	113%
S43SB016-0608	1,3-dinitrobenzene	0.135 mg/kg	**0.0320 mg/kg**	124%
	4-nitrotoluene	0.0793 mg/kg	**0.0239 mg/kg**	107%

- The laboratory indicated a matrix interference for some sample positive explosive results for samples S43TW08 2832, S43SB009-0608, S43SB014-0709, and S43SB016-0608. These sample positive explosive results were qualified estimated, (J), due to the matrix interference.

- The nitroguanidine results for all soil samples had significant matrix interference effects indicated in the raw data for all of the samples. The laboratory performed a MS and MSD on soil sample S43B017-0608 from another SDG which had a similar matrix interference and recovered the spikes with %Rs within the quality control limits. The laboratory used this spike date to raise the detection limit, the limit of detection, and the limit of quantitation for the samples as a result of the interference. As a result of this interference and the method used by the laboratory to raise the LOD, all non-detected nitroguanidine soil sample results were qualified estimated, (UJ). A comparison of the chromatograms for the soil samples, the LCS, the CCV, the method blanks, and the MS/MSD are included in the data validation package.

NOTES

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, chloromethane, 1,2-dibromo-3-chloropropane, dichlorodifluoromethane, methyl acetate, and 4-methyl-2-pentanone for instrument MS-VOA4 on 06/11/11 @ 12:36 affecting samples S43FB01-20110605, S43FB02-20110605, and S43TB02-20110604. No action was taken as all results for the aforementioned analytes were non-detected.

The VOC CCV percent difference (%D) was greater than the 20% and less than 50% quality control limit for 1,4-dioxane for instrument MS-VOA4 on 06/15/11 @ 22:53 affecting samples S43RB01-20110605 and S43TW08 2832. The 1,4-dioxane non-detected sample results were not affected as they were previously rejected for RRF quality control limit non-compliances.

The initial VOC analysis of samples S43FB01-20110605, S43FB02-20110605, and S43TB02-20110604 on 06/11/11 did not include an analysis for 1,4-dioxane. The samples were re-analyzed on 06/16/11 for VOCs including 1,4-dioxane. Only the VOC 1,4-dioxane results from the 06/16/11 sample analyses were reported for the aforementioned samples.

The explosive CCV %Ds was greater than the 20% for 2,4,6-trinitrotoluene quality control limits for instrument HPLC1 on 06/09/11 @ 12:27, 06/10/11 @ 18:21 affecting the method blank and the LCS/LCSD. No samples were affected and no sample validation action was necessary.

The explosive CCV %D was greater than the 20% quality control limit for 4-amino-2,6-dinitrotoluene on instrument HPLC1 on 06/10/11 @ 22:16. Additionally, the CCV %Ds for 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-trinitrotoluene, and nitrobenzene were greater than the 20% quality control limits on instrument HPLC1 on 06/11/11 @ 04:07. The affected samples were S43RB01-20110605 and S43TW08 2832. No validation action was taken as the samples had non-detected results for the aforementioned explosive analytes and the alternate column CCV %Ds for the analytes were within the quality control limits.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene on column 2 for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist provided the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits.

The LCS/LCSD %Rs were greater than the quality control limit for nitroglycerin in batch 1F07016 affecting the aqueous samples S43RB01-20110605 and S43TW08 2832. No action was taken as the aforementioned samples had non-detected nitroglycerin results.

The LCS %Rs were greater than the quality control limit for nitroguanidine for the LCSs associated with batches 1F15938 and 1F16734 affecting all the aqueous and soil samples. No action was taken as all samples had non-detected results for nitroguanidine.

The MS/MSD %Rs for nitroguanidine were less than the quality control limit at 0% for both the MS and the MSD for spiked sample S43B014-0709. No action was taken as the sample was not spiked at a high enough concentration to be detected by the analysis.

The explosives positive sample results were reported from the two analytical columns inconsistently for different SDGs by the laboratory. The laboratory was contacted on this issue and the response is included in the data package. The laboratory policy is to report the primary analytical column positive explosives results unless there is an RPD between analytical columns greater than 100%, in which case the lower of the two column results was reported. The data validation chemist reviewed this SDG sample data for this policy, and in the case of this SDG, no changes were necessary for positive explosive results.

As was stated earlier in the validation report, there were significant laboratory analytical difficulties associated with the nitroguanidine analyses.

Non-detected results were reported to the limit of detection (LOD).

Soil samples were air dried for the explosives analysis. Therefore, the percent solids results presented in the 'Appendix A - Qualified Analytical Results' are 100% for the explosive fractions.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF quality control limit non-compliances. All soil sample non-detected nitroguanidine results and some sample positive explosive results were qualified due to matrix sample analytical interferences. The sample S43TW08 2832 acetone result was qualified for a CCV %D quality control limit non-compliance. Explosive results were qualified for CCV %D quality control limit non-compliances. The non-detected result for 2-nitrotoluene for the sample S43SB014-0709 was qualified due to a MS/MSD %R quality control limit non-compliance.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for RPD quality control limit non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B and 8330B, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech NUS
Joseph Kalinyak
Chemist/Data Validator

TetraTech NUS
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

DATA QUALIFICATION CODE (QUAL CODE)

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's r < 0.995 / ICP PDS Recovery Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; e.g. chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient r < 0.995
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43FB01-20110605			S43FB02-20110605			S43RB01-20110605			S43TB02-20110604		
SDG: CTO114_002	LAB_ID	1106067-12			1106067-13			1106067-10			1106067-01		
FRACTION: OV	SAMP_DATE	6/5/2011			6/5/2011			6/5/2011			6/4/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		1	U		1	U		0.5	U		1	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		1	U		1	U		0.5	U		1	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.648	J	P	0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.385	J	P	0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771 SDG: CTO114_002 FRACTION: OV MEDIA: WATER	NSAMPLE	S43FB01-20110605			S43FB02-20110605			S43RB01-20110605			S43TB02-20110604		
	LAB_ID	1106067-12			1106067-13			1106067-10			1106067-01		
	SAMP_DATE	6/5/2011			6/5/2011			6/5/2011			6/4/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.127	J	P
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1.5	U		1.5	U		1	U		1.5	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW08 2832		
SDG: CTO114_002	LAB_ID	1106067-07		
FRACTION: OV	SAMP_DATE	6/5/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
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		0.364	J	P
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-DICHLOROPROPANE		0.5	U	
1,4-DICHLOROBENZENE		0.5	U	
1,4-DIOXANE		10	UR	C
2-BUTANONE		5	U	
2-HEXANONE		2.5	U	
4-METHYL-2-PENTANONE		2.5	U	
ACETONE		10.6	J	C
BENZENE		0.5	U	
BROMODICHLOROMETHANE		0.5	U	
BROMOFORM		0.5	U	
BROMOMETHANE		1	U	
CARBON DISULFIDE		0.5	U	
CARBON TETRACHLORIDE		0.5	U	
CHLOROBENZENE		0.5	U	
CHLORODIBROMOMETHANE		0.5	U	
CHLOROETHANE		1	U	
CHLOROFORM		0.5	U	
CHLOROMETHANE		0.5	U	
CIS-1,2-DICHLOROETHENE		21.8		
CYCLOHEXANE		0.5	U	
DICHLORODIFLUOROMETHANE		1	U	
ETHYLBENZENE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW08 2832
SDG: CTO114_002	LAB_ID	1106067-07
FRACTION: OV	SAMP_DATE	6/5/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	1	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	0.748	J	P
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	1	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRICHLOROETHENE	41.9		
TRICHLOROFLUOROMETHANE	1	U	
VINYL CHLORIDE	16.2		

PROJ_NO: 00771 SDG: CTO114_002 FRACTION: EXP MEDIA: WATER	NSAMPLE	S43RB01-20110605			S43TW08 2832		
	LAB_ID	1106067-10			1106067-07		
	SAMP_DATE	6/5/2011			6/5/2011		
	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.151	U		0.154	U	
1,3-DINITROBENZENE		0.151	U		0.154	U	
2,4,6-TRINITROTOLUENE		0.151	U		0.154	U	
2,4-DINITROTOLUENE		0.151	U		0.154	U	
2,6-DINITROTOLUENE		0.151	U		0.154	U	
2-AMINO-4,6-DINITROTOLUENE		0.151	U		0.154	U	
2-NITROTOLUENE		0.151	U		0.154	U	
3-NITROTOLUENE		0.151	U		0.156	J	PQU
4-AMINO-2,6-DINITROTOLUENE		0.151	U		0.154	U	
4-NITROTOLUENE		0.151	U		0.146	J	PQU
HMX		0.151	U		0.154	U	
NITROBENZENE		0.151	U		0.154	U	
NITROGLYCERIN		0.377	U		0.385	U	
NITROGUANIDINE		5	UJ	C	5	UJ	C
RDX		0.151	U		0.49	J	QU
TETRYL		0.151	U		0.154	U	

PROJ_NO: 00771	NSAMPLE	S43SB008-0608			S43SB009-0608			S43SB011-0709			S43SB011-0709-D		
SDG: CTO114_002	LAB_ID	1106067-03			1106067-02			1106067-04			1106067-05		
FRACTION: EXP	SAMP_DATE	6/4/2011			6/4/2011			6/4/2011			6/4/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	100.0			100.0			100.0			100.0		
	DUP_OF										S43SB011-0709		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
1,3-DINITROBENZENE		0.0392	U		0.0375	J	PQU	0.0396	U		0.0367	U	
2,4,6-TRINITROTOLUENE		0.0392	UJ	C	0.0385	UJ	C	0.0396	UJ	C	0.0367	UJ	C
2,4-DINITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
2,6-DINITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
2-AMINO-4,6-DINITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
2-NITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
3-NITROTOLUENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
4-AMINO-2,6-DINITROTOLUENE		0.0392	UJ	C	0.0385	UJ	C	0.0396	UJ	C	0.0367	UJ	C
4-NITROTOLUENE		0.0392	U		0.0385	U		0.064	J	PU	0.0367	U	
HMX		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
NITROBENZENE		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
NITROGLYCERIN		0.196	U		0.192	U		0.198	U		0.183	U	
NITROGUANIDINE		0.37	UJ	Q	0.455	UJ	Q	0.455	UJ	Q	0.37	UJ	Q
RDX		0.0392	U		0.0385	U		0.0396	U		0.0367	U	
TETRYL		0.0392	U		0.0385	U		0.0396	U		0.0367	U	

PROJ_NO: 00771 SDG: CTO114_002 FRACTION: EXP MEDIA: SOIL	NSAMPLE	S43SB014-0709			S43SB016-0608		
	LAB_ID	1106067-06			1106067-09		
	SAMP_DATE	6/4/2011			6/5/2011		
	QC_TYPE	NM			NM		
	UNITS	MG/KG			MG/KG		
	PCT_SOLIDS	100.0			100.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0377	U		0.0392	U	
1,3-DINITROBENZENE		0.0377	U		0.032	J	PQU
2,4,6-TRINITROTOLUENE		0.0377	UJ	C	0.0392	UJ	C
2,4-DINITROTOLUENE		0.0377	U		0.0392	U	
2,6-DINITROTOLUENE		0.0377	U		0.0392	U	
2-AMINO-4,6-DINITROTOLUENE		0.0377	U		0.0392	U	
2-NITROTOLUENE		0.0377	UJ	D	0.0392	U	
3-NITROTOLUENE		0.0377	U		0.0392	U	
4-AMINO-2,6-DINITROTOLUENE		0.0377	UJ	C	0.0392	UJ	C
4-NITROTOLUENE		0.0234	J	PQU	0.0239	J	PQU
HMX		0.0377	U		0.0392	U	
NITROBENZENE		0.0377	U		0.0392	U	
NITROGLYCERIN		0.189	U		0.196	U	
NITROGUANIDINE		0.385	UJ	Q	0.37	UJ	Q
RDX		0.0377	U		0.0392	U	
TETRYL		0.0377	U		0.0392	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 7, 2011**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / EXPLOSIVES / PERCHLORATE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP CTO114_003

SAMPLES: 5 / Aqueous / VOC

S43RB02-20110612	S43TB03-20110610	S43TW006-2832
S43TW11-3034	S43TW12-2630	

11 / Soil / VOC

S43SB008-0607	S43SB009-0708	S43SB009-0708-D
S43SB011-0507	S43SB012-0507	S43SB012-0507-D
S43SB016-0607	S43SB017-0608	S43SB018-0507
S43SB019-0607	S43SB022-0708	

4 / Aqueous / Explosives / Perchlorate

S43RB02-20110612	S43TW006-2832	S43TW11-3034
S43TW12-2630		

4 / Soil / Explosives / Perchlorate

S43SB012-0507	S43SB012-0507-D	S43SB017-0608
S43SB018-0507		

OVERVIEW

The sample set for NSF Indian Head CTO 114 SDG CTO114_003 consisted of eleven (11) soil environmental samples and five (5) aqueous samples, including one (1) aqueous rinse blank QC sample, and one (1) aqueous trip blank QC sample. The samples were analyzed as listed above for explosives (including nitroguanidine), perchlorate, and volatile organic compounds (VOC). Two (2) field duplicate sample pairs were contained in this sample delivery group (SDG): S43SB009-0708-D / S43SB009-0708 and S43SB012-0507-D / S43SB012-0507.

The samples were collected by TetraTech NUS on June 10, 11, and 12, 2011 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Method 8260B, 8330B, and 6850 analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for 1,4-dioxane for the initial calibration on instrument MS-VOA3 on 05/26/11 and the initial calibration on instrument MS-VOA4 on 06/02/11. The continuing calibration verification (CCV) 1,4-dioxane RRFs for both instruments were also less than the 0.05 quality control limit when performed. In some instances there was no CCV for 1,4-dioxane performed by the laboratory. All 1,4-dioxane results for all aqueous and soil samples were non-detected and qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC common laboratory contaminant acetone was detected in the method blank for batch 1F22002 at the concentration as listed below.

Analyte	Maximum Conc. (µg/kg)	Action Level (µg/kg)
Acetone	7.53	75.3

  An action level of 10X the maximum concentration for the common laboratory contaminant acetone was established to evaluate the sample for blank contamination. Sample aliquot, dilution factors and percent solids, if applicable, were taken into account when applying the action level. The affected sample S43SB012-0507 acetone positive result was less than the action level and was qualified as non-detected due to method blank contamination, (B).

- The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, 4-methyl-2-pentanone, tetrachloroethene, and trichlorofluoromethane for instrument MS-VOA3 on 06/17/11 @ 08:16 affecting samples S43SB017-0608, S43SB018-0507, S43SB011-0507, and S43SB022-0708. No action was taken for the non-detected acetone, 2-butanone, 4-methyl-2-pentanone, tetrachloroethene, and trichlorofluoromethane aforementioned sample results. The positive 4-methyl-2-pentanone result for sample S43SB022-0708 was qualified estimated, (J).

- The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone and 1,4-dioxane for instrument MS-VOA3 on 06/20/11 @ 08:35 and 09:02 affecting samples S43SB009-0708, S43SB009-0708-D, S43SB008-0607, S43SB012-0507-D, S43SB016-0607, and S43SB019-0607. No action was taken for 1.4-dioxane aforementioned sample results as they were rejected for an RRF quality control limit non-compliance. The positive acetone results for the aforementioned samples were qualified estimated, (J).

- The explosives aqueous sample time to extraction hold time of seven days was exceeded for the explosives SW-846 8330B analysis for aqueous samples S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612 by less than 2X. As a result of the sample time to extraction hold time exceedance, all aforementioned sample results for the explosives analysis (excluding nitroguanidine) were qualified estimated, (J) and (UJ), respectively.

- The explosives LCS %Rs were greater than the quality control limit for 1,3,5-trinitrobenzene and nitroglycerin in batch 1F23022 affecting the aqueous samples S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612. No action was taken for the

aforementioned sample non-detected 1,3,5-trinitrobenzene and nitroglycerin results. The positive nitroglycerin results for samples S43TW11-3034 and S43TW12-2630 were qualified estimated, (J).

- The explosives analysis relative percent difference (RPD) between the two analytical columns for the positive explosive results were greater than 40% as listed below. The positive explosives results for the samples were qualified estimated, (J). The C-18 (primary) column results were reported except when the RPD between the analytical columns was greater than 100%, in which case the lower of the two results from the columns was reported. The table below lists the samples and analytes qualified as well as the results for both analytical columns (the results reported are in bold).

Sample	Analyte	C-18	Ultra II Aromax	RPD
S43TW006-2832	RDX	**0.370 µg/l**	0.883 µg/l	82%
S43TW11-3034	1,3-dinitrobenzene	1.51 µg/l	**0.421 µg/l**	113%
	HMX	**1.33 µg/l**	0.517 µg/l	88%
	Nitroglycerin	**0.639 µg/l**	1.71 µg/l	91%
S43TW12-2630	Nitroglycerin	**0.341 µg/l**	1.07 µg/l	103%

- The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on instrument HPLC1 on 07/14/11 @ 05:20, @ 12:10, and @ 23:05 affecting samples S43SB017-0608, S43SB018-0507, S43SB012-0507, S43SB012-0507-D, S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612. No validation action was taken for the aqueous samples S43TW11-3034, S43TW12-2630, S43TW006-2832, and S43RB02-20110612, and soil sample S43SB017-0608 as they had non-detected results for 2,4,6-trinitrotoluene and the alternate instrument HPLC2 CCV %Ds for 2,4,6-trinitrotoluene were within the quality control limits. Samples S43SB018-0507, S43SB012-0507, and S43SB012-0507-D were not re-analyzed on the alternate instrument/column HPLC2, therefore, the non-detected 2,4,6-trinitrotoluene results for samples S43SB018-0507, S43SB012-0507, and S43SB012-0507-D were qualified estimated, (UJ).

- The nitroguanidine non-detected results for all soil samples were qualified estimated due to matrix interference effects indicated in the raw data for the samples. The raw data chromatograms associated with the nitroguanidine analyses indicated significant matrix interference with the soil sample analyses. The laboratory raised the reported non-detection results for the soil samples based on the matrix spike (MS) and MS duplicate (MSD) detection of sample S43SB017-0608. As a result of the matrix interference, a comparison of the chromatograms for the soil samples, the LCS, the CCV, the MS and MSD, and the method blanks indicated that there were significant interferences which did not make it possible for quantitation of lower level sample nitroguanidine concentrations. In addition to the soil samples, the aqueous sample S43TW006-2832 raw data also indicated a matrix interference. The laboratory used the MS/MSD spike amount as the limit of detection (LOD) for the soil samples S43SB017-0608, S43SB018-0507, S43SB012-0507, and S43SB012-0507-D and the aqueous sample S43TW006-2832. The raw data for the sample chromatograms is included in the data validation package.

- The perchlorate low level CCV %D was greater than the 30% laboratory established quality control limit for perchlorate for instrument LCMS1 on 06/24/11 @ 16:33 affecting samples S43SB017-0608, S43SB018-0507, and S43SB012-0507. The laboratory established CCV %D quality control limit of 30% was used for the data evaluation although the EPA SW-846 6850 procedure uses 50% for the %D quality control limit. The affected samples had non-detected perchlorate results which were qualified estimated, (UJ).

NOTES

Samples S43SB011-0507, S43SB011-0507, and S43SB018-0507 were analyzed diluted at 50X. Due to the dilution, the Limit of Detections (LOD) for non-detected VOC analytes were elevated.

Sample S43SB022-0708 was analyzed diluted at both a 50X and a 20000X due to an extremely high acetone result for the sample. Only the acetone result was reported from the 20000X dilution for the sample. Due to the 50X dilution, the LODs for non-detected VOC analytes were elevated.

