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RAPID ASSESSMENT REPORT FOR SITE 21 BUILDING 241 ZONE F CNC CHARLESTON SC

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TETRA TECH

Rapid Assessment Report for Site 21, Building 241

Zone F
Charleston Naval Complex
North Charleston, South Carolina

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0097

January, 2000

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RAPID ASSESSMENT REPORT
FOR
SITE 21, BUILDING 241

ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
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North Charleston, South Carolina 29406

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CERTIFICATION PAGE

I certify that the information contained in this report and on any attachments is true, accurate, and complete to the best of my knowledge, information, and belief.

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EXECUTIVE SUMMARY

Tetra Tech NUS, Inc. (TtNUS) has completed a Rapid Assessment (RA) for Site 21 which formerly contained an underground storage tank (UST) system that supported Building 241 at the Charleston Naval Complex (CNC) Zone F, in North Charleston, South Carolina. The UST (UST 02-241-000 or UST 241), a 6,000-gallon fiberglass constructed tank was used to store #2 fuel oil for use at Building 241. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control's (SCDHEC's) Rapid Assessment Plan and approval letter dated November 4, 1998.

TtNUS performed the following actions during this assessment:

- Reviewed available Navy documents to identify potential sources and receptors for petroleum hydrocarbons in the vicinity, to evaluate public and private potable wells, to locate utilities line areas, to locate nearby surface water bodies, and to determine surface hydrology and drainage;
- Reviewed the previously prepared Underground Storage Tank Assessment Report for UST 241 to determine boring locations and monitoring well placements;
- Conducted a site survey to identify utilities and to construct a site plan;
- Performed direct push technology (DPT) investigation; field screened 20 soil samples for organic vapors using an organic vapor analyzer equipped with a flame ionization detector;
- Collected soil samples from 26 DPT borings for mobile lab screening analysis for benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, and diesel range organics (DRO) using U.S. Environmental Protection Agency (USEPA) Method 8020/8015M;
- Collected groundwater samples from 26 DPT borings for mobile lab screening analysis for BTEX, naphthalene, and DRO using USEPA Method 8020/8015M;
- Installed three temporary piezometers in selected soil borings using DPT equipment to determine the relative groundwater flow direction;
- Installed seven shallow permanent monitoring wells to depths of approximately 10 to 14 feet below land surface (bls) and one deep, vertical delineation monitoring well to a depth of approximately 33.5 feet bls;
- Collected nine soil samples (including one duplicate sample) for fixed-base laboratory analysis for BTEX and naphthalene using USEPA Method 8260, and polynuclear aromatic hydrocarbons (PAHs) using USEPA Method 8270,

- Collected one soil sample for fixed-base laboratory analysis for total organic carbon (TOC) using USEPA Method 9060, total recoverable petroleum hydrocarbon (TRPH) using USEPA Method 9071A, and grain size analysis using American Society of Testing and Materials (ASTM) Method C-117 and C-136;
- Collected groundwater samples from the eight permanent monitoring wells (including one duplicate sample) for fixed-base laboratory analysis for BTEX, methyl tertiary butyl ether (MTBE), ethylene dibromide (EDB or 1,2-dibromoethane), and naphthalene using USEPA Method 8260, PAHs using USEPA Method 8270; and
- Surveyed the top of casing elevations for each monitoring well, with the exception of well CNC21M-08, and collected depth to groundwater measurements to confirm the groundwater flow direction.

Conclusion

On August 8, 1999, and October 13, 1999, depth to groundwater measurements were recorded from the site monitoring wells. Depth to groundwater measurements were not recorded in well CNC21M-08 during the August 1999 event. Based on the calculated water table elevations from each well, the primary groundwater flow direction at the site is to the east-northeast, towards the Cooper River. No free product was detected in any temporary or permanent monitoring well at the site during this assessment.

On June 23 and August 18, 1999, nine soil samples (including one duplicate) were collected and analyzed at a fixed base laboratory for BTEX, naphthalene, and PAHs. Naphthalene was detected in six soil samples at concentrations exceeding its RBSL. Chrysene, a PAH compound, was detected in one soil samples at a concentration exceeding it's RBSL. No other constituents analyzed were detected at concentrations exceeding their respective RBSLs.