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for bromodichloromethane, carbon tetrachloride, and trichlorofluoromethane for instrument MS-VOA3 on 06/21/11 @ 09:06 affecting sample S43SB022-0708 re-analysis. No action was taken as the aforementioned analytes were not reported from the sample dilution re-analysis (only the acetone result was reported from the sample dilution re-analysis).

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, tetrachloroethene, and trichlorofluoromethane for instrument MS-VOA3 on 06/22/11 @ 08:29 affecting sample S43SB012-0507. No action was taken as all results for the aforementioned analytes were non-detected (acetone qualified non-detected due to method blank contamination).

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, methyl acetate, and 1,4-dioxane for instrument MS-VOA4 on 06/20/11 @ 06:41 affecting samples S43RB02-20110612, S43TB03-20110610, S43TW006-2832, S43TW11-3034, and S43TW12-2630. No action was taken as all results for the aforementioned analytes were non-detected (sample 1,4-dioxane non-detected results rejected for RRF quality control limit non-compliances).

The VOC MS for spiked sample S43SB008-0607 had %Rs greater than the quality control limit for many VOC analytes. Additionally, the MSD for the spiked sample had %Rs for chloromethane and vinyl chloride greater than the quality control limit and the MS/MSD RPD for 1,4-dioxane was greater than the quality control limit. No validation action was taken as all analyte results for the sample were non-detected (and sample 1,4-dioxane non-detected results rejected for RRF quality control limit non-compliances).

The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on instrument HPLC1 on 06/27/11 @ 18:09 and @ 22:04. Additionally the CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, and tetryl on instrument HPLC2 on 07/10/11 @ 16:42. No validation action was taken as the CCVs affected only a method blank and an LCS and no samples for this SDG.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for the HPLC2 instrument for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist provided the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits. All affected samples had surrogate retention times within the quality control limits.

The LCS %R was greater than the quality control limit for nitroguanidine for batch 1F16734 affecting all the aqueous samples. No action was taken as all samples had non-detected results for nitroguanidine.

The explosive positive sample results were originally reported from the lower results of the two analytical columns. This was questioned by the data validator when an inconsistent laboratory reporting pattern for positive explosive results was noted for explosives reporting between different SDGs. The laboratory was contacted on this issue and the response is included in the data package. The laboratory policy is to report the primary analytical column positive explosives results unless there is an RPD between analytical columns greater than 100%, in which case the lower of the two column results was reported. The data validation chemist manually edited sample data to match the laboratory reporting policy for positive explosive results.

As was stated earlier in the validation report, there were significant laboratory analytical difficulties associated with the nitroguanidine analyses.

Non-detected results were reported to the limit of detection (LOD).

Soil samples were air dried for the explosives analysis. Therefore, the percent solids results presented in the 'Appendix A - Qualified Analytical Results' is listed as 100% for the explosive fractions.

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF quality control limit non-compliances. The sample S43SB012-0507 acetone result was qualified for blank contamination. Sample VOC results were qualified for CCV %D quality control limit non-compliances. All aqueous sample explosive results were qualified for sample to extraction hold time quality control limit hold time exceedances. Aqueous sample positive nitroglycerin results were qualified for LCS %R quality control limit non-compliances. Some sample non-detected nitroguanidine results were qualified, and the LOD for the sample was raised, due to matrix sample analytical interferences. Non-detected sample perchlorate results were qualified for CCV %D quality control limit non-compliances.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for RPD between columns quality control limit non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330B, and 6850, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

Tetra Tech NUS
Joseph Kalinyak
Chemist/Data Validator

TetraTech NUS
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:
1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Appendix A

Qualified Analytical Results

Value Qualifier Key (Val Qual)

J – The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ – The result is an estimated non-detected quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

U - Value is a non-detect as reported by the laboratory.

UR – Non-detected result is considered rejected, (UR), as a result of technical non-compliances.

DATA QUALIFICATION CODE (QUAL CODE)

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$ / ICP PDS Recovery Noncompliance
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; e.g. chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: OV MEDIA: WATER	NSAMPLE	S43RB02-20110612			S43TB03-20110610			S43TW006-2832			S43TW11-3034		
	LAB_ID	1106158-16			1106158-01			1106158-14			1106158-03		
	SAMP_DATE	6/12/2011			6/10/2011			6/11/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,1-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DIBROMOETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,2-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,3-DICHLOROPROPANE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DICHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
1,4-DIOXANE		10	UR	C	10	UR	C	10	UR	C	10	UR	C
2-BUTANONE		5	U		5	U		5	U		5	U	
2-HEXANONE		2.5	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE		2.5	U		2.5	U		2.5	U		2.5	U	
ACETONE		5	U		5	U		5	U		5	U	
BENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMODICHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOFORM		0.5	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE		1	U		1	U		1	U		1	U	
CARBON DISULFIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLORODIBROMOMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE		1	U		1	U		1	U		1	U	
CHLOROFORM		0.5	U		0.5	U		0.5	U		0.5	U	
CHLOROMETHANE		0.5	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE		0.5	U		0.5	U		4.49			0.5	U	
CYCLOHEXANE		0.5	U		0.5	U		0.5	U		0.5	U	
DICHLORODIFLUOROMETHANE		1	U		1	U		1	U		1	U	
ETHYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW12-2630
SDG: CTO114_003	LAB_ID	1106158-11
FRACTION: OV	SAMP_DATE	6/11/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
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-DICHLOROPROPANE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
1,4-DIOXANE	10	UR	C
2-BUTANONE	5	U	
2-HEXANONE	2.5	U	
4-METHYL-2-PENTANONE	2.5	U	
ACETONE	5	U	
BENZENE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	1	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	1	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	1	U	
ETHYLBENZENE	0.5	U	

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: OV MEDIA: WATER	NSAMPLE	S43RB02-20110612			S43TB03-20110610			S43TW006-2832			S43TW11-3034		
	LAB_ID	1106158-16			1106158-01			1106158-14			1106158-03		
	SAMP_DATE	6/12/2011			6/10/2011			6/11/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		0.5	U		0.5	U		0.5	U	
METHYL ACETATE		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER		0.5	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE		1	U		1	U		1	U		1	U	
STYRENE		0.5	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOLUENE		0.5	U		0.5	U		0.5	U		0.5	U	
TOTAL XYLENES		1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		0.5	U		0.5	U		0.5	U	
TRICHLOROETHENE		0.5	U		0.5	U		53.9			1.68		
TRICHLOROFLUOROMETHANE		1	U		1	U		1	U		1	U	
VINYL CHLORIDE		0.5	U		0.5	U		0.724	J	P	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43TW12-2630
SDG: CTO114_003	LAB_ID	1106158-11
FRACTION: OV	SAMP_DATE	6/11/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
ISOPROPYLBENZENE	0.5	U	
METHYL ACETATE	1	U	
METHYL TERT-BUTYL ETHER	0.5	U	
METHYLENE CHLORIDE	1	U	
STYRENE	0.5	U	
TETRACHLOROETHENE	0.5	U	
TOLUENE	0.5	U	
TOTAL XYLENES	1	U	
TRANS-1,2-DICHLOROETHENE	0.5	U	
TRICHLOROETHENE	0.5	U	
TRICHLOROFLUOROMETHANE	1	U	
VINYL CHLORIDE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43SB008-0607			S43SB009-0708			S43SB009-0708-D			S43SB011-0507		
SDG: CTO114_003	LAB_ID	1106158-08RE1			1106158-06RE1			1106158-07RE1			1106158-05		
FRACTION: OV	SAMP_DATE	6/10/2011			6/10/2011			6/10/2011			6/10/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	88.9			95.4			84.3			91.8		
	DUP_OF							S43SB009-0708					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1,2,2-TETRACHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1,2-TRICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		5	U		4.91	U		5.07	U		208	U	
1,1-DICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,1-DICHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
1,2,3-TRICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,2,4-TRICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DIBROMO-3-CHLOROPROPANE		5	U		4.91	U		5.07	U		208	U	
1,2-DIBROMOETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DICHLOROETHANE		2.5	U		2.45	U		2.53	U		104	U	
1,2-DICHLOROPROPANE		2.5	U		2.45	U		2.53	U		104	U	
1,3-DICHLOROPROPANE		2.5	U		2.45	U		2.53	U		104	U	
1,4-DICHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
1,4-DIOXANE		100	UR	C	98.2	UR	C	101	UR	C	4160	UR	C
2-BUTANONE		5	U		4.91	U		5.07	U		208	U	
2-HEXANONE		2.5	U		2.45	U		2.53	U		104	U	
4-METHYL-2-PENTANONE		2.5	U		2.45	U		2.53	U		104	U	
ACETONE		20	J	CP	14.5	J	CP	13.3	J	CP	416	U	
BENZENE		2.5	U		2.45	U		2.53	U		104	U	
BROMODICHLOROMETHANE		2.5	U		2.45	U		2.53	U		104	U	
BROMOFORM		2.5	U		2.45	U		2.53	U		104	U	
BROMOMETHANE		5	U		4.91	U		5.07	U		208	U	
CARBON DISULFIDE		2.5	U		2.45	U		2.53	U		104	U	
CARBON TETRACHLORIDE		2.5	U		2.45	U		2.53	U		104	U	
CHLOROBENZENE		2.5	U		2.45	U		2.53	U		104	U	
CHLORODIBROMOMETHANE		2.5	U		2.45	U		2.53	U		104	U	
CHLOROETHANE		5	U		4.91	U		5.07	U		208	U	
CHLOROFORM		2.5	U		2.45	U		2.53	U		104	U	
CHLOROMETHANE		5	U		4.91	U		5.07	U		208	U	
CIS-1,2-DICHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
CYCLOHEXANE		2.5	U		2.45	U		2.53	U		104	U	
DICHLORODIFLUOROMETHANE		5	U		4.91	U		5.07	U		208	U	
ETHYLBENZENE		2.5	U		2.45	U		2.53	U		104	U	

PROJ_NO: 00771	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB016-0607			S43SB017-0608		
SDG: CTO114_003	LAB_ID	1106158-12RE2			1106158-13RE1			1106158-15RE1			1106158-02		
FRACTION: OV	SAMP_DATE	6/11/2011			6/11/2011			6/12/2011			6/10/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.9			85.9			86.7			85.5		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1,2,2-TETRACHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1,2-TRICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		5.04	U		5.04	U		4.73	U		239	U	
1,1-DICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,1-DICHLOROETHENE		2.52	U		2.52	U		2.37	U		120	U	
1,2,3-TRICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,2,4-TRICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DIBROMO-3-CHLOROPROPANE		5.04	U		5.04	U		4.73	U		239	U	
1,2-DIBROMOETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DICHLOROETHANE		2.52	U		2.52	U		2.37	U		120	U	
1,2-DICHLOROPROPANE		2.52	U		2.52	U		2.37	U		120	U	
1,3-DICHLOROPROPANE		2.52	U		2.52	U		2.37	U		120	U	
1,4-DICHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
1,4-DIOXANE		101	UR	C	101	UR	C	94.6	UR	C	4780	UR	C
2-BUTANONE		5.04	U		5.04	U		4.73	U		239	U	
2-HEXANONE		2.52	U		2.52	U		2.37	U		120	U	
4-METHYL-2-PENTANONE		2.52	U		2.52	U		2.37	U		120	U	
ACETONE		12.1	B	A	12	J	CP	18.3	J	CP	478	U	
BENZENE		2.52	U		2.52	U		2.37	U		120	U	
BROMODICHLOROMETHANE		2.52	U		2.52	U		2.37	U		120	U	
BROMOFORM		2.52	U		2.52	U		2.37	U		120	U	
BROMOMETHANE		5.04	U		5.04	U		4.73	U		239	U	
CARBON DISULFIDE		2.52	U		2.52	U		2.37	U		120	U	
CARBON TETRACHLORIDE		2.52	U		2.52	U		2.37	U		120	U	
CHLOROBENZENE		2.52	U		2.52	U		2.37	U		120	U	
CHLORODIBROMOMETHANE		2.52	U		2.52	U		2.37	U		120	U	
CHLOROETHANE		5.04	U		5.04	U		4.73	U		239	U	
CHLOROFORM		2.52	U		2.52	U		2.37	U		120	U	
CHLOROMETHANE		5.04	U		5.04	U		4.73	U		239	U	
CIS-1,2-DICHLOROETHENE		2.52	U		2.52	U		2.37	U		397		
CYCLOHEXANE		2.52	U		2.52	U		2.37	U		120	U	
DICHLORODIFLUOROMETHANE		5.04	U		5.04	U		4.73	U		239	U	
ETHYLBENZENE		2.52	U		2.52	U		2.37	U		120	U	

PROJ_NO: 00771	NSAMPLE	S43SB018-0507			S43SB019-0607			S43SB022-0708			S43SB022-0708RE2		
SDG: CTO114_003	LAB_ID	1106158-04			1106158-10RE1			1106158-09			1106158-09RE2		
FRACTION: OV	SAMP_DATE	6/10/2011			6/11/2011			6/11/2011			6/11/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.8			86.1			87.1			87.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		118	U		2.26	U		132	U		53000	U	
1,1,2,2-TETRACHLOROETHANE		118	U		2.26	U		132	U				
1,1,2-TRICHLOROETHANE		118	U		2.26	U		132	U				
1,1,2-TRICHLOROTRIFLUOROETHANE		236	U		4.52	U		265	U				
1,1-DICHLOROETHANE		118	U		2.26	U		132	U				
1,1-DICHLOROETHENE		118	U		2.26	U		132	U				
1,2,3-TRICHLOROBENZENE		118	U		2.26	U		132	U				
1,2,4-TRICHLOROBENZENE		118	U		2.26	U		132	U				
1,2-DIBROMO-3-CHLOROPROPANE		236	U		4.52	U		265	U				
1,2-DIBROMOETHANE		118	U		2.26	U		132	U				
1,2-DICHLOROBENZENE		118	U		2.26	U		132	U				
1,2-DICHLOROETHANE		118	U		2.26	U		132	U				
1,2-DICHLOROPROPANE		118	U		2.26	U		132	U				
1,3-DICHLOROPROPANE		118	U		2.26	U		132	U				
1,4-DICHLOROBENZENE		118	U		2.26	U		132	U				
1,4-DIOXANE		4720	UR	C	90.4	UR	C	5300	UR	C			
2-BUTANONE		236	U		4.52	U		837					
2-HEXANONE		118	U		2.26	U		132	U				
4-METHYL-2-PENTANONE		118	U		2.26	U		19100	J	C			
ACETONE		472	U		23.6	J	C				4660000		
BENZENE		118	U		2.26	U		132	U				
BROMODICHLOROMETHANE		118	U		2.26	U		132	U				
BROMOFORM		118	U		2.26	U		132	U				
BROMOMETHANE		236	U		4.52	U		265	U				
CARBON DISULFIDE		118	U		2.26	U		132	U				
CARBON TETRACHLORIDE		118	U		2.26	U		132	U				
CHLOROBENZENE		118	U		2.26	U		132	U				
CHLORODIBROMOMETHANE		118	U		2.26	U		132	U				
CHLOROETHANE		236	U		4.52	U		265	U				
CHLOROFORM		118	U		2.26	U		132	U				
CHLOROMETHANE		236	U		4.52	U		265	U				
CIS-1,2-DICHLOROETHENE		118	U		2.26	U		585					
CYCLOHEXANE		118	U		2.26	U		132	U				
DICHLORODIFLUOROMETHANE		236	U		4.52	U		265	U				
ETHYLBENZENE		118	U		2.26	U		132	U				

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: OV MEDIA: SOIL	NSAMPLE	S43SB008-0607			S43SB009-0708			S43SB009-0708-D			S43SB011-0507		
	LAB_ID	1106158-08RE1			1106158-06RE1			1106158-07RE1			1106158-05		
	SAMP_DATE	6/10/2011			6/10/2011			6/10/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	88.9			95.4			84.3			91.8		
	DUP_OF							S43SB009-0708					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.5	U		2.45	U		2.53	U		104	U	
METHYL ACETATE		5	U		4.91	U		5.07	U		208	U	
METHYL TERT-BUTYL ETHER		2.5	U		2.45	U		2.53	U		104	U	
METHYLENE CHLORIDE		5	U		4.91	U		5.07	U		208	U	
STYRENE		2.5	U		2.45	U		2.53	U		104	U	
TETRACHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
TOLUENE		2.5	U		2.45	U		2.53	U		104	U	
TOTAL XYLENES		5	U		4.91	U		5.07	U		208	U	
TRANS-1,2-DICHLOROETHENE		2.5	U		2.45	U		2.53	U		104	U	
TRICHLOROETHENE		2.5	U		2.45	U		2.53	U		470		
TRICHLOROFLUOROMETHANE		5	U		4.91	U		5.07	U		208	U	
VINYL CHLORIDE		2.5	U		2.45	U		2.53	U		104	U	

PROJ_NO: 00771	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB016-0607			S43SB017-0608		
SDG: CTO114_003	LAB_ID	1106158-12RE2			1106158-13RE1			1106158-15RE1			1106158-02		
FRACTION: OV	SAMP_DATE	6/11/2011			6/11/2011			6/12/2011			6/10/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.9			85.9			86.7			85.5		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		2.52	U		2.52	U		2.37	U		120	U	
METHYL ACETATE		5.04	U		5.04	U		4.73	U		239	U	
METHYL TERT-BUTYL ETHER		2.52	U		2.52	U		2.37	U		120	U	
METHYLENE CHLORIDE		5.04	U		5.04	U		4.73	U		239	U	
STYRENE		2.52	U		2.52	U		2.37	U		120	U	
TETRACHLOROETHENE		2.52	U		2.52	U		2.37	U		120	U	
TOLUENE		2.52	U		2.52	U		2.37	U		120	U	
TOTAL XYLENES		5.04	U		5.04	U		4.73	U		239	U	
TRANS-1,2-DICHLOROETHENE		2.52	U		2.52	U		2.37	U		120	U	
TRICHLOROETHENE		2.52	U		2.52	U		2.37	U		3940		
TRICHLOROFLUOROMETHANE		5.04	U		5.04	U		4.73	U		239	U	
VINYL CHLORIDE		2.52	U		2.52	U		2.37	U		120	U	

PROJ_NO: 00771	NSAMPLE	S43SB018-0507			S43SB019-0607			S43SB022-0708			S43SB022-0708RE2		
SDG: CTO114_003	LAB_ID	1106158-04			1106158-10RE1			1106158-09			1106158-09RE2		
FRACTION: OV	SAMP_DATE	6/10/2011			6/11/2011			6/11/2011			6/11/2011		
MEDIA: SOIL	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/KG			UG/KG			UG/KG			UG/KG		
	PCT_SOLIDS	84.8			86.1			87.1			87.1		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		118	U		2.26	U		132	U				
METHYL ACETATE		236	U		4.52	U		265	U				
METHYL TERT-BUTYL ETHER		118	U		2.26	U		132	U				
METHYLENE CHLORIDE		236	U		4.52	U		265	U				
STYRENE		118	U		2.26	U		132	U				
TETRACHLOROETHENE		118	U		2.26	U		132	U				
TOLUENE		118	U		2.26	U		132	U				
TOTAL XYLENES		236	U		4.52	U		265	U				
TRANS-1,2-DICHLOROETHENE		118	U		2.26	U		132	U				
TRICHLOROETHENE		776			2.26	U		132	U				
TRICHLOROFLUOROMETHANE		236	U		4.52	U		265	U				
VINYL CHLORIDE		118	U		14.3			132	U				