On August 16 and 22, 1999, and on September 8, 1999, nine groundwater samples (including one duplicate) were collected from the permanent wells for fixed-base laboratory analysis for BTEX, MTBE, EDB, naphthalene, and PAHs. Naphthalene was detected in only one groundwater sample at a concentration exceeding it's RBSL. No other constituents analyzed were detected in the groundwater samples, including the deep, vertical delineation well.

The vertical and horizontal extent of petroleum hydrocarbon impact to soil and groundwater in the vicinity of the former UST system at Building 241 has been delineated.

The Site Conceptual Model identified two possible future receptors: a construction worker in a utility trench and the Cooper River. Pathways for the construction worker include (1) possibly

ingesting, having dermal contact with, or inhaling volatilized vapors from the groundwater in the utility trench and (2) possibly ingesting or having dermal contact with soil within the trench. The pathway for the Cooper River is groundwater migration to the river from the site.

Based on the commercial worker RBSLs, a construction worker contacting or accidentally ingesting soil while working below grade on utility lines adjacent the Site 21 may be at risk to exposure from dibenzo(a,h)anthracene, benzo(a)anthracene, and benzo(b)fluoranthene. The minimum RBSL for naphthalene is greater than the greatest onsite concentration of naphthalene detected in site groundwater. Therefore, a construction worker exposed to groundwater in a utility trench contaminated by the release at the site is not at risk from naphthalene exposure.

The soil leaching SSTL calculated for the CoCs were all above the maximum concentration found in soil borings onsite. Therefore, benzene, naphthalene, and chrysene leaching from the soil to the groundwater are not a risk to a construction worker in a utility trench exposed to groundwater. The current concentration of naphthalene in groundwater at monitoring well CNC21-M01 is below the calculated SSTL for affecting the Cooper River. Therefore, the Cooper River is not at risk because of the naphthalene concentrations in groundwater at the site.

The maximum concentrations found onsite for benzene, naphthalene, and chrysene do not exceed their respective SSTLs, and therefore, do not pose a threat to the identified receptors at the site. However, the maximum concentrations for benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene do exceed (by approximately 10%) their respective SSTLs, and therefore, may pose a threat to a construction worker in a utility trench exposed to groundwater or soil.

Recommendation

The concentrations for benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h) anthracene in the soil exceed the their respective SSTLs for dermal contact. Based on the results of the Tier 2 evaluation, the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases* (RBCA guidance), 1998, indicate that an active corrective action should be recommended. However, the maximum source concentrations of the aforementioned CoCs detected in soils slightly exceed the calculated SSTLs. As a result, intrinsic corrective action/remediation is a more appropriate decision option for this site. Therefore, Tetra Tech NUS, Inc. recommends that an Intrinsic Corrective Action Plan be prepared for this site.

1.0 INTRODUCTION

Site 21 contains a closed underground storage tank (UST) system located adjacent to Building 241 at the Charleston Naval Complex (CNC), Zone F in Charleston, South Carolina. This Rapid Assessment (RA) was performed by Tetra Tech NUS, Inc.'s (TtNUS's) Tallahassee, Florida, office, located at 1401 Oven Park Drive, Suite 102, Tallahassee, Florida 32312 (telephone number 850-385-9899) on behalf of the U.S. Navy Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC), 2155 Eagle Drive, North Charleston, South Carolina (telephone number 843-820-7307). Authorization to conduct the RA for the site was issued by NAVFAC under Contract Task Order (CTO) 0097. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control's (SCDHEC's) Rapid Assessment Plan approval letter dated November 4, 1998. Fieldwork necessary to complete the RA was performed from June to October 1999, and was interrupted twice during this period due to approaching hurricanes (Dennis and Floyd.)

1.1 SITE DESCRIPTION

The CNC is in the city of North Charleston, on the west bank of the Cooper River in Charleston County, South Carolina, as shown on Figure 1. This installation consists of two major areas: an undeveloped dredge materials area on the east bank of the Cooper River on Daniel Island in Berkley County, and a developed area on the west bank of the Cooper River. The developed portion of the base is on the peninsula bound on the west by the Ashley River and on the east by the Cooper River. The site is located within the developed portion of the base as shown on Figure 1.

The area surrounding CNC is "mature urban," having long been developed with commercial, industrial, and residential land use. Commercial areas are primarily west of CNC; industrial areas are primarily to the north of the base along Shipyard Creek. A site vicinity map, which exhibits adjacent properties and structures, vicinity roads, current utilities, and vicinity surface drainage, is included as Figure 2.