PROJ_NO: 00771	NSAMPLE	S43RB02-20110612			S43TW006-2832			S43TW11-3034			S43TW12-2630		
SDG: CTO114_003	LAB_ID	1106158-16			1106158-14			1106158-03			1106158-11		
FRACTION: EXP	SAMP_DATE	6/12/2011			6/11/2011			6/10/2011			6/11/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
1,3-DINITROBENZENE		0.151	UJ	H	0.157	UJ	H	0.421	J	HPQU	0.248	UJ	H
2,4,6-TRINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2,4-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2,6-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2-AMINO-4,6-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
2-NITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
3-NITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.811	J	H
4-AMINO-2,6-DINITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
4-NITROTOLUENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
HMX		0.151	UJ	H	0.157	UJ	H	1.33	J	HU	0.248	UJ	H
NITROBENZENE		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H
NITROGLYCERIN		0.377	UJ	H	0.392	UJ	H	0.639	J	EHPU	0.341	J	EHPQU
NITROGUANIDINE		5	U		10	UJ	Q	5	U		5	U	
RDX		0.151	UJ	H	0.37	J	HU	0.478	UJ	H	0.248	UJ	H
TETRYL		0.151	UJ	H	0.157	UJ	H	0.478	UJ	H	0.248	UJ	H

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: EXP MEDIA: SOIL	NSAMPLE	S43SB012-0507			S43SB012-0507-D			S43SB017-0608			S43SB018-0507		
	LAB_ID	1106158-12			1106158-13			1106158-02			1106158-04		
	SAMP_DATE	6/11/2011			6/11/2011			6/10/2011			6/10/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	MG/KG			MG/KG			MG/KG			MG/KG		
	PCT_SOLIDS	100.0			100.0			100.0			100.0		
	DUP_OF				S43SB012-0507								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
1,3-DINITROBENZENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2,4,6-TRINITROTOLUENE		0.0367	UJ	C	0.0396	UJ	C	0.0377	U		0.0381	UJ	C
2,4-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2,6-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2-AMINO-4,6-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
2-NITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
3-NITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
4-AMINO-2,6-DINITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
4-NITROTOLUENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
HMX		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
NITROBENZENE		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
NITROGLYCERIN		0.183	U		0.198	U		0.189	U		0.19	U	
NITROGUANIDINE		0.476	UJ	Q	0.455	UJ	Q	0.476	UJ	Q	0.455	UJ	Q
RDX		0.0367	U		0.0396	U		0.0377	U		0.0381	U	
TETRYL		0.0367	U		0.0396	U		0.0377	U		0.0381	U	

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: MISC MEDIA: WATER	NSAMPLE	S43RB02-20110612						S43TW006-2832					
	LAB_ID	1106158-16						1106158-14					
	SAMP_DATE	6/12/2011						6/11/2011					
	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

PROJ_NO: 00771	NSAMPLE	S43TW11-3034						S43TW12-2630					
SDG: CTO114_003	LAB_ID	1106158-03						1106158-11					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/11/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.02	U					0.02	U				
PERCHLORATE					0.2	U					0.2	U	

PROJ_NO: 00771 SDG: CTO114_003 FRACTION: MISC MEDIA: SOIL	NSAMPLE	S43SB012-0507						S43SB012-0507-D					
	LAB_ID	1106158-12						1106158-13					
	SAMP_DATE	6/11/2011						6/11/2011					
	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	84.9			84.9			85.9			85.9		
	DUP_OF							S43SB012-0507			S43SB012-0507		
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.883	U					0.873	U				
PERCHLORATE					2.36	UJ	C				2.33	U	
TOTAL ORGANIC CARBON		1260	J	P				1690					

PROJ_NO: 00771	NSAMPLE	S43SB017-0608						S43SB018-0507					
SDG: CTO114_003	LAB_ID	1106158-02						1106158-04					
FRACTION: MISC	SAMP_DATE	6/10/2011						6/10/2011					
MEDIA: SOIL	QC_TYPE	NM						NM					
	UNITS	MG/KG			UG/KG			MG/KG			UG/KG		
	PCT_SOLIDS	85.5			85.5			84.8			84.8		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CYANIDE		0.877	U					0.884	U				
PERCHLORATE					2.34	UJ	C				2.36	UJ	C
TOTAL ORGANIC CARBON		588	J	P				1130	J	P			

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 7, 2011**
FROM:	**J. KALINYAK**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC / OVG / EXPLOSIVES / PERCHLORATE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP 1106198

SAMPLES: 7 / Aqueous / VOC

S43MW00301	S43MW00401	S43MW00401-D
S43MW00601	S43MW0103	S43MW0501
TB061311-01		

1 / Aqueous / VOC – Trichloroethene Only

S43MW0203

6 / Aqueous / Explosives / Perchlorate

S43MW00301	S43MW00401	S43MW00401-D
S43MW00601	S43MW0103	S43MW0501

5 / Aqueous / OVG

S43MW00401	S43MW00401-D	S43MW00601
S43MW0103	S43MW0203	

OVERVIEW

The sample set for NSF Indian Head CTO 114 SDG 1106198 consisted of eight (8) aqueous environmental samples including one (1) aqueous trip blank sample. The samples were analyzed as listed above for explosives, perchlorate, volatile organic compounds (VOC) (trichloroethene only for sample S43MW0203), and Organic Volatile Gases (OVG) in this sample delivery group (SDG). One (1) field duplicate pair was contained within this SDG: S43MW00401-D / S43MW00401.

The samples were collected by TetraTech NUS on June 17, 2011 and analyzed by Empirical Laboratory LLC. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using EPA SW-846 Methods 8260B, 8330B, 6850, and EPA Method RSK-175 analysis and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, hold times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, internal standard recoveries, field duplicate results, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

MAJOR

- The relative response factor (RRF) was less than the 0.05 quality control limit for the VOC 1,4-dioxane for the initial calibration on instrument MS-VOA4 on 06/02/11 and all the continuing calibration verifications (CCV) for instrument MS-VOA4 affecting all samples. All samples had non-detected results for 1,4-dioxane which were qualified rejected, (UR).

MINOR

- Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated, (J).

- The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, methyl acetate, 4-methyl-2-pentanone, 1,1,2,2-tetrachloroethane, and 1,4-dioxane for instrument MS-VOA4 on 06/23/11 @ 07:25 and @ 07:51 affecting samples TB061311-01, S43MW00301, S43MW0501, S43MW00401, S43MW00401-D, S43MW00601, and S43MW0103. No action was taken for the non-detected aforementioned sample analyte results (1,4-dioxane rejected for RRF quality control limit non-compliance). The positive acetone result for sample TB061311-01 was qualified estimated, (J).

- The explosives analysis relative percent difference (RPD) between the two analytical columns were greater than 40% for some sample positive explosives results. The positive explosives results for these samples were qualified estimated, (J). The C-18 (primary) column results were reported except when the RPD between the analytical columns was greater than 100%, in which case the lower of the two results from the columns was reported. The table below lists the samples and analytes qualified as well as the results for both analytical columns (the results reported are in bold).

Sample	Analyte	C-18 µg/l	Ultra II Aromax µg/l	RPD
S43MW00301	Nitroglycerin	**0.262**	1.20	128%
S43MW00401	HMX	**0.125**	247	200%
	RDX	0.967	**0.212**	128%
S43MW00401-D	3-Nitrotoluene	**3.57**	1.45	84%
	HMX	**0.125**	255	200%
	RDX	**0.415**	3.80	161%
S43MW00601	4-Amino-2,6-dinitrotoluene	**0.128**	0.633	133%
	4-Nitrotoluene	**0.195**	0.0994	65%
	Nitroglycerin	**32.3**	2310	194%
	RDX	**1.70**	13.0	154%
S43MW0103	1,3-Dinitrobenzene	**0.659**	0.150	126%
	2-Amino-4,6-dinitrotoluene	**0.274**	1.71	145%
	2-Nitrotoluene	**0.236**	1.24	136%
	3-Nitrotoluene	**0.723**	1.55	73%
	Nitroglycerin	**25.2**	2510	196%
S43MW0501	1,3-Dinitrobenzene	0.533	**0.131**	121%
	RDX	0.420	**0.0886**	145%

- The laboratory indicated a matrix interference for some sample positive explosive results in all samples. These sample positive explosive results were qualified estimated, (J), due to the matrix interference.

- The explosives LCS %Rs were greater than the quality control limit for 1,3,5-trinitrobenzene and nitroglycerin for batch 1F23022 affecting samples S43MW00301, S43MW00401, S43MW00401-D, S43MW00601, S43MW0103, and S43MW0501. The non-detected 1,3,5-trinitrobenzene and nitroglycerin sample results were not qualified and the positive nitroglycerin results for samples

S43MW00301, S43MW00601, and S43MW0103,were qualified estimated, (J).

- The non-detected nitroguanidine result for sample S43MW0103 was qualified estimated, (UJ), due to chromatographic interference. As a result of the interference, the sample Limit of Detection (LOD) result was raised by the laboratory

- The OVG CCV %D was greater than the 15% quality control limit for ethane and ethene for instrument GL-GCVOA on 06/26/11 @ 14:05 affecting samples S43MW00401, S43MW00401-D, S43MW00601, and S43MW0203. Additionally, the CCVs from 06/26/11 @ 20:07 and 00:34 had 0% recoveries due to bad injections (per an examination of the raw data). As a result of these issues the positive and non-detected methane, ethane, and ethene results for the aforementioned samples were qualified estimated, (J) and (UJ), respectively.

- The OVG CCV %D was greater than the 15% quality control limit for methane for instrument GL-GCVOA on 06/30/11 @ 15:37 and 07/01/11 @ 14:32 affecting sample S43MW0103. The methane result for the sample S43MW0103 was qualified estimated, (J).

- The OVG methane result for sample S43MW00401 was greater than the highest calibration level for the instrument. There was insufficient sample volume remaining for a sample re-analysis, therefore, the methane result for sample S43MW00401 was qualified estimated, (J).

- The OVG gas ethane, ethene, and methane RPDs were greater than the 30% quality control limit for the field duplicate samples S43MW00401-D and S43MW00401. The ethane, ethene, and methane positive and non-detected results for the aforementioned samples were qualified estimated, (J) and (UJ), respectively.

NOTES

The common laboratory VOC contaminants were detected in the trip blank sample at the following concentrations.

Analyte	Maximum Conc. (µg/l)	Action Level (µg/l)
Acetone	5.05	50.5
Methylene Chloride	6.23	62.3

An action level of 10X the maximum concentration for the common laboratory contaminants acetone and methylene chloride was established to evaluate the sample for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into account when applying the action level. All samples had non-detected results for acetone and methylene chloride and no samples were qualified.

The VOC CCV %D was greater than the 20% and less than 50% quality control limit for acetone, 2-butanone, chloroethane, 1,2-dibromo-3-chloropropane, methyl acetate, 4-methyl-2-pentanone, 1,1,2,2-tetrachloroethane, tetrachloroethene, and 1.4-dioxane for instrument MS-VOA4 on 06/24/11 @ 08:34 and @ 09:24 affecting sample S43MW0103 re-analysis at a lower dilution. As the aforementioned analytes for the sample were reported from this analysis, and the analytes were non-detected, no validation action was taken with the exception of the 1,4-dioxane non-detected result which was rejected for the RRF quality control limit non-compliance.

The following samples were analyzed for VOC analytes at dilutions, as listed below, resulting in elevated detection limits for the non-detected VOC analytes.

Sample	Dilution
S43MW00401	5X

S43MW00401-D	5X
S43MW00601	10X
S43MW0103	50X, 200X

The VOC surrogate dibromofluoromethane %R was greater than the quality control limit for sample S43MW0103 200X analysis. As only the sample trichloroethene result was reported from this analysis and due to the high sample dilution, no validation action was taken.

The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on 06/27/11 @ 18:09 and @ 22:04 affecting a method blank and an LCS for instrument HPLC1. No samples were affected and no sample validation action was necessary.

The explosive CCV %Ds were greater than the 20% quality control limits for 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, and tetryl on 07/10/11 @ 16:42 affecting a method blank for instrument HPLC2. No samples were affected and no sample validation action was necessary.

The explosive CCV %D was greater than the 20% quality control limit for 2,4,6-trinitrotoluene on instrument HPLC1 on 07/14/11 @ 05:20 affecting all the samples. No validation action was taken as the samples had non-detected results for 2,4,6-trinitrotoluene and the alternate column CCV %Ds for the analyte were within the quality control limits.

The laboratory explosives surrogate standard recovery and retention time summary forms were missing the retention times for the surrogate 1-chloro-3-nitrobenzene for a number of samples, blanks, CCVs, etc. making it appear that there were quality control limit retention time exceedances. The data validation chemist provided the correct retention times from the raw data for the samples to verify that the sample surrogate standard retention times were within the quality control limits.

The laboratory report was missing the raw sample data for the instrument HPLC1 for explosives. The laboratory was contacted on this issue.

The explosives positive sample results were reported from the two analytical columns inconsistently for different SDGs by the laboratory. The laboratory was contacted on this issue and the response is included in the data package. The laboratory policy is to report the primary analytical column positive explosives results unless there is an RPD between analytical columns greater than 100%, in which case the lower of the two column results was reported. The data validation chemist manually edited sample data to match the laboratory reporting policy for positive explosive results.

As was stated earlier in the validation report, there were significant laboratory analytical difficulties associated with the nitroguanidine analyses.

The nitroguanidine MSD %R was less than the quality control limit and the RPD for the MS/MSD was greater than the quality control limit for spiked sample S43MW00301. No action was taken as the MS %R was within the quality control limit for nitroguanidine.

The OVG LCSD %R was greater than the quality control limit for ethene for batch 1F26003 affecting samples S43MW00401, S43MW00401-D, S43MW00601, and S43MW0203. The OVG LCSD %R was greater than the quality control limit for ethene for batch 1F30008 affecting sample S43MW0103. The positive ethene results for the samples were not qualified as the LCS in both cases was within the quality control limits as was the RPD for the LCS/LCSD.

Non-detected results were reported to the limit of detection (LOD).

EXECUTIVE SUMMARY

Laboratory Performance Issues: VOC sample 1,4-dioxane non-detected results were rejected due to RRF quality control limit non-compliances. The sample TB061311-01 acetone result was qualified for a CCV %D quality control limit non-compliance. Positive explosives results were qualified for sample matrix interferences. Sample positive nitroglycerin results were qualified for a LCS %R quality control limit non-compliance. Sample S43MW0103 non-detected nitroguanidine result was qualified and the detection limit raised due to a sample matrix interference. OVG results for sample S43MW00401, S43MW00401-D, S43MW00601, and S43MW0203 were qualified for CCV %D quality control limit non-compliances and missing CCV data. The methane result for sample S43MW0103 was qualified due to a CCV %D quality control limit non-compliance. The methane result for sample S43MW00401 was qualified due to exceeding the highest calibration level.

Other Factors Affecting Data Quality: Positive results reported below the quantitation limit but above the method detection limit were qualified as estimated (J). Sample positive explosive results were qualified for analytical column RPD quality control limit non-compliances. OVG results for the field duplicate sample pair were qualified for RPD quality control limit non-compliances.

The data for these analyses were reviewed with reference to the Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), USEPA SW-846 Methods 8260B, 8330B, 6850, and RSK-175, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories" (April 2009).

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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

Appendix A

Qualified Analytical Results

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1,2,2-TETRACHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1,2-TRICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1-DICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,1-DICHLOROETHENE		0.5	U		2.56	J	P	2.43	J	P	5	U	
1,2,3-TRICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,2,4-TRICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DIBROMO-3-CHLOROPROPANE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DIBROMOETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DICHLOROETHANE		0.5	U		2.5	U		2.5	U		5	U	
1,2-DICHLOROPROPANE		0.5	U		2.5	U		2.5	U		5	U	
1,3-DICHLOROPROPANE		0.5	U		2.5	U		2.5	U		5	U	
1,4-DICHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
1,4-DIOXANE		10	UR	C	50	UR	C	50	UR	C	100	UR	C
2-BUTANONE		5	U		25	U		25	U		50	U	
2-HEXANONE		2.5	U		12.5	U		12.5	U		25	U	
4-METHYL-2-PENTANONE		2.5	U		12.5	U		12.5	U		25	U	
ACETONE		5	U		25	U		25	U		50	U	
BENZENE		0.5	U		2.5	U		2.5	U		5	U	
BROMODICHLOROMETHANE		0.5	U		2.5	U		2.5	U		5	U	
BROMOFORM		0.5	U		2.5	U		2.5	U		5	U	
BROMOMETHANE		1	U		5	U		5	U		10	U	
CARBON DISULFIDE		0.5	U		2.5	U		2.5	U		5	U	
CARBON TETRACHLORIDE		0.5	U		2.5	U		2.5	U		5	U	
CHLOROBENZENE		0.5	U		2.5	U		2.5	U		5	U	
CHLORODIBROMOMETHANE		0.5	U		2.5	U		2.5	U		5	U	
CHLOROETHANE		1	U		5	U		5	U		10	U	
CHLOROFORM		0.5	U		2.5	U		2.5	U		5	U	
CHLOROMETHANE		6.35			5.05			2.5	U		5	U	
CIS-1,2-DICHLOROETHENE		0.896	J	P	152			156			41.6		
CYCLOHEXANE		0.5	U		2.5	U		2.5	U		5	U	
DICHLORODIFLUOROMETHANE		1	U		5	U		5	U		10	U	
ETHYLBENZENE		0.5	U		2.5	U		2.5	U		5	U	

PROJ_NO: 00771	NSAMPLE	S43MW0103			S43MW0103RE			S43MW0203			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06			1106198-06RE1			1106198-10			1106198-14		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE											0.5	U	
1,1,2,2-TETRACHLOROETHANE					25	U					0.5	U	
1,1,2-TRICHLOROETHANE					25	U					0.5	U	
1,1,2-TRICHLOROTRIFLUOROETHANE					25	U					0.5	U	
1,1-DICHLOROETHANE					25	U					0.5	U	
1,1-DICHLOROETHENE					25	U					0.5	U	
1,2,3-TRICHLOROBENZENE					25	U					0.5	U	
1,2,4-TRICHLOROBENZENE					25	U					0.5	U	
1,2-DIBROMO-3-CHLOROPROPANE					25	U					0.5	U	
1,2-DIBROMOETHANE					25	U					0.5	U	
1,2-DICHLOROBENZENE					25	U					0.5	U	
1,2-DICHLOROETHANE					25	U					0.5	U	
1,2-DICHLOROPROPANE					25	U					0.5	U	
1,3-DICHLOROPROPANE					25	U					0.5	U	
1,4-DICHLOROBENZENE					25	U					0.5	U	
1,4-DIOXANE					500	UR	C				10	UR	C
2-BUTANONE					250	U					5	U	
2-HEXANONE					125	U					2.5	U	
4-METHYL-2-PENTANONE					125	U					2.5	U	
ACETONE					250	U					5	U	
BENZENE					25	U					0.5	U	
BROMODICHLOROMETHANE					25	U					0.5	U	
BROMOFORM					25	U					0.5	U	
BROMOMETHANE					50	U					1	U	
CARBON DISULFIDE					25	U					0.5	U	
CARBON TETRACHLORIDE					25	U					0.5	U	
CHLOROBENZENE					25	U					0.5	U	
CHLORODIBROMOMETHANE					25	U					0.5	U	
CHLOROETHANE					50	U					1	U	
CHLOROFORM					8.32	J	P				0.5	U	
CHLOROMETHANE					25	U					3.41		
CIS-1,2-DICHLOROETHENE					284						0.5	U	
CYCLOHEXANE					25	U					0.5	U	
DICHLORODIFLUOROMETHANE					50	U					1	U	
ETHYLBENZENE					25	U					0.5	U	