Building 241 served as the Charleston Naval Base Crane Shop after construction was completed in 1987 until base closure. UST 02-241-001, a 6,000-gallon fiberglass tank, was used to store #2 fuel oil for Building 241. During the removal of UST 02-241-001 (UST 241), approximately 900 gallons of free product was pumped out of the excavation. The site is situated approximately 800 feet from the Cooper River [Supervisor of Ship Building, Conversion and Repair, United States Navy, Portsmouth, Virginia, Environmental Detachment Charleston (SPORTENDETCHASN), 1998].

1.2 SITE HISTORY

In 1901, the U.S. Navy acquired 2,250 acres near Charleston to build a shipyard and the first naval officer was assigned duty in early 1902. Subsequently, buildings and a dry dock were constructed in the Naval Yard. The dry dock was completed in 1909 along with several other brick buildings and the main power plant, which is still in operation today. The first ship was placed in dry dock and work began on fleet vessels in 1910. World War I brought about an expansion of the yards, facilities, land area, and work force. The yard built two gunboats, several submarine chasers, and tugs in addition to performing repairs and other services to the fleet. In 1933, building activity had increased principally in construction of several Coast Guard tugs, a Coast Guard cutter, and a Navy gunboat, creating the need for more facilities and a much larger work force. In 1943 civilian work force peaked with almost 26,000 employees divided among three daily shifts. In 1956, construction began on piers, barracks, and buildings for mine warfare ships and personnel. Later in the decade, the facility became a major home port for combatant ships and submarines of the U.S. Atlantic Fleet [Ensafe/Allan & Hoshall, Inc. (E/A&H), 1996].

In 1993, major cuts in defense spending, as a result in part to the end of the cold war, caused CNC to be added to the list of bases scheduled for closure under the Defense Base Realignment and Closure Act (BRAC). BRAC regulates the closure and transition of property back to the community (E/A&H, 1996). With the scheduled closure of the base, operations were scaled back and environmental cleanup proceeded to make the property available for redevelopment after closure. As part of the environmental cleanup process, the UST at Building 241 was removed and the tank closure completed on July 22, 1996.

Between July 8 and 22, 1996, UST 241 was removed, cleaned, and disposed of at the local municipal landfill. At the time of the UST removal, no corrosion, pitting, or holes were found in the tank. The UST system piping was constructed of steel and ran from the vault to the building. The piping from the vault to the building was not completely removed during the closure because of the concrete slab, asphalt paving, and the piping's proximity to the building. Instead, the pipeline was excavated at the coupling/joints and subsequently pulled from the ground. It was then laid out and inspected. Areas where holes were found were excavated for further inspection and sampling (SPORTENDETCHASN, 1998). The Underground Storage Tank Closure Assessment Report for UST 241 is included in
Appendix A.

1.3 RECEPTOR SURVEY RESULTS

A survey of the site vicinity was conducted by TtNUS personnel to identify potential receptors for petroleum hydrocarbon contamination. The site vicinity map (Figure 2) depicts the public utilities located

within 250 feet of the former location of UST 241. Specific information concerning the depth of utilities below land surface is currently unavailable. However, according to facility personnel, utility lines are typically located approximately 2 to 6 feet below land surface (bls) (SPORTENVDETCHASN, 1999). The following utility receptors were located:

- Sanitary Sewer, Water Utility: Sanitary sewer lines originate near the southwest corner of Building 241 and extend toward the northwest connecting to a sanitary sewer line which runs between Buildings 241 and 1172. A sanitary sewer line also exits Building 241 on the southeast side, continuing to the south between Buildings 241 and 242. Although Figure 2 does not show a water utility line, this building does have a potable water utility. The exact location of the water utility is not known.

- Compressed Air Utility: A compressed air line runs along the southwestern side of Building 241, intersecting with a line that runs along the northern side of 9th Street.

- Electrical Utility, Gas Utility, Steam Utility: An electrical line cross the north corner of Building 241, intersects with another line, and enters Building 241 at the east corner of the building. An electrical line also runs along the southeastern edge of the building. No gas utility is shown on Figure 2. The field inspection at this site did not identify a gas utility servicing this building. In addition, Figure 2 does not show the aboveground steam line which runs between and parallel to Buildings 241 and 1172, located nearest to Building 1172.