PROJ_NO: 00771	NSAMPLE	TB061311-01
SDG: 1106198	LAB_ID	1106198-01
FRACTION: OV	SAMP_DATE	6/13/2011
MEDIA: WATER	QC_TYPE	NM
	UNITS	UG/L
	PCT_SOLIDS	0.0
	DUP_OF	

PARAMETER	RESULT	VQL	QLCD
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-DICHLOROPROPANE	0.5	U	
1,4-DICHLOROBENZENE	0.5	U	
1,4-DIOXANE	10	UR	C
2-BUTANONE	5	U	
2-HEXANONE	2.5	U	
4-METHYL-2-PENTANONE	2.5	U	
ACETONE	5.05	J	CP
BENZENE	0.5	U	
BROMODICHLOROMETHANE	0.5	U	
BROMOFORM	0.5	U	
BROMOMETHANE	1	U	
CARBON DISULFIDE	0.5	U	
CARBON TETRACHLORIDE	0.5	U	
CHLOROBENZENE	0.5	U	
CHLORODIBROMOMETHANE	0.5	U	
CHLOROETHANE	1	U	
CHLOROFORM	0.5	U	
CHLOROMETHANE	0.5	U	
CIS-1,2-DICHLOROETHENE	0.5	U	
CYCLOHEXANE	0.5	U	
DICHLORODIFLUOROMETHANE	1	U	
ETHYLBENZENE	0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U		2.5	U		2.5	U		5	U	
METHYL ACETATE		1	U		5	U		5	U		10	U	
METHYL TERT-BUTYL ETHER		0.5	U		2.5	U		2.5	U		5	U	
METHYLENE CHLORIDE		1	U		5	U		5	U		10	U	
STYRENE		0.5	U		2.5	U		2.5	U		5	U	
TETRACHLOROETHENE		0.5	U		2.5	U		2.5	U		5	U	
TOLUENE		0.5	U		2.5	U		2.5	U		5	U	
TOTAL XYLENES		1	U		5	U		5	U		10	U	
TRANS-1,2-DICHLOROETHENE		0.5	U		2.5	U		2.5	U		5	U	
TRICHLOROETHENE		1.74			699			682			1130		
TRICHLOROFLUOROMETHANE		1	U		5	U		5	U		10	U	
VINYL CHLORIDE		1.16			15.7			14.1			5	U	

PROJ_NO: 00771	NSAMPLE	S43MW0103			S43MW0103RE			S43MW0203			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06			1106198-06RE1			1106198-10			1106198-14		
FRACTION: OV	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ISOPROPYLBENZENE					25	U					0.5	U	
METHYL ACETATE					50	U					1	U	
METHYL TERT-BUTYL ETHER					25	U					0.5	U	
METHYLENE CHLORIDE					50	U					1	U	
STYRENE					25	U					0.5	U	
TETRACHLOROETHENE					25	U					0.5	U	
TOLUENE					25	U					0.5	U	
TOTAL XYLENES					50	U					1	U	
TRANS-1,2-DICHLOROETHENE					25	U					0.5	U	
TRICHLOROETHENE		10900						0.398	J	P	0.5	U	
TRICHLOROFLUOROMETHANE					50	U					1	U	
VINYL CHLORIDE					25	U					0.5	U	

PROJ_NO: 00771	NSAMPLE	TB061311-01		
SDG: 1106198	LAB_ID	1106198-01		
FRACTION: OV	SAMP_DATE	6/13/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ISOPROPYLBENZENE		0.5	U	
METHYL ACETATE		1	U	
METHYL TERT-BUTYL ETHER		0.5	U	
METHYLENE CHLORIDE		6.23		
STYRENE		0.5	U	
TETRACHLOROETHENE		0.148	J	P
TOLUENE		0.5	U	
TOTAL XYLENES		1	U	
TRANS-1,2-DICHLOROETHENE		0.5	U	
TRICHLOROETHENE		0.5	U	
TRICHLOROFLUOROMETHANE		1	U	
VINYL CHLORIDE		0.5	U	

PROJ_NO: 00771	NSAMPLE	S43MW00401			S43MW00401-D			S43MW00601			S43MW0103		
SDG: 1106198	LAB_ID	1106198-02			1106198-04			1106198-08			1106198-06RE1		
FRACTION: OVG	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	S43MW00401											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ETHANE		60.6	J	CG	2	UJ	CG	2.94	J	CP	15.8		
ETHENE		11.5	J	CG	2	UJ	CG	2	UJ	C	2	U	
METHANE		623	J	CGL	5.14	J	CG	257	J	C	687	J	C

PROJ_NO: 00771	NSAMPLE	S43MW0203		
SDG: 1106198	LAB_ID	1106198-10		
FRACTION: OVG	SAMP_DATE	6/17/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ETHANE		2	UJ	C
ETHENE		2	UJ	C
METHANE		2	UJ	C

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: EXP	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.15	U		0.15	U		0.16	U		0.168	U	
1,3-DINITROBENZENE		0.15	U		0.15	U		0.16	U		0.244	J	P
2,4,6-TRINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2,4-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2,6-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2-AMINO-4,6-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
2-NITROTOLUENE		0.15	U		0.15	U		0.16	U		0.168	U	
3-NITROTOLUENE		0.15	U		2.91			3.57	J	U	0.168	U	
4-AMINO-2,6-DINITROTOLUENE		0.15	U		0.15	U		0.16	U		0.128	J	PQU
4-NITROTOLUENE		0.15	U		0.15	U		0.16	U		0.195	J	PU
HMX		0.15	U		0.125	J	PQU	0.125	J	PQU	0.904		
NITROBENZENE		0.15	U		0.15	U		0.16	U		0.168	U	
NITROGLYCERIN		0.262	J	EPQU	0.374	U		0.4	U		32.3	J	EQU
NITROGUANIDINE		5	U		5	U		5	U		5	U	
RDX		0.15	U		0.212	J	PQU	0.415	J	QU	1.7	J	QU
TETRYL		0.15	U		0.15	U		0.16	U		0.168	U	

PROJ_NO: 00771	NSAMPLE	S43MW0103			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06			1106198-14		
FRACTION: EXP	SAMP_DATE	6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM		
	UNITS	UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0		
	DUP_OF						
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,3,5-TRINITROBENZENE		0.15	U		0.157	U	
1,3-DINITROBENZENE		0.15	J	PQU	0.131	J	PQU
2,4,6-TRINITROTOLUENE		0.15	U		0.157	U	
2,4-DINITROTOLUENE		0.15	U		0.157	U	
2,6-DINITROTOLUENE		0.15	U		0.157	U	
2-AMINO-4,6-DINITROTOLUENE		0.274	J	PQU	0.157	U	
2-NITROTOLUENE		0.236	J	PQU	0.157	U	
3-NITROTOLUENE		0.723	J	U	0.157	U	
4-AMINO-2,6-DINITROTOLUENE		0.15	U		0.0929	J	P
4-NITROTOLUENE		0.15	U		0.157	U	
HMX		0.15	U		0.157	U	
NITROBENZENE		0.15	U		0.157	U	
NITROGLYCERIN		25.2	J	EQU	0.392	U	
NITROGUANIDINE		72	UJ	Q	5	U	
RDX		0.15	U		0.0886	J	PQU
TETRYL		0.15	U		0.157	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**August 31, 2011**
FROM:	**MEGAN CARSON**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –SELECT METALS, CYANIDE, SULFIDE, TOTAL ORGANIC CARBON, CHLORIDE, NITRATE-N, NITRITE-N, AND SULFATE**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1106198

SAMPLES: 7/Water/

S43MW00301	S43MW00401
S43MW00401-D	S43MW00601
S43MW0103	S43MW0203
S43MW0501	

Overview

The sample set for NSF Indian Head, SDG 1106198 consists of seven (7) aqueous samples. This SDG contained one field duplicate pair: S43MW00401/S43MW00401-D.

All samples (except S43MW0203) were analyzed for select total and dissolved metals. All samples were analyzed for cyanide. Samples S43MW00401, S43MW00401-D, S43MW00601, S43MW0103, and S43MW0203 were analyzed for sulfide, TOC, chloride, nitrate, nitrite, sulfide, and sulfate. Sample S43MW0203 was analyzed for total and dissolved cobalt. The samples were collected by Tetra Tech NUS, Inc. on June 17th, 2011 and analyzed by Empirical Laboratories, LLC under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010C. Cyanide analyses were conducted using method SM9012A. TOC analyses were conducted using method SW9060. Sulfide analyses were conducted using method SM4500S2CF. Chloride, nitrate-N, nitrite-N, and sulfate were analyzed using EPA method 300.

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, ICP/MS tune, laboratory method/preparation blanks, interference check sample (ICS) results, matrix spike / matrix spike duplicate results, field duplicate precision, laboratory duplicate precision, laboratory control sample (LCS) results, ICP serial dilution results, ICP/MS internal standard recoveries, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Major Problems:

- None.

Minor Problems:

- The continuing calibrations analyzed on 7/5/11 at 17:57 and 18:55 had percent recoveries >110% for iron. All samples were affected except S43MW00301 (dissolved) and S43MW0501 (total and dissolved). Positive iron results were qualified as biased high (K).

- The CRDL standard analyzed on 7/5/11 had a percent recovery < 90% for lead and thallium. All samples were affected. Positive results for lead were qualified as biased low (L) or estimated (J) due to conflicting directional bias. Non-detected lead results were qualified as biased low (UL). Non-detected thallium results were qualified as biased low (UL).

- The CRDL standard analyzed on 7/6/11 had a percent recovery < 90% for lead. Dissolved sample S43MW00601 was affected. The non-detected lead result was qualified as biased low (UL).

- The matrix spike duplicate for sample S43MW0203 had a percent recovery <80% for nitrite. All samples were affected. Positive results were qualified as estimated (J) and non-detected results were qualified as estimated (UJ).

- All analyses for nitrate-N and nitrite-N were analyzed one day past the 48 hour hold time. Positive results were qualified as estimated (J) and non-detected results were qualified as estimated (UJ).

Notes

The continuing calibration analyzed on 6/24/11 at 15:22 had a percent recovery > 110% for cyanide. Samples S43MW00401, S43MW00401-D, S43MW0103, S43MW00601, and S43MW0203 were affected. No validation action was warranted as sample results were non-detected.

Executive Summary

Laboratory Performance: Continuing calibration non-compliances resulted in the qualification of sample results. CRDL standard non-compliances resulted in the qualification of sample results. Hold time non-compliances for nitrate-N and nitrite-N resulted in qualification of sample results.

Other Factors Affecting Data Quality: Matrix spike non-compliances for nitrite resulted in the qualification of sample results.

The data for these analyses were reviewed with reference to Region III modifications to the "National Functional Guidelines for Inorganic Data Validation", April 1993, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories "(April, 2009).

The text of this report has been formulated to address only those problem areas affecting data quality.

Megan Carson

Tetra Tech NUS
Megan Carson
Chemist/Data Validator

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

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Data Validation Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01	=	GC/MS Tuning Noncompliance
D	=	MS/MSD Recovery Noncompliance
E	=	LCS/LCSD Recovery Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	GFAA PDS - GFAA MSA's $r < 0.995$
K	=	ICP Interference - includes ICS % R Noncompliance
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation Noncompliance
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Recovery Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (e.g. base-line drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R	=	Surrogates Recovery Noncompliance
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	% Difference between columns/detectors >25% for positive results determined via GC/HPLC
V	=	Non-linear calibrations; correlation coefficient $r < 0.995$
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-12			1106198-02			1106198-04			1106198-08		
FRACTION: M	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		22.5	J	P	18.2	J	P	14.1	J	P	4050		
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		16.9			1.72	J	P	1.7	J	P	2.76		
BARIUM		132			96.6			90.9			138		
BERYLLIUM		0.5	U		0.5	U		0.5	U		0.536	J	P
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		9.79		
COBALT		4.25			24.7			23.4			40.7		
COPPER		2	U		2	U		2	U		9.93		
IRON		42600	K	C	16600	K	C	16200	K	C	35800	K	C
LEAD		0.75	UL	C	0.75	UL	C	0.75	UL	C	3.73		
MANGANESE		602			409			383			611		
NICKEL		0.875	J	P	14.3			14			28.8		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	UL	C	1	UL	C	1	UL	C	1	UL	C
VANADIUM		2.5	U		2.5	U		2.5	U		15.7		
ZINC		11.6			14.8			13.2			33.2		

PROJ_NO: 00771 SDG: 1106198 FRACTION: M MEDIA: WATER	NSAMPLE	S43MW0103			S43MW0203			S43MW0501		
	LAB_ID	1106198-06			1106198-10			1106198-14		
	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		1550						1090		
ANTIMONY		2	U					2	U	
ARSENIC		2.65						1.58	J	P
BARIUM		30.8						106		
BERYLLIUM		0.385	J	P				0.386	J	P
CADMIUM		0.558	J	P				0.5	U	
CHROMIUM		11.6						2.76		
COBALT		9.03			70.4			31.1		
COPPER		14.3						2.92		
IRON		2420	K	C				10400		
LEAD		4.57						1.41	L	C
MANGANESE		101						345		
NICKEL		11.7						25.5		
SELENIUM		0.786	J	P				1.25	U	
SILVER		0.5	U					0.5	U	
THALLIUM		1	UL	C				1	UL	C
VANADIUM		14.2						4.61		
ZINC		102						38.3		

PROJ_NO: 00771	NSAMPLE	S43MW00301			S43MW00401			S43MW00401-D			S43MW00601		
SDG: 1106198	LAB_ID	1106198-13			1106198-03			1106198-05			1106198-09		
FRACTION: MF	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF							S43MW00401					
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		16.2	J	P	25	U		25	U		17	J	P
ANTIMONY		2	U		2	U		2	U		2	U	
ARSENIC		15.2			1.67	J	P	1.53	J	P	2.09	J	P
BARIUM		129			91.9			94.1			126		
BERYLLIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CADMIUM		0.5	U		0.5	U		0.5	U		0.5	U	
CHROMIUM		1	U		1	U		1	U		1	U	
COBALT		4.21			23.9			24.5			35.4		
COPPER		2	U		2	U		2	U		2	U	
IRON		38600			15900	K	C	16400	K	C	34800	K	C
LEAD		0.75	UL	C	0.75	UL	C	0.75	UL	C	1.5	UL	C
MANGANESE		572			394			396			616		
NICKEL		1.5	U		14.4			14.5			24.9		
SELENIUM		1.25	U		1.25	U		1.25	U		1.25	U	
SILVER		0.5	U		0.5	U		0.5	U		0.5	U	
THALLIUM		1	UL	C	1	UL	C	1	UL	C	1	UL	C
VANADIUM		2.5	U		2.5	U		2.5	U		2.5	U	
ZINC		11.5			14.1			13.9			13.9		

PROJ_NO: 00771 SDG: 1106198 FRACTION: MF MEDIA: WATER	NSAMPLE	S43MW0103			S43MW0203			S43MW0501		
	LAB_ID	1106198-07			1106198-11			1106198-15		
	SAMP_DATE	6/17/2011			6/17/2011			6/17/2011		
	QC_TYPE	NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0		
	DUP_OF									
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ALUMINUM		195						26.5	J	P
ANTIMONY		2	U					2	U	
ARSENIC		2.13	J	P				1.22	J	P
BARIUM		25.3						110		
BERYLLIUM		0.5	U					0.5	U	
CADMIUM		0.427	J	P				0.5	U	
CHROMIUM		6.58						1	U	
COBALT		8.28			73.5			33.5		
COPPER		8.94						2	U	
IRON		768	K	C				10900		
LEAD		0.444	J	CP				0.75	UL	C
MANGANESE		90						383		
NICKEL		10.2						27.7		
SELENIUM		0.916	J	P				1.25	U	
SILVER		0.5	U					0.5	U	
THALLIUM		1	UL	C				1	UL	C
VANADIUM		9.48						2.5	U	
ZINC		60.6						36		

PROJ_NO: 00771	NSAMPLE	S43MW00301						S43MW00401					
SDG: 1106198	LAB_ID	1106198-12						1106198-02					
FRACTION: MISC	SAMP_DATE	6/17/2011						6/17/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CHLORIDE								39.2					
CYANIDE		0.01	U					0.01	U				
DISSOLVED ORGANIC CARBON								1.71					
NITRATE-N								0.1	UJ	H			
NITRITE-N								0.1	UJ	DH			
PERCHLORATE					0.2	U					0.244	J	P
SULFATE								5.82					
SULFIDE								1.82	U				

PROJ_NO: 00771	NSAMPLE	S43MW00401-D						S43MW00601					
SDG: 1106198	LAB_ID	1106198-04						1106198-08					
FRACTION: MISC	SAMP_DATE	6/17/2011						6/17/2011					
MEDIA: WATER	QC_TYPE	NM						NM					
	UNITS	MG/L			UG/L			MG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	S43MW00401			S43MW00401								
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CHLORIDE		39.4						57					
CYANIDE		0.01	U					0.01	U				
DISSOLVED ORGANIC CARBON		1.76						3.08					
NITRATE-N		0.1	UJ	H				0.1	UJ	H			
NITRITE-N		0.1	UJ	DH				0.1	UJ	DH			
PERCHLORATE					0.2	U					0.2	U	
SULFATE		5.93						4.96					
SULFIDE		1.82	U					1.82	U				

PROJ_NO: 00771	NSAMPLE	S43MW0103						S43MW0203			S43MW0501		
SDG: 1106198	LAB_ID	1106198-06						1106198-10			1106198-14		
FRACTION: MISC	SAMP_DATE	6/17/2011						6/17/2011			6/17/2011		
MEDIA: WATER	QC_TYPE	NM						NM			NM		
	UNITS	MG/L			UG/L			MG/L			MG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
CHLORIDE		32.3						125					
CYANIDE		0.01	U					0.01	U		0.01	U	
DISSOLVED ORGANIC CARBON		9.41						1.77					
NITRATE-N		0.845	J	H				0.388	J	H			
NITRITE-N		0.059	J	DHP				0.1	UJ	DH			
PERCHLORATE					0.251	J	P						
SULFATE		34.2						14					
SULFIDE		1.82	U					1.82	U				

PROJ_NO: 00771	NSAMPLE	S43MW0501		
SDG: 1106198	LAB_ID	1106198-14		
FRACTION: MISC	SAMP_DATE	6/17/2011		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
CHLORIDE				
CYANIDE				
DISSOLVED ORGANIC CARBON				
NITRATE-N				
NITRITE-N				
PERCHLORATE		0.2	U	
SULFATE				
SULFIDE				

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**R. SOK**	**DATE:**	**SEPTEMBER 2, 2011**
FROM:	**A. COGNETTI**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOC**
NSF INDIAN HEAD, CTO 114
SAMPLE DELIVERY GROUP (SDG) – 1106304R

SAMPLES: 4/Soil Gas/VOC

S430DA01 S43SG0106 S43SG0305
S43SG0406

Overview

The sample set for NSF Indian Head CTO 114, SDG 1106304R consisted of four (4) soil gas samples. All samples were analyzed for volatile organic compounds (VOC). No field duplicate pair is included in this SDG.

The samples were collected by Tetra Tech on June 11, 2011 and analyzed by Air Toxics Ltd. All analyses were conducted in accordance with EPA Method TO-15 analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, internal standard recoveries, chromatographic resolution, compound identification, compound quantitation, and detection limits. Areas of concern are listed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

Major

No major noncompliances were noted.

Minor

- The initial calibration percent relative standard deviation (%RSD) for carbon tetrachloride was greater than the 30% quality control limit but less than 50% on June 8, 2011 on instrument MSD-A affecting samples S430DA01 and S43SG0305. The positive carbon tetrachloride result in sample S430DA01 was qualified as estimated (J).