According to the Final RCRA Facility Investigation Report for Zone F (E/A&H, 1996) a survey of groundwater users within a 7-mile radius of CNC was conducted by the South Carolina Water Resources Commission to ascertain the extent of any shallow groundwater usage. Results of the water use investigation revealed that no drinking water wells, which utilize the shallow aquifer, are located within a 4-mile radius of CNC. Irrigation wells were not identified within 1,000 feet of the site. Numerous monitoring wells are located within 1,000 feet of the site. The nearest surface water body to UST 241 is the Cooper River located approximately 800 feet to the east-northeast.

There are no city, county, or state zoning ordinances as the property (CNC) is currently owned by the federal government. Information concerning zoning ordinances was obtained from the SOUTHDIV Remedial Project Manager (Gabriel Magwood) located at 2155 Eagle Drive, North Charleston, South Carolina (telephone number 843-820-7307).

1.4 REGIONAL GEOLOGY AND HYDROGEOLOGY

CNC is located in Charleston County, South Carolina, in the Lower South Carolina Coastal Plain Physiographic Province on the Cooper River side of the Charleston Peninsula. The peninsula is formed by the confluence of the Cooper and Ashley Rivers. Topography in the area is typical of the South Carolina lower coastal plain and is characterized by having low-relief plains broken by the meandering streams and rivers, flowing toward the coast past occasional marine terrace escarpments (E/A&H, 1996).

The geology of the Charleston area is typical of the southern Atlantic Coastal Plain. Cretaceous-age and younger sediments thicken seaward and are underlain by older igneous and metamorphic basement rock. Surface exposures consist of recent or Pleistocene sands, silts, and clays of high organic content referred to as the Wando Formation (E/A&H, 1996). Underlying the Wando Formation, increasing with age, are the Oligocene-age Cooper Group and the Eocene–age Santee Limestone. The Cooper Group is comprised of the Ashley, Parker's Ferry, and Harleyville Formations. The formation of particular importance in the Cooper Group is the Ashley Formation, which was formerly referred to as the Cooper Marl in most regional geologic literature. In more recent geologic nomenclature, the name "Cooper" has been given to a group of formations including the Ashley Formation, a pale green to olive-brown, sandy phosphoric limestone or marl, which is locally muddy and/or sandy. The Ashley Formation in the vicinity of Charleston is encountered at depths of approximately 30 to 70 feet bls. The top of the Ashley Formation has been reported to be associated with an erosional basin and the entire Cooper Unit, including the Ashley Formation, is indicated to be approximately 300 feet thick (E/A&H, 1996).

Groundwater within the recent or Pleistocene deposits overlying the Ashley Formation of the Cooper Group occurs under unconfined and poorly confined conditions. Transmissivity in the Pleistocene aquifer is generally less than 1,000 feet per day and well yields are variable, ranging from 0 to 200 gallons per minute (gpm). This groundwater contains high concentrations of iron and is commonly acidic at shallow depths (E/A&H, 1996).

The Cooper Group is hydrogeologically significant mainly because of its low permeability. In most locales, its sandy, finely granular limestone produces little or no water, but instead acts as confining material causing artesian conditions in the underlying Santee Limestone. Yields from wells in the Santee are usually less than 300 gpm (E/A&H, 1996).

2.0 ASSESSMENT INFORMATION

2.1 SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

2.1.1 Site Geology

Twenty-six direct push soil borings (CNC21-B01 through CNC21-B26) were advanced at Site 21 under the supervision of a TtNUS geologist between June 3 and July 23, 1999 (Figure 3). These borings ranged in depth from 8 to 16 feet bls and provided soil samples to characterize the subsurface lithology. From July 12 through August 5, seven shallow monitoring wells (CNC21-MW01 through CNC21-MW06, and CNC21-MW08) were installed to depths of 10 to 14 feet bls (Figure 3). During installation, grab soil samples were collected to describe the subsurface lithology. On July 14 and August 3, 1999, a vertical delineation monitoring well (CNC21-MW07D) was installed. During the drilling process, lithologic samples were collected using split-spoon samplers to characterize the subsurface lithology from 20 feet to 33 feet bls.

From 5 to 20 feet, the soil consisted of grey silty sand with mixed gravel. Based on lithologic descriptions from the soil borings and monitoring wells, the subsurface soil generally consists of green silty clay from 20 to 33 feet bls (see Figures 4, 5, and 6). Boring logs and monitoring well construction logs are presented in Appendix B.