Notes

The initial calibration %RSD for 1,2-dibromo-3-chloropropane was greater than 30% but less than 50% on May 25, 2011 on instrument MSD-14 affecting samples S43SG0406 and S43SG0106. No action was taken on the nondetected 1,2-dibromo-3-chloropropane results in the affected samples.

The laboratory method blank analyzed on June 22, 2011 @ 4:36 on instrument MSD-A contained a contaminant.

Contaminant	Maximum Concentration (ug/m^3)	Action Level (ug/m^3)
Benzene	0.021	0.105

An action level of 5X the maximum concentration of benzene was established in order to evaluate samples for blank contamination. Sample aliquot and dilution factors were taken into account when applying the action level. The positive benzene results in the affected samples S430DA01 and S43SG0305 were greater than the action level. No action was taken.

The laboratory control samples/laboratory control sample duplicates (LCS/LCSD) associated with batches 1106304R1-07A analyzed on June 22, 2011 @ 8:18 and 1106304R1-07C analyzed on June 24, 2011 @ 10:21 were not spiked with 1,2-dibromo-3-chloropropane and methyl acetate. No action was taken.

The LCS/LCSD percent recoveries (%Rs) of 1,2,4-trichlorobenzene was greater than the upper quality control limit in batch 1106304R1-07C analyzed on June 24, 2011. No action was taken on the nondetected 1,2,4-trichlorobenzene results in the affected samples.

Samples S43SG0305 and S430DA01 were analyzed using SIM.

A library search was performed for the analytes 1,2,3-trichlorobenzene and 1,3-dichloropropene. The aforementioned analytes were not detected.

Nondetected results were reported to the limit of detection (LOD) except for 1,2-dibromo3-chloropropane and methyl acetate which were reported to the reporting limit (RL).

Executive Summary

Laboratory Performance: The initial calibration %RSD for carbon tetrachloride exceeded quality control limits resulting in the qualification of positive results.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to Region III modifications to U.S. EPA National Functional Guidelines for Organic Data Validation (Sept. 1994), EPA Method TO-15, and the Department of Defense (DoD) document entitled "Quality Systems Manual (QSM) for Environmental Laboratories (April 2009). The text of this report has been formulated to address only those problem areas affecting data quality.

Ann Cognetti

Tetra Tech NUS
Ann Cognetti
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

Appendix A

Qualified Analytical Results

Data Validation Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (e.g. % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (e.g. base-line drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can be any number of issues; e.g. poor chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = % Difference between columns/detectors >25% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient $r < 0.995$
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is greater than sample activity

PROJ_NO: 00771 SDG: 1106304R1 FRACTION: OV-M3 MEDIA: AIR	NSAMPLE	S43ODA01			S43SG0106			S43SG0305			S43SG0406		
	LAB_ID	1106304R1-01A			1106304R1-04A			1106304R1-02A			1106304R1-03A		
	SAMP_DATE	6/11/2011			6/11/2011			6/11/2011			6/11/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/M3			UG/M3			UG/M3			UG/M3		
	PCT_SOLIDS												
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
1,1,1-TRICHLOROETHANE		0.071	J	P	45	U		0.24	J	P	1000	U	
1,1,2,2-TETRACHLOROETHANE		0.044	U		56	U		0.088	U		1300	U	
1,1,2-TRICHLOROETHANE		0.029	U		45	U		0.058	U		1000	U	
1,1,2-TRICHLOROTRIFLUOROETHANE		0.56	U		63	U		1.1	U		1400	U	
1,1-DICHLOROETHANE		0.029	U		140			0.069	J	P	760	U	
1,1-DICHLOROETHENE		0.029	U		33	U		0.19			740	U	
1,2,4-TRICHLOROBENZENE		1.3	U		140	U		2.6	U		3100	U	
1,2-DIBROMO-3-CHLOROPROPANE		7	U		800	U		14	U		18000	U	
1,2-DIBROMOETHANE		0.56	U		63	U		1.1	U		1400	U	
1,2-DICHLOROBENZENE		0.44	U		50	U		0.88	U		1100	U	
1,2-DICHLOROETHANE		0.046	J	P	33	U		0.07	J	P	760	U	
1,2-DICHLOROPROPANE		0.34	U		38	U		0.67	U		860	U	
1,4-DICHLOROBENZENE		0.44	U		50	U		0.88	U		1100	U	
1,4-DIOXANE		0.27	U		67	U		0.68	J	P	1500	U	
2-BUTANONE		6.1			160	J	P	100			1600	J	P
2-HEXANONE		0.86	J	P	76	U		12			1700	U	
4-METHYL-2-PENTANONE		0.3	U		76	U		0.6	U		1600	J	P
ACETONE		17			3100			190			690000		
BENZENE		0.31			26	U		1.1			600	U	
BROMODICHLOROMETHANE		0.49	U		55	U		0.98	U		1200	U	
BROMOFORM		0.75	U		85	U		1.5	U		1900	U	
BROMOMETHANE		0.45	U		32	U		0.91	U		730	U	
CARBON DISULFIDE		0.55	J	P	26	U		2.8	J	P	580	U	
CARBON TETRACHLORIDE		0.66	J	CP	52	U		0.92	U		1200	U	
CHLOROBENZENE		0.34	U		38	U		0.67	U		860	U	
CHLORODIBROMOMETHANE		0.62	U		70	U		1.2	U		1600	U	
CHLOROETHANE		0.31	U		180	J	P	0.64	J	P	1100	U	
CHLOROFORM		0.36	U		40	U		0.71	U		910	U	
CHLOROMETHANE		1.8			100	J	P	2.3			870	U	
CIS-1,2-DICHLOROETHENE		0.029	U		140			59			29000		
CYCLOHEXANE		0.25	U		28	U		0.5	U		640	U	
DICHLORODIFLUOROMETHANE		2.6			41	U		2.7			920	U	
ETHYLBENZENE		0.068	J	P	36	U		0.53			810	U	
ISOPROPYLBENZENE		0.36	U		40	U		0.72	U		920	U	
M+P-XYLENES		0.11	J	P	100			1.1			810	U	

PROJ_NO: 00771 SDG: 1106304R1 FRACTION: OV-M3 MEDIA: AIR	NSAMPLE	S43ODA01			S43SG0106			S43SG0305			S43SG0406		
	LAB_ID	1106304R1-01A			1106304R1-04A			1106304R1-02A			1106304R1-03A		
	SAMP_DATE	6/11/2011			6/11/2011			6/11/2011			6/11/2011		
	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/M3			UG/M3			UG/M3			UG/M3		
	PCT_SOLIDS												
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
METHYL ACETATE		2.2	U		250	U		4.4	U		5700	U	
METHYL TERT-BUTYL ETHER		0.026	J	P	30	U		0.083	J	P	670	U	
METHYLENE CHLORIDE		0.68	J	P	29	U		5			650	U	
O-XYLENE		0.055	J	P	36	U		0.68			810	U	
STYRENE		0.31	U		35	U		0.62	U		800	U	
TETRACHLOROETHENE		0.1	J	P	56	U		0.19	J	P	1300	U	
TOLUENE		0.52			790			2			700	U	
TRANS-1,2-DICHLOROETHENE		0.029	U		33	U		0.44	J	P	740	U	
TRICHLOROETHENE		0.029	U		44	U		0.33			1000	U	
TRICHLOROFLUOROMETHANE		1.6			46	U		1.6	J	P	1000	U	
VINYL CHLORIDE		0.015	U		30000			100			1100	U	

APPENDIX M
VALIDATED ANALYTICAL RESULTS

Appendix M
Validated Air Analytical Results
NSF Indian Head, Maryland

LOCATION	S43ODA01	S43SG01	S43SG03	S43SG04
SAMPLE ID	S43ODA01	S43SG0106	S43SG0305	S43SG0406
SAMPLE DATE	20110611	20110611	20110611	20110611
TOP DEPTH	-9999	6	5	6
BOTTOM DEPTH	-9999	6	5	6
VOLATILE ORGANICS FOR AIR REPORTED IN METERS CUBED (UG/M3)				
1,1,1-TRICHLOROETHANE	0.071 J	45 U	0.24 J	1000 U
1,1,2,2-TETRACHLOROETHANE	0.044 U	56 U	0.088 U	1300 U
1,1,2-TRICHLOROETHANE	0.029 U	45 U	0.058 U	1000 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.56 U	63 U	1.1 U	1400 U
1,1-DICHLOROETHANE	0.029 U	140	0.069 J	760 U
1,1-DICHLOROETHENE	0.029 U	33 U	0.19	740 U
1,2,4-TRICHLOROBENZENE	1.3 U	140 U	2.6 U	3100 U
1,2-DIBROMO-3-CHLOROPROPANE	7 U	800 U	14 U	18000 U
1,2-DIBROMOETHANE	0.56 U	63 U	1.1 U	1400 U
1,2-DICHLOROBENZENE	0.44 U	50 U	0.88 U	1100 U
1,2-DICHLOROETHANE	0.046 J	33 U	0.07 J	760 U
1,2-DICHLOROPROPANE	0.34 U	38 U	0.67 U	860 U
1,4-DICHLOROBENZENE	0.44 U	50 U	0.88 U	1100 U
1,4-DIOXANE	0.27 U	67 U	0.68 J	1500 U
2-BUTANONE	6.1	160 J	100	1600 J
2-HEXANONE	0.86 J	76 U	12	1700 U
4-METHYL-2-PENTANONE	0.3 U	76 U	0.6 U	1600 J
ACETONE	17	3100	190	690000
BENZENE	0.31	26 U	1.1	600 U
BROMODICHLOROMETHANE	0.49 U	55 U	0.98 U	1200 U
BROMOFORM	0.75 U	85 U	1.5 U	1900 U
BROMOMETHANE	0.45 U	32 U	0.91 U	730 U
CARBON DISULFIDE	0.55 J	26 U	2.8 J	580 U
CARBON TETRACHLORIDE	0.66 J	52 U	0.92 U	1200 U
CHLOROBENZENE	0.34 U	38 U	0.67 U	860 U
CHLORODIBROMOMETHANE	0.62 U	70 U	1.2 U	1600 U
CHLOROETHANE	0.31 U	180 J	0.64 J	1100 U
CHLOROFORM	0.36 U	40 U	0.71 U	910 U
CHLOROMETHANE	1.8	100 J	2.3	870 U
CIS-1,2-DICHLOROETHENE	0.029 U	140	59	29000
CYCLOHEXANE	0.25 U	28 U	0.5 U	640 U
DICHLORODIFLUOROMETHANE	2.6	41 U	2.7	920 U
ETHYLBENZENE	0.068 J	36 U	0.53	810 U
ISOPROPYLBENZENE	0.36 U	40 U	0.72 U	920 U
M+P-XYLENES	0.11 J	100	1.1	810 U
METHYL ACETATE	2.2 U	250 U	4.4 U	5700 U
METHYL TERT-BUTYL ETHER	0.026 J	30 U	0.083 J	670 U
METHYLENE CHLORIDE	0.68 J	29 U	5	650 U
O-XYLENE	0.055 J	36 U	0.68	810 U
STYRENE	0.31 U	35 U	0.62 U	800 U
TETRACHLOROETHENE	0.1 J	56 U	0.19 J	1300 U
TOLUENE	0.52	790	2	700 U
TRANS-1,2-DICHLOROETHENE	0.029 U	33 U	0.44 J	740 U
TRICHLOROETHENE	0.029 U	44 U	0.33	1000 U
TRICHLOROFLUOROMETHANE	1.6	46 U	1.6 J	1000 U
VINYL CHLORIDE	0.015 U	30000	100	1100 U

Appendix M
Validated Groundwater Analytical Results
NSF Indian Head, Maryland

LOCATION	S43MW001	S43MW002	S43MW003	S43MW004		S43MW005	S43MW006	S43TW006	S43TW007	
SAMPLE ID	S43MW00103	S43MW00203	S43MW00301	S43MW00401	S43MW00401-D	S43MW00501	S43MW00601	S43TW006-2832	S43TW007-2327	S43TW007-2327-D
SAMPLE DATE	20110617	20110617	20110617	20110617	20110617	20110617	20110617	20110611	20110603	20110603
TOTAL METALS (UG/L)										
ALUMINUM	1550	NA	22.5 J	18.2 J	14.1 J	1090	4050	21900	23700	24300
ANTIMONY	2 U	NA	2 U	2 U	2 U	2 U	2 U	2.5 U	10 U	10 U
ARSENIC	2.65	NA	16.9	1.72 J	1.7 J	1.58 J	2.76	12.9	11.7 J	11.8 J
BARIUM	30.8	NA	132	96.6	90.9	106	138	234	295	301
BERYLLIUM	0.385 J	NA	0.5 U	0.5 U	0.5 U	0.386 J	0.536 J	2.38	2.53 J	2.54 J
CADMIUM	0.558 J	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.25 U	2.5 U	2.5 U
CHROMIUM	11.6	NA	1 U	1 U	1 U	2.76	9.79	141	53.2	53.6
COBALT	9.03	70.4	4.25	24.7	23.4	31.1	40.7	29.5	28.3	29.6
COPPER	14.3	NA	2 U	2 U	2 U	2.92	9.93	99.2	93.5	98.2
IRON	2420 K	NA	42600 K	16600 K	16200 K	10400	35800 K	52800 K	58200	58300
LEAD	4.57	NA	0.75 UL	0.75 UL	0.75 UL	1.41 L	3.73	42.6	48.1	48.7
MANGANESE	101	NA	602	409	383	345	611	811	610	618
MERCURY	NA	NA	NA	NA	NA	NA	NA	0.125 J	0.261	0.25
NICKEL	11.7	NA	0.875 J	14.3	14	25.5	28.8	34	23.1	23.8
SELENIUM	0.786 J	NA	1.25 U	1.25 U	1.25 U	1.25 U	1.25 U	2.5 U	6.25 UL	6.25 UL
SILVER	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	2.5 U
THALLIUM	1 UL	NA	1 UL	1 UL	1 UL	1 UL	1 UL	2 UL	5 U	5 U
VANADIUM	14.2	NA	2.5 U	2.5 U	2.5 U	4.61	15.7	101	80.2	82.2
ZINC	102	NA	11.6	14.8	13.2	38.3	33.2	66	99.3	104
DISSOLVED METALS (UG/L)										
ALUMINUM	195	NA	16.2 J	25 U	25 U	26.5 J	17 J	3150	11400 J	2740 J
ANTIMONY	2 U	NA	2 U	2 U	2 U	2 U	2 U	2.5 U	4 U	4 U
ARSENIC	2.13 J	NA	15.2	1.67 J	1.53 J	1.22 J	2.09 J	2.97	7.17 K	2.86 J
BARIUM	25.3	NA	129	91.9	94.1	110	126	93.4	173 J	106 J
BERYLLIUM	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.386 J	1.11 J	1 U
CADMIUM	0.427 J	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.25 U	1 U	1 U
CHROMIUM	6.58	NA	1 U	1 U	1 U	1 U	1 U	16.3	23.8 J	5.59 J
COBALT	8.28	73.5	4.21	23.9	24.5	33.5	35.4	14.2	14.7 J	7.12 J
COPPER	8.94	NA	2 U	2 U	2 U	2 U	2 U	11.9	38.9 J	9.23 J
IRON	768 K	NA	38600	15900 K	16400 K	10900	34800 K	28300 K	48200	39900
LEAD	0.444 J	NA	0.75 UL	0.75 UL	0.75 UL	0.75 UL	1.5 UL	5.6	18.7 J	4.78 J
MANGANESE	90	NA	572	394	396	383	616	566	550	472
MERCURY	NA	NA	NA	NA	NA	NA	NA	0.2 U	0.0825 J	0.2 U
NICKEL	10.2	NA	1.5 U	14.4	14.5	27.7	24.9	8.43	12.7 J	5.2 J
SELENIUM	0.916 J	NA	1.25 U	1.25 U	1.25 U	1.25 U	1.25 U	2.5 U	2.5 U	2.5 U
SILVER	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	1 U	1 U
THALLIUM	1 UL	NA	1 UL	1 UL	1 UL	1 UL	1 UL	2 UL	2 U	2 U
VANADIUM	9.48	NA	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	14.9	38 J	9.44 J
ZINC	60.6	NA	11.5	14.1	13.9	36	13.9	10.9	42.5 J	12.2 J
EXPLOSIVES (UG/L)										
1,3,5-TRINITROBENZENE	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
1,3-DINITROBENZENE	0.15 J	NA	0.15 U	0.15 U	0.16 U	0.131 J	0.244 J	0.157 UJ	0.157 U	0.15 U
2,4,6-TRINITROTOLUENE	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
2,4-DINITROTOLUENE	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
2,6-DINITROTOLUENE	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
2-AMINO-4,6-DINITROTOLUENE	0.274 J	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
2-NITROTOLUENE	0.236 J	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
3-NITROTOLUENE	0.723 J	NA	0.15 U	2.91	3.57 J	0.157 U	0.168 U	0.157 UJ	0.898 J	0.708 J
4-AMINO-2,6-DINITROTOLUENE	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.0929 J	0.128 J	0.157 UJ	0.176 J	0.177 J
4-NITROTOLUENE	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.195 J	0.157 UJ	0.157 U	0.401 J
HMX	0.15 U	NA	0.15 U	0.125 J	0.125 J	0.157 U	0.904	0.157 UJ	0.157 U	0.15 U
NITROBENZENE	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
NITROGLYCERIN	25.2 J	NA	0.262 J	0.374 U	0.4 U	0.392 U	32.3 J	0.392 UJ	0.392 U	0.374 U
NITROGUANIDINE	72 UJ	NA	5 U	5 U	5 U	5 U	5 U	10 UJ	5 U	5 U
RDX	0.15 U	NA	0.15 U	0.212 J	0.415 J	0.0886 J	1.7 J	0.37 J	0.628 J	0.616 J
TETRYL	0.15 U	NA	0.15 U	0.15 U	0.16 U	0.157 U	0.168 U	0.157 UJ	0.157 U	0.15 U
MISCELLANEOUS PARAMETERS (UG/L)										
PERCHLORATE	0.251 J	NA	0.2 U	0.244 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
MISCELLANEOUS PARAMETERS (MG/L)										
ALKALINITY	NA	NA	NA	NA	NA	NA	NA	NA	27.4	41
CHLORIDE	32.3	125	NA	39.2	39.4	NA	57	NA	41.7	41
CYANIDE	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.02 U	0.01 U	0.01 U
DISSOLVED ORGANIC CARBON	9.41	1.77	NA	1.71	1.76	NA	3.08	NA	NA	NA
NITRATE-N	0.845 J	0.388 J	NA	0.1 UJ	0.1 UJ	NA	0.1 UJ	NA	0.043 J	0.1 U
NITRITE-N	0.059 J	0.1 UJ	NA	0.1 UJ	0.1 UJ	NA	0.1 UJ	NA	0.1 U	0.1 U
SULFATE	34.2	14	NA	5.82	5.93	NA	4.96	NA	11.8	11.2
SULFIDE	1.82 U	1.82 U	NA	1.82 U	1.82 U	NA	1.82 U	NA	1.82 U	1.85 U
TOTAL ORGANIC CARBON	NA	NA	NA	NA	NA	NA	NA	NA	1.86 J	4.33 J

Appendix M
Validated Groundwater Analytical Results
NSF Indian Head, Maryland

LOCATION	S43MW001	S43MW002	S43MW003	S43MW004		S43MW005	S43MW006	S43TW006	S43TW007	
SAMPLE ID	S43MW00103	S43MW00203	S43MW00301	S43MW00401	S43MW00401-D	S43MW00501	S43MW00601	S43TW006-2832	S43TW007-2327	S43TW007-2327-D
SAMPLE DATE	20110617	20110617	20110617	20110617	20110617	20110617	20110617	20110611	20110603	20110603
VOLATILE GASES (UG/L)										
ETHANE	15.8	2 UJ	NA	60.6 J	2 UJ	NA	2.94 J	NA	10.3 J	11.5 J
ETHENE	2 U	2 UJ	NA	11.5 J	2 UJ	NA	2 UJ	NA	8.89	10.3
METHANE	687 J	2 UJ	NA	623 J	5.14 J	NA	257 J	NA	196 J	235 J
VOLATILES (UG/L)										
1,1,1-TRICHLOROETHANE	NA	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	10 U	10 U
1,1-DICHLOROETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,1-DICHLOROETHENE	25 U	NA	0.5 U	2.56 J	2.43 J	0.5 U	5 U	0.5 U	4.5 J	4.75 J
1,2,3-TRICHLOROBENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	10 U	10 U
1,2-DIBROMOETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,2-DICHLOROBENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,2-DICHLOROETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,2-DICHLOROPROPANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,3-DICHLOROPROPANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,4-DICHLOROBENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
1,4-DIOXANE	500 UR	NA	10 UR	50 UR	50 UR	10 UR	100 UR	10 UR	100 UR	100 UR
2-BUTANONE	250 U	NA	5 U	25 U	25 U	5 U	50 U	5 U	50 U	50 U
2-HEXANONE	125 U	NA	2.5 U	12.5 U	12.5 U	2.5 U	25 U	2.5 U	25 U	25 U
4-METHYL-2-PENTANONE	125 U	NA	2.5 U	12.5 U	12.5 U	2.5 U	25 U	2.5 U	25 U	25 U
ACETONE	250 U	NA	5 U	25 U	25 U	5 U	50 U	5 U	50 U	50 U
BENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
BROMODICHLOROMETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
BROMOFORM	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
BROMOMETHANE	50 U	NA	1 U	5 U	5 U	1 U	10 U	1 U	10 U	10 U
CARBON DISULFIDE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
CARBON TETRACHLORIDE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
CHLOROBENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
CHLORODIBROMOMETHANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
CHLOROETHANE	50 U	NA	1 U	5 U	5 U	1 U	10 U	1 U	10 U	10 U
CHLOROFORM	8.32 J	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
CHLOROMETHANE	25 U	NA	6.35	5.05	2.5 U	3.41	5 U	0.5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	284	NA	0.896 J	152	156	0.5 U	41.6	4.49	56.5	61.3
CYCLOHEXANE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	50 U	NA	1 U	5 U	5 U	1 U	10 U	1 U	10 U	10 U
ETHYLBENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
ISOPROPYLBENZENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
METHYL ACETATE	50 U	NA	1 U	5 U	5 U	1 U	10 U	1 U	10 U	10 U
METHYL TERT-BUTYL ETHER	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
METHYLENE CHLORIDE	50 U	NA	1 U	5 U	5 U	1 U	10 U	1 U	7.7 J	9.74 J
STYRENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
TETRACHLOROETHENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
TOLUENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
TOTAL XYLENES	50 U	NA	1 U	5 U	5 U	1 U	10 U	1 U	15 U	15 U
TRANS-1,2-DICHLOROETHENE	25 U	NA	0.5 U	2.5 U	2.5 U	0.5 U	5 U	0.5 U	5 U	5 U
TRICHLOROETHENE	10900	0.398 J	1.74	699	682	0.5 U	1130	53.9	923	1010
TRICHLOROFLUOROMETHANE	50 U	NA	1 U	5 U	5 U	1 U	10 U	1 U	10 U	10 U
VINYL CHLORIDE	25 U	NA	1.16	15.7	14.1	0.5 U	5 U	0.724 J	26.2	25.8

LOCATION	S43TW008	S43TW009	S43TW011	S43TW012
SAMPLE ID	S43TW008-2832	S43TW009-2125	S43TW011-3034	S43TW012-2630
SAMPLE DATE	20110605	20110603	20110610	20110611
TOTAL METALS (UG/L)				
ALUMINUM	21500	13900	27100	20500
ANTIMONY	10 U	10 U	5 U	5 U
ARSENIC	28.8	13.8 L	43.5	39.2
BARIUM	316	208	267	243
BERYLLIUM	4.11 J	1.99 J	1.98 J	1.76 J
CADMIUM	2.5 U	2.5 U	2.5 U	2.5 U
CHROMIUM	75.7	78.5	126	239
COBALT	132	11.4 J	32.3	29.6
COPPER	91.8	87	93.7	163
IRON	58500	61300	58200 K	68500 K
LEAD	41.9	43.4	38.7	32
MANGANESE	678	485	418	507
MERCURY	0.36	0.0857 J	0.236	0.206
NICKEL	112	15 L	64.9	85.6
SELENIUM	6.25 UL	6.25 UL	6.49	2.92
SILVER	2.5 U	2.5 U	5 U	5 U
THALLIUM	5 U	5 U	4 UL	4 UL
VANADIUM	104	64.8	91	78.6
ZINC	312	42	103	129
DISSOLVED METALS (UG/L)				
ALUMINUM	2150	42.2 J	373	1340
ANTIMONY	10 U	4 U	2.5 U	2.5 U
ARSENIC	5.84 J	7.59 L	3.74	4.53
BARIUM	93.7	108 J	92.2	90.9
BERYLLIUM	2.5 U	1 U	1.25 U	1.25 U
CADMIUM	2.5 U	1 U	1.25 U	1.25 U
CHROMIUM	9.44 J	2 UJ	1.83 J	15.3
COBALT	17.8	2.5 J	3.12 U	2.2 J
COPPER	9.53 J	4 UJ	2.5 U	9.95
IRON	32500	47200	23700 K	24200 K
LEAD	3.72 J	1.5 UJ	0.75 UL	1.12 L
MANGANESE	491	475	270	274
MERCURY	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	17.9	8.06 J	4.4	10.2
SELENIUM	6.25 UL	2.5 UL	2.5 U	2.5 U
SILVER	2.5 U	1 U	2.5 U	2.5 U
THALLIUM	5 U	2 U	2 UL	2 UL
VANADIUM	11.9 J	5 UJ	1.54 J	5.39
ZINC	33.1	17.4 J	2.72 J	11.4
EXPLOSIVES (UG/L)				
1,3,5-TRINITROBENZENE	0.154 U	0.157 U	0.478 UJ	0.248 UJ
1,3-DINITROBENZENE	0.154 U	0.157 U	0.421 J	0.248 UJ
2,4,6-TRINITROTOLUENE	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2,4-DINITROTOLUENE	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2,6-DINITROTOLUENE	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2-AMINO-4,6-DINITROTOLUENE	0.154 U	0.157 U	0.478 UJ	0.248 UJ
2-NITROTOLUENE	0.154 U	0.11 J	0.478 UJ	0.248 UJ
3-NITROTOLUENE	0.156 J	0.157 U	0.478 UJ	0.811 J
4-AMINO-2,6-DINITROTOLUENE	0.154 U	0.0873 J	0.478 UJ	0.248 UJ
4-NITROTOLUENE	0.146 J	0.157 U	0.478 UJ	0.248 UJ
HMX	0.154 U	0.157 U	1.33 J	0.248 UJ
NITROBENZENE	0.154 U	0.157 U	0.478 UJ	0.248 UJ
NITROGLYCERIN	0.385 U	0.392 U	0.639 J	0.341 J
NITROGUANIDINE	5 UJ	10 U	5 U	5 U
RDX	0.49 J	0.763	0.478 UJ	0.248 UJ
TETRYL	0.154 U	0.157 U	0.478 UJ	0.248 UJ
MISCELLANEOUS PARAMETERS (UG/L)				
PERCHLORATE	0.2 UJ	0.2 U	0.2 U	0.2 U
MISCELLANEOUS PARAMETERS (MG/L)				
ALKALINITY	NA	41.8	NA	NA
CHLORIDE	NA	54	NA	NA
CYANIDE	0.01 U	0.01 U	0.02 U	0.02 U
DISSOLVED ORGANIC CARBON	NA	NA	NA	NA
NITRATE-N	NA	0.1 U	NA	NA
NITRITE-N	NA	0.1 U	NA	NA
SULFATE	NA	0.926 J	NA	NA
SULFIDE	NA	2 U	NA	NA
TOTAL ORGANIC CARBON	NA	3.86 J	NA	NA

LOCATION	S43TW008	S43TW009	S43TW011	S43TW012
SAMPLE ID	S43TW008-2832	S43TW009-2125	S43TW011-3034	S43TW012-2630
SAMPLE DATE	20110605	20110603	20110610	20110611
VOLATILE GASES (UG/L)				
ETHANE	NA	2 UJ	NA	NA
ETHENE	NA	2 U	NA	NA
METHANE	NA	46.4 J	NA	NA
VOLATILES (UG/L)				
1,1,1-TRICHLOROETHANE	0.5 U	2.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	2.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	2.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	0.5 U	5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	2.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.364 J	2.5 U	0.5 U	0.5 U
1,2,3-TRICHLOROBENZENE	0.5 U	2.5 U	0.5 U	0.5 U
1,2,4-TRICHLOROBENZENE	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	0.5 U	5 U	0.5 U	0.5 U
1,2-DIBROMOETHANE	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DICHLOROBENZENE	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	2.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	2.5 U	0.5 U	0.5 U
1,3-DICHLOROPROPANE	0.5 U	2.5 U	0.5 U	0.5 U
1,4-DICHLOROBENZENE	0.5 U	2.5 U	0.5 U	0.5 U
1,4-DIOXANE	10 UR	10 UR	10 UR	10 UR
2-BUTANONE	5 U	25 U	5 U	5 U
2-HEXANONE	2.5 U	12.5 U	2.5 U	2.5 U
4-METHYL-2-PENTANONE	2.5 U	12.5 U	2.5 U	2.5 U
ACETONE	10.6 J	55.6 J	5 U	5 U
BENZENE	0.5 U	2.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	2.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	2.5 U	0.5 U	0.5 U
BROMOMETHANE	1 U	5 U	1 U	1 U
CARBON DISULFIDE	0.5 U	2.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	2.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	2.5 U	0.5 U	0.5 U
CHLORODIBROMOMETHANE	0.5 U	2.5 U	0.5 U	0.5 U
CHLOROETHANE	1 U	5 U	1 U	1 U
CHLOROFORM	0.5 U	2.5 U	0.5 U	0.5 U
CHLOROMETHANE	0.5 U	2.5 U	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	21.8	2.61 J	0.5 U	0.5 U
CYCLOHEXANE	0.5 U	2.5 U	0.5 U	0.5 U
DICHLORODIFLUOROMETHANE	1 U	5 U	1 U	1 U
ETHYLBENZENE	0.5 U	2.5 U	0.5 U	0.5 U
ISOPROPYLBENZENE	0.5 U	2.5 U	0.5 U	0.5 U
METHYL ACETATE	1 U	5 U	1 U	1 U
METHYL TERT-BUTYL ETHER	0.5 U	2.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	0.748 J	4.84 J	1 U	1 U
STYRENE	0.5 U	2.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	2.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	2.5 U	0.5 U	0.5 U
TOTAL XYLENES	1 U	7.5 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	0.5 U	2.5 U	0.5 U	0.5 U
TRICHLOROETHENE	41.9	563	1.68	0.5 U
TRICHLOROFLUOROMETHANE	1 U	5 U	1 U	1 U
VINYL CHLORIDE	16.2	2.5 U	0.5 U	0.5 U

Appendix M
Validated Soil Analytical Results
NSF Indian Head, Maryland

LOCATION	S43SB008		S43SB009			S43SB010	S43SB011		
SAMPLE ID	**S43SB008-0607**	**S43SB008-0608**	**S43SB009-0608**	**S43SB009-0708**	**S43SB009-0708-D**	**S43SB010-0709**	**S43SB011-0507**	**S43SB011-0709**	**S43SB011-0709-D**
SAMPLE DATE	**20110610**	**20110604**	**20110604**	**20110610**	**20110610**	**20110603**	**20110610**	**20110604**	**20110604**
TOP DEPTH	**6**	**6**	**6**	**7**	**7**	**7**	**5**	**7**	**7**
BOTTOM DEPTH	**7**	**8**	**8**	**8**	**8**	**9**	**7**	**9**	**9**
EXPLOSIVES (MG/KG)									
1,3,5-TRINITROBENZENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
1,3-DINITROBENZENE	NA	0.0392 U	0.0375 J	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
2,4,6-TRINITROTOLUENE	NA	0.0392 UJ	0.0385 UJ	NA	NA	0.0396 U	NA	0.0396 UJ	0.0367 UJ
2,4-DINITROTOLUENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
2,6-DINITROTOLUENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
2-AMINO-4,6-DINITROTOLUENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
2-NITROTOLUENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
3-NITROTOLUENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
4-AMINO-2,6-DINITROTOLUENE	NA	0.0392 UJ	0.0385 UJ	NA	NA	0.0396 U	NA	0.0396 UJ	0.0367 UJ
4-NITROTOLUENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.064 J	0.0367 U
HMX	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
NITROBENZENE	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
NITROGLYCERIN	NA	0.196 U	0.192 U	NA	NA	0.198 U	NA	0.198 U	0.183 U
NITROGUANIDINE	NA	0.37 UJ	0.455 UJ	NA	NA	0.345 U	NA	0.455 UJ	0.37 UJ
RDX	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
TETRYL	NA	0.0392 U	0.0385 U	NA	NA	0.0396 U	NA	0.0396 U	0.0367 U
METALS (MG/KG)									
ALUMINUM	NA	5890	8690	NA	NA	5970	NA	8040	7100
ANTIMONY	NA	0.469 UL	0.472 UL	NA	NA	0.956 UL	NA	0.474 UL	0.461 UL
ARSENIC	NA	1.53 J	3.01 J	NA	NA	0.925 J	NA	2.25 J	5.24 J
BARIUM	NA	28.2 J	51.1 J	NA	NA	30.8	NA	39.6 J	16.7 J
BERYLLIUM	NA	0.361	0.777	NA	NA	0.455 J	NA	0.557	0.613
CADMIUM	NA	0.117 U	0.118 U	NA	NA	0.239 U	NA	0.119 U	0.115 U
CHROMIUM	NA	8.03 K	15.8 K	NA	NA	10	NA	13.3 K	14.5 K
COBALT	NA	3.36	5.28	NA	NA	2.54	NA	6.12	5.13
COPPER	NA	4.8	14	NA	NA	10	NA	8.13	11.6
IRON	NA	9430	14500	NA	NA	8670	NA	9380	15500
LEAD	NA	5.34	11.6	NA	NA	5.99	NA	9.23	9.19
MANGANESE	NA	23.3 K	16.9 K	NA	NA	11.5	NA	28.6 K	30 K
MERCURY	NA	0.0128 J	0.0347 U	NA	NA	0.0418 U	NA	0.0292 U	0.0383 U
NICKEL	NA	6.02	10.3	NA	NA	5.92	NA	10.4	9.5
SELENIUM	NA	0.293 UL	0.343 J	NA	NA	0.597 U	NA	0.223 J	0.258 J
SILVER	NA	0.117 U	0.118 U	NA	NA	0.239 U	NA	0.119 U	0.115 U
THALLIUM	NA	0.235 U	0.472 U	NA	NA	0.478 U	NA	0.474 U	0.461 U
VANADIUM	NA	11.3 J	27.1 J	NA	NA	12.7	NA	16.4 J	29.9 J
ZINC	NA	18.8 K	35.7 K	NA	NA	16.9	NA	27.8 K	31.4 K
MISCELLANEOUS PARAMETERS (MG/KG)									
CYANIDE	NA	0.292 U	0.266 U	NA	NA	0.266 U	NA	0.285 U	0.291 U
TOTAL ORGANIC CARBON	NA	1180 J	1660	NA	NA	702 J	NA	1210 J	900 J
PERCHLORATE	NA	3.86 J	2.38 UJ	NA	NA	2.45 U	NA	2.42 UJ	4.84 J
VOLATILES (UG/KG)									
1,1,1-TRICHLOROETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,1,2,2-TETRACHLOROETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,1,2-TRICHLOROETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,1,2-TRICHLOROTRIFLUOROETHANE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
1,1-DICHLOROETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,1-DICHLOROETHENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,2,3-TRICHLOROBENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,2,4-TRICHLOROBENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,2-DIBROMO-3-CHLOROPROPANE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
1,2-DIBROMOETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,2-DICHLOROBENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,2-DICHLOROETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,2-DICHLOROPROPANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,3-DICHLOROPROPANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,4-DICHLOROBENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
1,4-DIOXANE	100 UR	NA	NA	98.2 UR	101 UR	112 UR	4160 UR	NA	NA
2-BUTANONE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
2-HEXANONE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
4-METHYL-2-PENTANONE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
ACETONE	20 J	NA	NA	14.5 J	13.3 J	11.2 UR	416 U	NA	NA
BENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
BROMODICHLOROMETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
BROMOFORM	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
BROMOMETHANE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
CARBON DISULFIDE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
CARBON TETRACHLORIDE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
CHLOROBENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
CHLORODIBROMOMETHANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
CHLOROETHANE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
CHLOROFORM	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
CHLOROMETHANE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
CIS-1,2-DICHLOROETHENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
CYCLOHEXANE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
DICHLORODIFLUOROMETHANE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
ETHYLBENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
ISOPROPYLBENZENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
METHYL ACETATE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
METHYL TERT-BUTYL ETHER	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
METHYLENE CHLORIDE	5 U	NA	NA	4.91 U	5.07 U	9.47 B	208 U	NA	NA
STYRENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
TETRACHLOROETHENE	2.5 U	NA	NA	2.45 U	2.53 U	1.65 J	104 U	NA	NA
TOLUENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
TOTAL XYLENES	5 U	NA	NA	4.91 U	5.07 U	8.43 U	208 U	NA	NA
TRANS-1,2-DICHLOROETHENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA
TRICHLOROETHENE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	470	NA	NA
TRICHLOROFLUOROMETHANE	5 U	NA	NA	4.91 U	5.07 U	5.62 U	208 U	NA	NA
VINYL CHLORIDE	2.5 U	NA	NA	2.45 U	2.53 U	2.81 U	104 U	NA	NA