2.1.2 Site Hydrogeology

Three temporary PVC piezometers, CNC21-P01 through CNC21-P03 were installed at the site (Figure 3). The piezometers were constructed of 1.25-inch diameter Schedule 40 PVC threaded casing and well screen. The screen sections of the piezometers were installed to bracket the water table. The piezometers were completed with a 10-foot screen section installed from 6 to 16 feet bls. The piezometers were used to inspect the groundwater for the presence of free product and to provide data used to determine the relative groundwater flow direction at the site.

Seven shallow monitoring wells, CNC21-MW01 through CNC21-MW06, and CNC21-MW08 and one deep vertical delineation monitoring well, CNC21-MW07D, were installed as part of this RA investigation (Figure 3). The shallow monitoring wells were completed to depths of 10 to 14 feet bls. Each shallow monitoring well, with the exception of CNC21-MW08, was completed using 10 feet of 0.01-inch machine-

slotted Schedule 40 polyvinyl chloride (PVC) screen that bracketed the water table. Monitoring well CNC21-MW08 was installed using the DPT rig and was completed using 1.25-inch diameter Schedule 40 polyvinyl chloride (PVC) riser and a 1.25-inch diameter by 10 feet of 0.01-inch machine-slotted Schedule 40 PVC screen that bracketed the water table. Monitoring well CNC21-M07D was completed as a Type III monitoring well with 6-inch-diameter PVC surface casing grouted to a depth of 25 feet bls. After the grout for the surface casing cured for 24 hours, the borehole was advanced to a depth of approximately 33.5 feet and a 2-inch-diameter PVC monitoring well was installed with a 5-foot, 0.01-inch machine-slotted PVC screen. Well construction logs for the RA monitoring wells are presented in Appendix B. At the completion of the well installation activities, each monitoring well location and the top of casing elevation was surveyed by a South Carolina Registered Professional Surveyor.

Groundwater in shallow wells at Site 21 was encountered at depths ranging from approximately 2.9 to 6.7 feet bls during the RA investigation. The recorded water-level data collected during the RA are presented in Table 1. Groundwater elevation measurements were recorded from the site monitoring wells on August 8, 1999, and October 13, 1999. Figure 7 presents the groundwater potentiometric surface measurements recorded on August 8, 1999, and Figure 8 presents the groundwater potentiometric surface measurements recorded on October 13, 1999. The potentiometric surface maps depict a groundwater flow direction to the east-northeast, towards the Cooper River.

As part of the Final RCRA Facility Investigation Report for Zone E (E/A&H, 1996), a tidal influence investigation was conducted. The objective of the investigation was to provide long-term water level monitoring to determine the effects of the tidal fluctuation on wells and groundwater flow throughout Zone E. Zone E is located immediately adjacent to and north-northwest of Zone F. During the tidal study, water levels were recorded in 15 wells throughout Zone E over a period of 4 days. Measurements were recorded every hour using data loggers. The 2-day period spanned four high and four low tides.

Results of the tidal survey identified fluctuations in shallow monitoring wells ranged from 1 foot to 4 feet. Monitoring wells located closer to the tidal source were influenced more by tidal changes than wells on the peninsula. The heterogeneity of the aquifer material may limit or accentuate the tidal response in some wells. The report concluded that the minimal fluctuations in the groundwater levels were not expected to play a significant role in contaminant transport in any direction other than that determined by the natural groundwater gradient (E/A&H, 1996).

2.2 ASSESSMENT RESULTS

Twenty-six soil borings (CNC21-B01 through CNC21-B26) were completed as part of the screening portion of the soil investigation at Site 21. Eight soil borings were completed to collect confirmation soil samples for analysis at a fixed base laboratory to confirm the Chemicals of Concern (CoC). The soil borings for screening evaluation were completed using a DPT rig. Samples were collected to evaluate subsurface soil vapors, soil contaminant concentration (via a mobile laboratory), and groundwater contaminant concentrations (via a mobile laboratory). The soil samples analyzed in the mobile laboratory were collected from a maximum depth of 10 feet bls. The soil and groundwater samples collected for mobile laboratory screening were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), naphthalene, and diesel range organics (DRO).