Appendix M
Validated Soil Analytical Results
NSF Indian Head, Maryland

LOCATION	S43SB012			S43SB013	S43SB014	S43SB015	S43SB016		S43SB017	S43SB018	S43SB019	S43SB022
SAMPLE ID	S43SB012-0507	S43SB012-0507-AVG	S43SB012-0507-D	S43SB013-0608	S43SB014-0709	S43SB015-0810	S43SB016-0607	S43SB016-0608	S43SB017-0608	S43SB018-0507	S43SB019-0607	S43SB022-0708
SAMPLE DATE	20110611	20110611	20110611	20110603	20110604	20110603	20110612	20110605	20110610	20110610	20110611	20110611
TOP DEPTH	5	5	5	6	7	8	6	6	6	5	6	7
BOTTOM DEPTH	7	7	7	8	9	10	7	8	8	7	7	8
EXPLOSIVES (MG/KG)												
1,3,5-TRINITROBENZENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
1,3-DINITROBENZENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.032 J	0.0377 U	0.0381 U	NA	NA
2,4,6-TRINITROTOLUENE	0.0367 UJ	0.03815 U	0.0396 UJ	0.0367 U	0.0377 UJ	0.0381 U	NA	0.0392 UJ	0.0377 U	0.0381 UJ	NA	NA
2,4-DINITROTOLUENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
2,6-DINITROTOLUENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
2-AMINO-4,6-DINITROTOLUENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
2-NITROTOLUENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 UJ	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
3-NITROTOLUENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
4-AMINO-2,6-DINITROTOLUENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 UJ	0.0381 U	NA	0.0392 UJ	0.0377 U	0.0381 U	NA	NA
4-NITROTOLUENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0234 J	0.0381 U	NA	0.0239 J	0.0377 U	0.0381 U	NA	NA
HMX	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
NITROBENZENE	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
NITROGLYCERIN	0.183 U	0.1905 U	0.198 U	0.183 U	0.189 U	0.19 U	NA	0.196 U	0.189 U	0.19 U	NA	NA
NITROGUANIDINE	0.476 UJ	0.4655 U	0.455 UJ	0.435 U	0.385 UJ	0.417 U	NA	0.37 UJ	0.476 UJ	0.455 UJ	NA	NA
RDX	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
TETRYL	0.0367 U	0.03815 U	0.0396 U	0.0367 U	0.0377 U	0.0381 U	NA	0.0392 U	0.0377 U	0.0381 U	NA	NA
METALS (MG/KG)												
ALUMINUM	10500	9470	8440	2180	12300	10600	NA	9680	7220	7260	NA	NA
ANTIMONY	0.569 U	0.577 U	0.585 U	0.928 UL	0.448 UL	0.932 UL	NA	0.454 UL	0.596 U	0.575 U	NA	NA
ARSENIC	2.91	2.915	2.92	0.834 J	2.48 J	2.14 L	NA	1.19 J	1.28	0.895	NA	NA
BARIUM	221	193	165	19	115 J	148	NA	55.4 J	33.2	25.6	NA	NA
BERYLLIUM	0.713	0.6895	0.666	0.295 J	0.855	0.844	NA	0.675	0.545	0.605	NA	NA
CADMIUM	0.284 U	0.288 U	0.292 U	0.232 U	0.112 U	0.233 U	NA	0.113 U	0.298 U	0.288 U	NA	NA
CHROMIUM	16.2	14.8	13.4	18.5	15.7 K	13.1	NA	14.2 K	12.7	11.9	NA	NA
COBALT	6.16	5.74	5.32	1.47	5.45	4.17	NA	5.29	5.04	4.71	NA	NA
COPPER	12.1	11.15	10.2	7.38	15.3	12.9	NA	10.4	6.77	9.81	NA	NA
IRON	9620	9605	9590	4010	10600	8630	NA	8290	9110	10500	NA	NA
LEAD	10.7	10.03	9.36	5.02	13.3	11.4	NA	9.87	8.21	8.1	NA	NA
MANGANESE	30.9 J	24.5	18.1 J	23	17 K	10.3	NA	9.75 K	16.5 J	15.4 J	NA	NA
MERCURY	0.0376 U	0.0368 U	0.036 U	0.0368 U	0.0133 J	0.0364 U	NA	0.0388 U	0.0351 U	0.0365 U	NA	NA
NICKEL	11.2	10.54	9.88	5.26	11.8	10.1	NA	9.09	8.38	8.97	NA	NA
SELENIUM	0.569 UL	0.577 U	0.585 UL	0.58 U	0.28 UL	0.583 U	NA	0.284 UL	0.596 UL	0.575 UL	NA	NA
SILVER	0.569 UL	0.577 U	0.585 UL	0.232 U	0.112 U	0.233 U	NA	0.113 U	0.596 UL	0.575 UL	NA	NA
THALLIUM	0.455 U	0.4615 U	0.468 U	0.464 U	0.392 U	0.466 U	NA	0.454 U	0.477 U	0.46 U	NA	NA
VANADIUM	18.3	18.15	18	7.53	20.3 J	20.1	NA	12.6 J	17.8	16.7	NA	NA
ZINC	35.2	34.5	33.8	9.98	46.6 K	26.3	NA	36.2 K	23.1	22.7	NA	NA
MISCELLANEOUS PARAMETERS (MG/KG)												
CYANIDE	0.883 U	0.878 U	0.873 U	0.268 U	0.294 U	0.272 U	NA	0.265 U	0.877 U	0.884 U	NA	NA
TOTAL ORGANIC CARBON	1260 J	1475	1690	1100 J	1030 J	828 J	NA	1020 J	588 J	1130 J	NA	NA
PERCHLORATE	2.36 UJ	2.345 U	2.33 U	2.38 U	1.08 J	2.35 U	NA	2.35 UJ	2.34 UJ	2.36 UJ	NA	NA
VOLATILES (UG/KG)												
1,1,1-TRICHLOROETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,1,2,2-TETRACHLOROETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,1,2-TRICHLOROETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,1,2-TRICHLOROTRIFLUOROETHANE	5.04 U	5.04 U	5.04 U	4.6 U	NA	4.87 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
1,1-DICHLOROETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,1-DICHLOROETHENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,2,3-TRICHLOROBENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,2,4-TRICHLOROBENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,2-DIBROMO-3-CHLOROPROPANE	5.04 U	5.04 U	5.04 U	4.6 U	NA	4.87 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
1,2-DIBROMOETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,2-DICHLOROBENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,2-DICHLOROETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,2-DICHLOROPROPANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,3-DICHLOROPROPANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,4-DICHLOROBENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
1,4-DIOXANE	101 UR	101 R	101 UR	92 UR	NA	97.4 UR	94.6 UR	NA	4780 UR	4720 UR	90.4 UR	5300 UR
2-BUTANONE	5.04 U	5.04 U	5.04 U	4.6 U	NA	564 J	4.73 U	NA	239 U	236 U	4.52 U	837
2-HEXANONE	2.52 U	2.52 U	2.52 U	2.3 U	NA	16	2.37 U	NA	120 U	118 U	2.26 U	132 U
4-METHYL-2-PENTANONE	2.52 U	2.52 U	2.52 U	2.3 U	NA	5190 J	2.37 U	NA	120 U	118 U	2.26 U	19100 J
ACETONE	12.1 B	12 J	12 J	9.2 UR	NA	157000 J	18.3 J	NA	478 U	472 U	23.6 J	4660000
BENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
BROMODICHLOROMETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
BROMOFORM	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
BROMOMETHANE	5.04 U	5.04 U	5.04 U	4.6 UJ	NA	4.87 UJ	4.73 U	NA	239 U	236 U	4.52 U	265 U
CARBON DISULFIDE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
CARBON TETRACHLORIDE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
CHLOROBENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
CHLORODIBROMOMETHANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
CHLOROETHANE	5.04 U	5.04 U	5.04 U	4.6 U	NA	4.87 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
CHLOROFORM	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
CHLOROMETHANE	5.04 U	5.04 U	5.04 U	4.6 U	NA	4.87 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
CIS-1,2-DICHLOROETHENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	397	118 U	2.26 U	585
CYCLOHEXANE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
DICHLORODIFLUOROMETHANE	5.04 U	5.04 U	5.04 U	4.6 U	NA	4.87 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
ETHYLBENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
ISOPROPYLBENZENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
METHYL ACETATE	5.04 U	5.04 U	5.04 U	4.6 U	NA	4.87 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
METHYL TERT-BUTYL ETHER	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
METHYLENE CHLORIDE	5.04 U	5.04 U	5.04 U	6.81 J	NA	8.6 J	4.73 U	NA	239 U	236 U	4.52 U	265 U
STYRENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
TETRACHLOROETHENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
TOLUENE	2.52 U	2.52 U	2.52 U	1.29 J	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
TOTAL XYLENES	5.04 U	5.04 U	5.04 U	6.9 U	NA	7.31 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
TRANS-1,2-DICHLOROETHENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	2.26 U	132 U
TRICHLOROETHENE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	3940	776	2.26 U	132 U
TRICHLOROFLUOROMETHANE	5.04 U	5.04 U	5.04 U	4.6 U	NA	4.87 U	4.73 U	NA	239 U	236 U	4.52 U	265 U
VINYL CHLORIDE	2.52 U	2.52 U	2.52 U	2.3 U	NA	2.44 U	2.37 U	NA	120 U	118 U	14.3	132 U

APPENDIX N
PHASE 2 RI - SAP ADDENDUM

APPENDIX N
SAMPLING AND ANALYSIS PLAN ADDENDUM
PHASE 2 REMEDIAL INVESTIGATION
SITE 43 – TOLUENE DISPOSAL AREA
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

INTRODUCTION

This Sampling and Analysis Plan (SAP) Addendum has been prepared for the Washington Division of the Naval Facilities Engineering Command (NAVFAC) under Contract Task Order (CTO) 114 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract number N62472-03-D-0057. This document is an addendum to the Final SAP (March 2011) for Site 43 – Toluene Disposal Area at Naval Support Facility (NSF) Indian Head (IH) in Indian Head, Maryland. The purpose of this SAP addendum is to summarize the conclusions from the Phase 1 RI and present the objectives and planned field activities for the Phase 2 RI at Site 43.

PHASE 1 RI OBJECTIVES

The following objectives were presented in the March 2011 RI SAP for Site 43:

1. Historical dumping activities at Site 43 have impacted soil and surficial aquifer groundwater. Risk screening of limited historical analytical data showed Site contaminants could result in an unacceptable level of human health risk. Based on the current conceptual site model (CSM) and consensus of the Team, further characterization of volatile organic compounds (VOCs), energetic/explosives, and metals contamination in soil and groundwater near Building 1040 is needed to refine the CSM and evaluate the need for future corrective action at Site 43. This characterization includes a determination of:
    - Horizontal and vertical extent of explosives-, solvent-, and/or metals-contaminated soils in the Building 1040 source area.
    - Presence of a continuing source of VOC contamination in soils near Building 1040.
    - Extent of the trichloroethane (TCE)-contaminated groundwater near Building 1040.
    - Localized groundwater flow direction near Building 1040

2. Determine if there is potential for a complete VOC vapor intrusion pathway near Building 1040 and if further assessment is needed for vapor intrusion.
3. A baseline human health risk assessment (HHRA) is needed to evaluate human health risks and determine the need for further corrective action.
4. Verification of cobalt detections in groundwater near Building 1041 to assess the need for further investigation and/or evaluation into the source of cobalt in groundwater.

PHASE 1 RI CONCLUSIONS AND RECOMMENDATIONS

The Phase 1 RI included soil sampling, groundwater grab sampling, installing four monitoring wells, groundwater sampling at six monitoring wells, soil gas sampling, and slug testing. During this investigation, groundwater samples were collected and analyzed for VOCs, total and filtered metals, total cyanide, explosives, perchlorate, filtered total organic carbon (TOC), sulfide, anions, alkalinity, and methane, ethane, and ethene. Soil samples were collected and analyzed for VOCs, metals, total cyanide, TOC, explosives, and perchlorate. One shelby tube sample, three grain size samples, one bulk density/effective porosity sample, and three total oxidant demand samples were collected. Outdoor air and three soil gas samples were also collected and analyzed for VOCs. All samples were collected in accordance with the SAP. Samples were sent to an approved laboratory and the analytical results were validated in accordance with current EPA Region 3 functional guidelines (USEPA, 1994).

The Phase 1 RI results were presented in the Interim RI Report and detailed in Section 4. The following conclusions based on the Phase 1 RI results at Site 43:

- Sampling indicated a potential soil source area may exist along the ditch (southside of Schuyler Road) east of the suspected disposal area.
- The extent of groundwater contamination (VOCs, explosives, and metals) near Building 1040 has not been delineated.
- Local groundwater flow near Building 1040 has not been determined.
- A potable water line leak and other site utilities may be influencing local groundwater flow and contaminant migration.
- VOC detections in soil gas (acetone, cis-1,2-dichloroethene, and vinyl chloride) indicate potential concern for vapor intrusion into Building 720.
- The elevated cobalt detection in groundwater at well S43MW02 near Building 1041 was confirmed during the Phase 1 RI sampling.

REVISED CONCEPTUAL SITE MODEL (CSM)

Contaminant Sources

Based on the historical investigations conducted at Site 43, VOCs represent the primary contaminants of concern. It is assumed that the contamination resulted from releases to surface soil during historical dumping of solvents outside of Buildings 1040 and 1041. Metals contamination could have resulted from the cleaning of metal parts with the solvents. Soil data collected during the Phase 1 RI indicated that a potential source may be localized in and along the ditch north and east of Building 1040.

Contaminant Migration Pathways

Contaminant migration pathways potentially affecting current conditions at Site 43 consist of the following:

- Migration of VOCs, energetics, and metals via leaching of soils to groundwater.
- Migration of dissolved VOCs, energetics, and metals in groundwater being influenced by groundwater flow and, if present, by preferential flow pathways.

Following the initial infiltration of the VOCs (dumping and subsequent flushing from precipitation), the VOC transport migration pathway is in accordance with the predominant flow direction of groundwater (assumed to the southeast). The rates of horizontal advective flow in the groundwater system will be evaluated in the RI report. The rate of migration for TCE is affected very little by retardation in the aquifer (retardation coefficients are just over 1), but is significantly affected by natural attenuation mechanisms (degradation, dispersion, dilution, etc.); however, aquifer geochemical conditions at the Site do not support ideal biodegradation of VOCs.

- Migration of VOCs via vaporization / volatilization. VOCs (e.g., TCE) observed in groundwater and/or soil gas may volatilize and migrate through building foundations as vapor into indoor air.

Exposure Pathways

Based on Phase 1 RI results, there is potential for human exposure under current Site conditions, considering the potential vapor intrusion into Building 720. The primary medium at the Site through which future potential residential receptors could be exposed to VOCs is groundwater (which would also be the source of any soil gas/indoor air vapor). Potential exposure routes under a hypothetical future exposure scenario (potable water use of groundwater or during construction) include dermal contact, ingestion, and inhalation, as well as inhalation of indoor air vapor.

Potential Receptors

The potential receptors that may be exposed to contaminated media at Site 43 include Site workers and hypothetical future residents via ingestion, inhalation, or dermal contact with contaminated soils or groundwater. Future Site use is uncertain, but is anticipated to be industrial considering the base mission.

Summary

The vertical and horizontal extent of groundwater contamination has not been delineated and groundwater flow direction has not been determined with the existing monitoring well network at Site 43. A leaking potable water line and other utilities may be affecting groundwater flow and contaminant migration. Groundwater contamination has been detected both east and west of the assumed disposal point and the plume footprint is larger than originally anticipated after the site screening process (SSP) investigations. A suspected source of VOCs in soils along the ditch has been identified, approximately 75 feet east of the assumed disposal point. Site lithological data suggests a basal clay unit (at approximately 30 to 35 ft bgs) across the study area, likely prevents downward migration of VOCs into lower aquifers. VOCs appear to have limited migration at the Site, but further investigation is needed to define extent. There are no current receptors or exposure routes, except for the potential vapor intrusion pathway.

PHASE 2 RI SCOPE AND SAMPLING

Based on the conclusions and results of the Phase 1 RI, further investigation is required to determine nature and extent of contamination at Site 43. To address the data gaps observed in the Phase 1 RI, the following are the recommendations for the Phase 2 RI at Site 43:

- Determine the impact of site utilities on groundwater flow and contaminant migration.
- Investigate potential soil source area along the ditch, east of the assumed disposal area.
- Delineate groundwater contamination near Building 1040.
- Determine local groundwater flow direction in both portions of Site 43 (Building 1040 and 1041).
- Further evaluate potential vapor intrusion into Building 720 (indoor air sampling).
- Further investigate cobalt in groundwater near Building 1041.

This SAP Addendum presents the proposed additional sampling that addresses these recommendations for the Phase 2 RI at Site 43. All sampling will be conducted in accordance with the original SAP, including methods, procedures, standard operating procedures (SOPs), comparison criteria, and laboratory analytical methods.

The following work will be conducted during the Phase 2 investigation:

- Utility mapping and research.
- Six soil borings.
- Up to 16 temporary well/groundwater grab locations (two groundwater samples at each location).
- Up to ten new monitoring wells.
- Two indoor air samples in Building 720.

The attached Table 1 presents the sampling design and rationale for the Phase 2 RI field activities. Please refer to the original SAP for all table references, procedures, and SOPs.

SOIL BORINGS

Six soil borings will be advanced via direct-push technology (DPT) methods in the ditch near Building 1040. Each soil boring will be advanced to a depth of approximately 10 feet bgs to the watertable. Lithology will be logged and two soil samples will be collected in the vadose zone at each location (Figure 1). Soil samples are being collected to assess potential soil contamination along the ditch. Soil samples will be analyzed for VOCs, energetics, and inorganics. Table 2 presents the proposed sampling and analytical parameters for each sample.

GROUNDWATER GRAB SAMPLING

Up to 16 temporary well locations will be advanced via DPT drilling methods during this additional investigation to further delineate groundwater contamination observed near Building 1040. Two groundwater grab samples will be collected from each temporary well location and analyzed for VOCs on an expedited turnaround time (48 hours). Due to the weekend work only at Site 43, a modified triad approach will be used and results of the groundwater samples will be evaluated weekly to determine if and where additional temporary well locations are needed to delineate VOCs in groundwater near Building 1040. Permanent monitoring well locations will be placed based on the groundwater grab results.

MONITORING WELL INSTALLATION

Up to ten additional monitoring wells will be installed via hollow-stem auger (HSA) drilling methods during the Phase 2 RI. Six monitoring wells will be installed in the northern portion of the site near Building 1040 and four monitoring wells will be installed near well S43MW02 and

Building 1041. Each monitoring well will be installed as perimeter type wells and placement will be based on the groundwater grab results. Table 2 provides a summary of the monitoring well sampling anticipated for the Phase 2 RI.

Soil cuttings, purge water, and decontamination fluids generated from the soil boring, temporary well, and monitoring well installations will be containerized in 55-gallon drums, sampled, and managed as investigation derived waste (IDW).

INDOOR AIR SAMPLING

Two indoor air samples will be collected in Building 720 to evaluate vapor intrusion at Site 43. One outdoor air sample will be collected upwind of Building 720 to evaluate ambient air conditions and potential influence on indoor air. Air samples will be analyzed for VOCs via EPA method TO-15. Table 3 presents the Site-specific compound list for air sampling. This list includes the compounds of concern detected in soil, soil gas, and groundwater during the Phase 1 RI in 2011.

The Phase 2 RI sampling results will be combined with historical data and used to complete the RI for Site 43 and support the FS.

TABLE 1
SAMPLING DESIGN AND RATIONALE
PHASE 2 REMEDIAL INVESTIGATION
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Location	Matrix	Depth of Samples	Analysis [1]	Method	Number of Samples	Rationale	Sampling Strategy
Building 1041	Monitoring well groundwater	Up to 4 new monitoring wells at approximately 9-19 ft bgs	TCE, cobalt	See **WS #19, Final March 2011 UFP-SAP**	5	Samples will be collected from MW02 and up to four new wells to evaluate concentrations of Site-related contaminants only (TCE and cobalt).	See **WSs #11** and **14, Final March 2011 UFP-SAP**
Building 1040	Soil	Sample just below ditch (0-1 ft bgs)	VOCs, Metals, Energetics		6	Samples will be collected to evaluate potential contaminant sources in soil. Soil data will be used in the baseline HHRA to evaluate potential risks. Soil samples are located in the ditch from the assumed disposal point and downgradient of the assumed source area.	
		Sample just above water table (~8 ft bgs)	VOCs, Metals, Energetics		6	Samples will be collected to evaluate potential source areas in soil. Soil data will be used in the baseline HHRA to evaluate potential risks. Soil samples are located in the ditch from the assumed disposal point and down length of ditch to other side of culvert.	
	DPT Temporary Well/Grab Groundwater	Approximately 15-25 ft bgs and approximately 30-35 ft bgs (Actual depths TBD)	VOCs Only (Quick Turn)		Up to 32	Samples will be collected to define the extent of groundwater contamination. Weekly quick turn samples (weekend work only at Site 43) will determine step out locations and subsequent monitoring well placement.	
	Monitoring well groundwater	Up to six additional wells to-be-installed approximately 20-35 ft bgs	VOCs, Metals (total and dissolved), Energetics		11	Samples will be collected from monitoring wells to bound the VOC plume. Data will be used in the baseline HHRA and to characterize the Site.	
	Indoor Air	Samples will be collected inside Building 720	VOCs		2	Samples will be collected to evaluate the potential vapor intrusion pathway into Building 720.	

Note: The sampling design presented in the table above includes the collection of soil, groundwater, and indoor air samples needed to further characterize Site 43. The sampling will provide the data needed to evaluate risks to human health, vapor intrusion into Building 720, and support the FS. This table is an update to Worksheet #17 from the UFP-SAP (March 2011) and please refer to SAP for all references to Worksheet #'s and .

1. Groundwater "Metals" Analytical Group samples will include both field-filtered (dissolved metals) and non-field-filtered (total metals) samples. VOCs for all media include 1,4-Dioxane. The "Energetics" Analytical Group for groundwater and soil includes nitroaromatics, nitrocellulose, nitroguanidine, and nitroglycerin.

TABLE 2
SAMPLE SUMMARY
PHASE 2 REMEDIAL INVESTIGATION
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

Sampling Location / ID Number [1]	Depth	Analytical Group	Number of Samples (identify field duplicates [2])	Sampling SOP Reference [3]
SOIL SAMPLES [4]				
SB23 / S43SB023*TDBD*	Above the water table	VOCs, Metals, Energetics	2 (plus 1 duplicate)	GH-1.5, SA-1.3, SA-2.5
SB24 / S43SB024*TDBD*	Above the water table	VOCs, Metals, Energetics	2	GH-1.5, SA-1.3, SA-2.5
SB25 / S43SB025*TDBD*	Above the water table	VOCs, Metals, Energetics	2	GH-1.5, SA-1.3, SA-2.5
SB26 / S43SB026*TDBD*	Above the water table	VOCs, Metals, Energetics	2	GH-1.5, SA-1.3, SA-2.5
SB27 / S43SB027*TDBD*	Above the water table	VOCs, Metals, Energetics	2 (plus 1 duplicate)	GH-1.5, SA-1.3, SA-2.5
SB28 / S43SB028*TDBD*	Above the water table	VOCs, Metals, Energetics	2	GH-1.5, SA-1.3, SA-2.5
DPT GRAB GROUNDWATER SAMPLES [6]				
TW13 / S43TW013*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2 (plus 1 duplicate)	SA-1.1, SA-2.5
TW14 / S43TW014*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2	SA-1.1, SA-2.5
TW15 / S43TW015*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2	SA-1.1, SA-2.5
TW16 / S43TW016*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2	SA-1.1, SA-2.5
TW17 / S43TW017*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2	SA-1.1, SA-2.5
TW18 / S43TW018*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2 (plus 1 duplicate)	SA-1.1, SA-2.5
TW19 / S43TW019*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2	SA-1.1, SA-2.5
TW20 / S43TW020*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2	SA-1.1, SA-2.5
TW21 / S43TW021*TDBD*	Shallow and on top of basal unit . ~10-20 ft bgs and ~30-35 ft bgs.	VOCs Only (Quick Turn)	2	SA-1.1, SA-2.5
MONITORING WELL GROUNDWATER SAMPLES [6]				
MW01 / S43MW00104	9-19 ft bgs	VOCs, Metals (Total and Dissolved), Energetics	1 (plus 1 duplicate)	SA-1.1
MW02 / S43MW00204	12-22 ft bgs	TCE, Cobalt (Total and Dissolved)	1	SA-1.1
MW03 / S43MW00302	24-34 ft bgs	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW04 / S43MW00402	23-33 ft bgs	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW05 / S43MW00502	21-31 ft bgs	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW06 / S43MW00602	17-27 ft bgs	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW07 / S43MW00701	TBD	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW08 / S43MW00801	TBD	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW09 / S43MW00901	TBD	VOCs, Metals (Total and Dissolved), Energetics	1 (plus 1 duplicate)	SA-1.1
MW10 / S43MW01001	TBD	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW11 / S43MW01101	TBD	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW12 / S43MW01201	TBD	VOCs, Metals (Total and Dissolved), Energetics	1	SA-1.1
MW13 / S43MW01301	TBD	TCE, Cobalt (Total and Dissolved), Wet Chemistry	1	SA-1.1
MW14 / S43MW01401	TBD	TCE, Cobalt (Total and Dissolved)	1	SA-1.1
MW15 / S43MW01501	TBD	TCE, Cobalt (Total and Dissolved)	1	SA-1.1
MW16 / S43MW01601	TBD	TCE, Cobalt (Total and Dissolved), Wet Chemistry	1	SA-1.1

TABLE 2
SAMPLE SUMMARY
PHASE 2 REMEDIAL INVESTIGATION
SITE 43 - TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

AIR SAMPLES				
IND01 / S43IND01	Building 720.	VOCs	1 (plus 1 duplicate)	SA-2.4
IND02 / S43IND02	Building 720.	VOCs	1	SA-2.4
ODA02 / S43SG03*TDBD*	Upgradient of Building 720 (ambient air).	VOCs	1	SA-2.4

Note: This table is a supplement to Worksheet #18 from the Final Sampling and Analysis Plan (SAP) (March 2011) and please see original SAP for all standard operating procedures (SOP) and analytical references.

1. Refer to SOP CT-04 for sample numbering system.
2. Field duplicate locations may change in the field based sampling order and samples per day. Duplicate samples will have "-D" added to the parent sample ID (this is a deviation from Facility SOP CT-04).
3. Facility SOPs are provided in Appendix D of the NSF-IH Master SAP.
4. "TDBD" refers to the two-digit top depth and two-digit bottom depth from which the soil sample is collected. Samples will be collected just above the water table (determined in the field).
5. Groundwater samples from monitoring wells MW01 and MW02 are being collected for the fourth time (Round 4), MW03 to MW06 will be sampled for the second time (Round 2), while the to-be-installed monitoring wells will be collected for the first time (Round 1). Groundwater "Metals" Analytical Group samples will include both field-filtered (dissolved metals) and non-field-filtered (total metals) samples. For groundwater grab sample IDs, the "TDBD" refers to the two-digit top depth and two-digit bottom depth of the screened interval from which the sample is collected.
6. Energetics for groundwater and soil include nitroaromatics, nitrocellulose, nitroguanidine, and nitroglycerin.

TBD : To be determined
VOC : volatile organic compounds
TCE : trichloroethane

TABLE 3
INDOOR AIR ANALYTE LIST (TO-15)
PHASE 2 REMEDIAL INVESTIGATION
SITE 43 TOLUENE DISPOSAL AREA
NSF INDIAN HEAD, MARYLAND

ACETONE
BENZENE
BROMOFORM
2-BUTANONE
2-HEXANONE
CARBON DISULFIDE
CARBON TETRACHLORIDE
CHLOROETHANE
CHLOROMETHANE
CIS-1,2-DICHLOROETHENE
TRANS-1,2-DICHLOROETHANE
CHLOROFORM
1,1-DICHLOROETHANE
1,1-DICHLOROETHENE
1,2-DICHLOROETHANE
1,4-DIOXANE
ETHYL BENZENE
FREON 11
FREON 12
METHYLENE CHLORIDE
METHYL TERT-BUTYL ETHER
4-METHYL-2-PENTANONE
TETRACHLOROETHENE
TOLUENE
1,1,1-TRICHLOROETHANE
TRICHLOROETHENE
VINYL CHLORIDE

Note:

1. Analyte list of Compounds of Potential Concern for vapor intrusion include all detected volatile organic compounds in soil, groundwater, and soil gas during SSP and Phase 1 RI sampling

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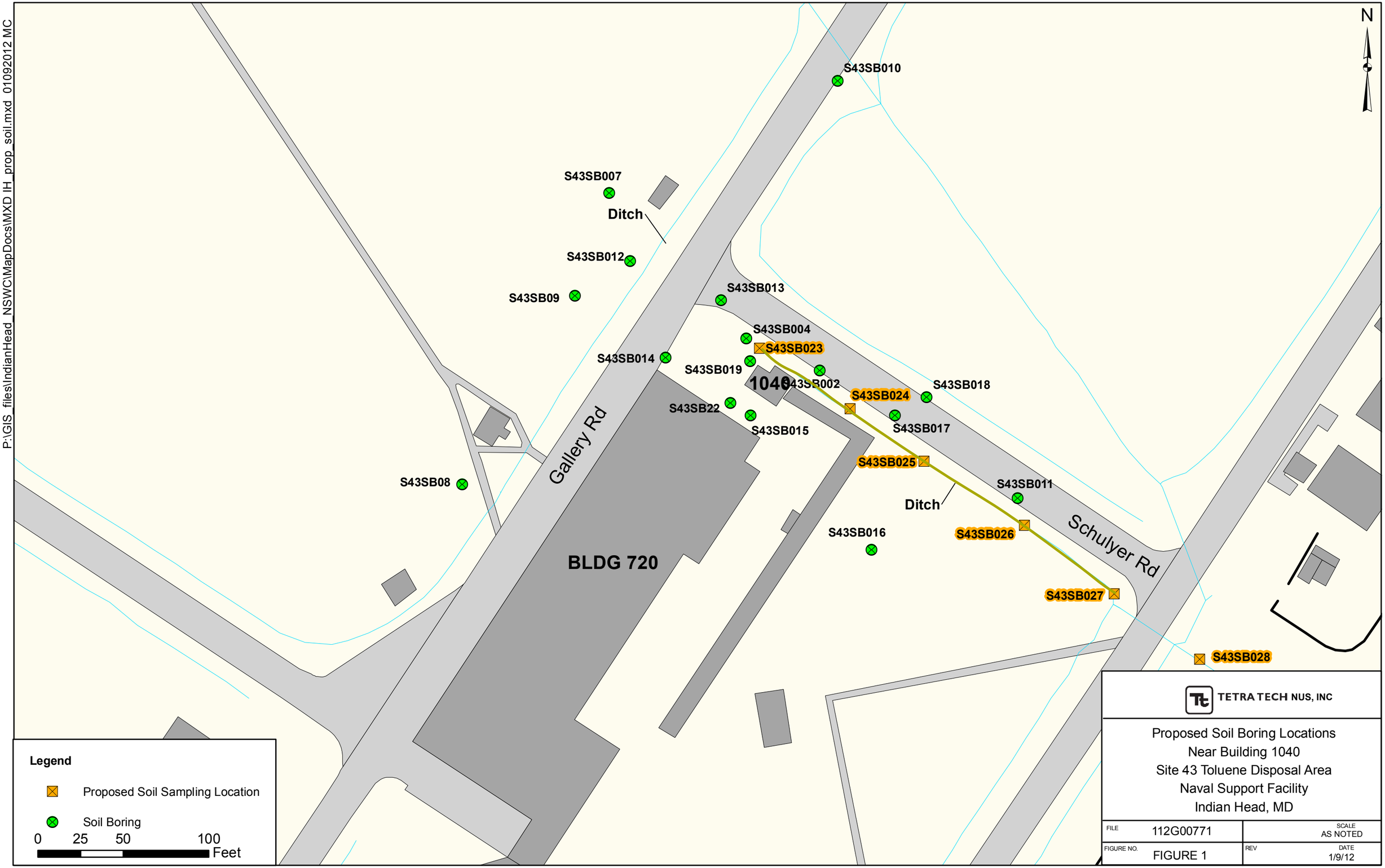

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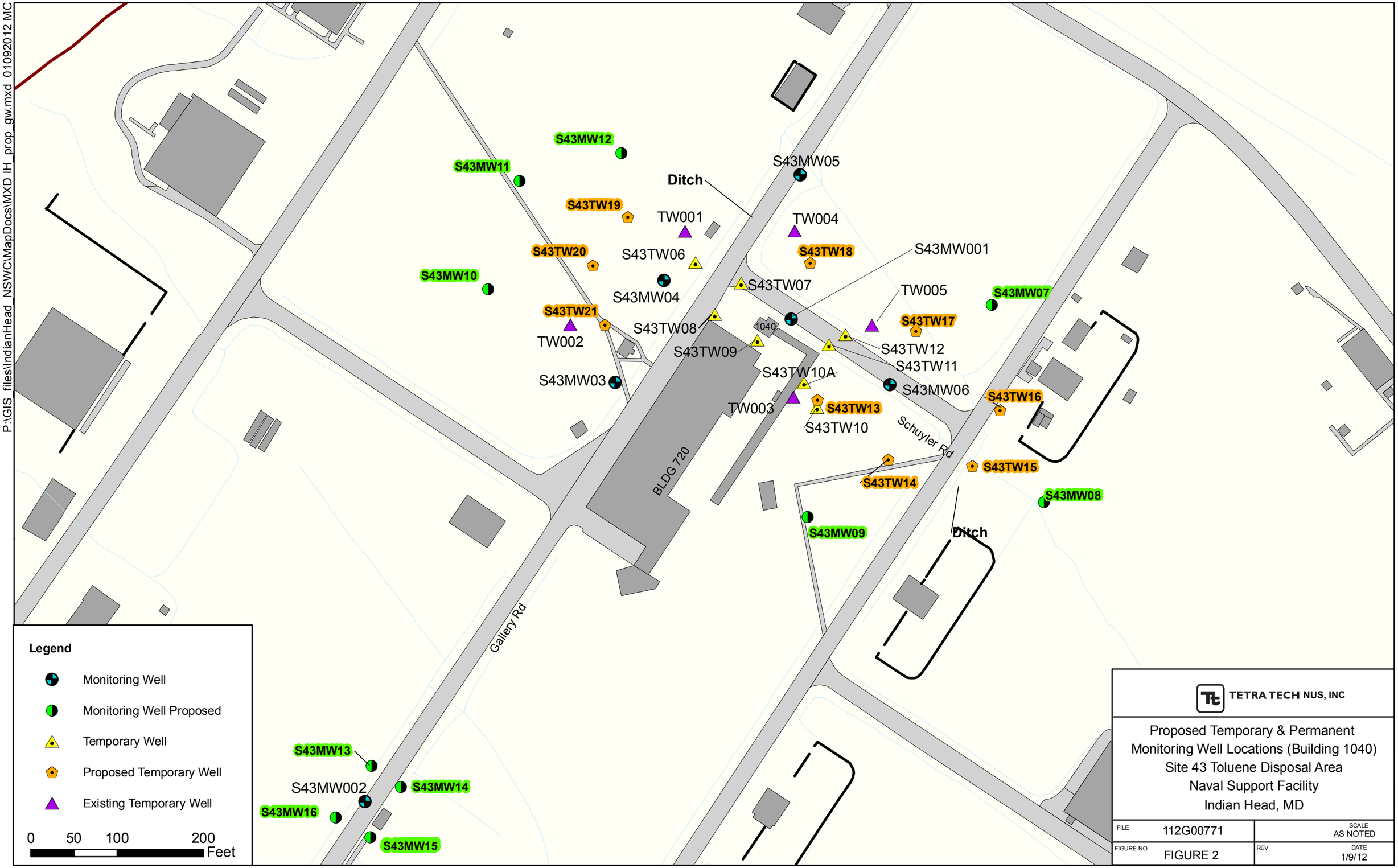

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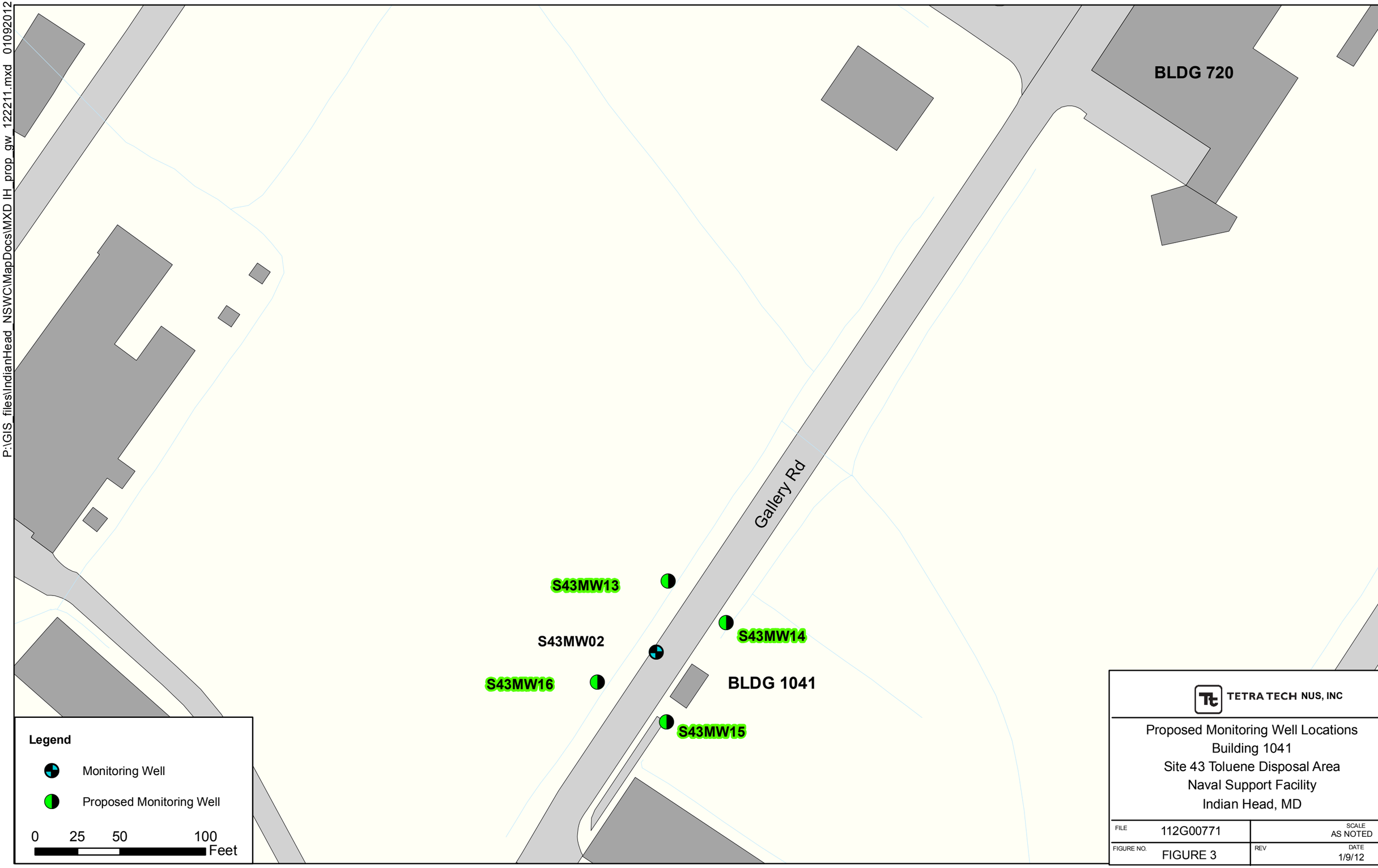

TETRA TECH NUS, INC

Proposed Monitoring Well Locations
Building 1041
Site 43 Toluene Disposal Area
Naval Support Facility
Indian Head, MD

FILE	112G00771	SCALE	AS NOTED
FIGURE NO.	FIGURE 3	REV	DATE 1/9/12