On June 23 and August 18, 1999, soil samples for CoC evaluation were collected and analyzed at a fixed base laboratory These soil samples were analyzed for BTEX and naphthalene using U.S. Environmental Protection Agency (USEPA) Method 8260 and polynuclear aromatic hydrocarbons (PAHs) using USEPA Method 8270. One sample was collected for total organic carbon (TOC) analysis using USEPA Method 415.1, total recoverable petroleum hydrocarbons (TRPH) using USEPA Method 9071, and grain size analysis using sieve and hydrometer analysis. The sample collection was conducted in accordance with the SCDHEC guidance document "Standard Limited Assessment" (June 1997). Lithologic logs for each soil boring are presented in Appendix B. The soil boring locations are shown on Figure 3, and the soil vapor assessment results are presented in Section 2.3.1.

Groundwater samples were collected from the permanent wells on August 16 and 22, 1999, and on September 8, 1999. Groundwater sampling was conducted using a peristaltic pump and low flow, quiescent techniques. The monitoring wells were sampled in accordance with SCDHEC's guidance document "South Carolina Risk-Based Corrective Action for Petroleum Releases" (January 1998). Each well was purged of three to six well volumes or until water quality parameters of pH, temperature, and specific conductivity stabilized. The field data sheets are included in Appendix C. A summary of the field parameter measurements is presented in Table 2.

Groundwater samples were analyzed for BTEX, methyl tertiary butyl ether (MTBE), ethylene dibromide (EDB or 1,2-dibromoethane), and naphthalene using USEPA Method 8260 and PAHs using USEPA Method 8270. Three of the groundwater samples (CNC21M-01, CNC21M-04, and CNC21M-06) were also analyzed for the following natural attenuation parameters: dissolved oxygen, alkalinity, carbon dioxide, manganese, ferrous iron, sulfide, nitrogen/nitrate, sulfate and methane. Nitrogen/nitrate, sulfate

and methane were analyzed in a fixed base laboratory, and the remaining natural attenuation parameters were analyzed in the field at the time of sample collection. Groundwater natural attenuation field data are summarized in Table 3.

2.3 FIELD SCREENING ASSESSMENT

2.3.1 Soil Vapor Assessment

Twenty-six soil borings were completed to evaluate soil vapors as part of the soil screening assessment at Site 21. Total organic vapor headspace concentrations were measured from soil samples using a flame ionization detector (FID). The measurements were recorded periodically from land surface to the termination depth of each boring. Each boring was terminated once the water table was encountered. Due to some equipment malfunctions during this assessment, organic vapors were not measured in six of the borings. Table 4 summarizes the soil vapor screening results. Figure 3 presents the soil boring locations.

Soil vapor concentrations ranged from non-detect to 5,000 parts per million (ppm). The highest vapor concentration was detected in soil boring CNC21-B04 at the 10-foot depth interval. The highest concentration of vapors detected in soil from the remaining sample locations did not exceed 310 ppm. Due to equipment malfunctions, organic vapor concentrations were not measured in soil borings CNC26-B17 and CNC26-B22 through CNC26-B26. The soil vapor assessment was used as a screening method to assist in identifying locations for the collection of soil samples and groundwater monitoring wells.

2.3.2 Soil Mobile Laboratory Results

One soil sample collected from each soil boring was analyzed in a mobile laboratory for BTEX, naphthalene and DRO using USEPA Method 8020/8015M. The soil samples were selected based on the soil vapor screening results with the additional criteria that the samples originate in the vadose zone, above the water table. Table 5 presents a summary of the soil analytical data from the mobile laboratory.

As shown in Table 5, none of the constituents analyzed were detected in 19 of the 26 soil samples collected. No benzene concentrations were detected in the seven soil samples in which petroleum hydrocarbon constituents were detected. Toluene was detected in only one soil sample, CNC21-B04, at the 4-5 feet depth interval at an estimated concentration of 58.6 micrograms per kilogram (µg/kg). Ethylbenzene was detected in four soil samples at concentrations ranging from 30.6 µg/kg to 467 µg/kg with the highest concentration detected in soil boring CNC21-B04 at the 4-5 ft. depth interval. Total

xylenes were detected in six soil samples at concentrations ranging from 122 µg/kg to 1,247(E) µg/kg with the highest concentration detected in soil boring CNC21-B04 at the 4-5 ft. depth interval. The (E) indicates that the concentration of 1,247 µg/kg is an estimated value because this concentration exceeded the upper calibration range for the mobile laboratory instrument. Naphthalene was detected in seven soil samples at concentrations ranging from 92.4 µg/kg to 465 µg/kg with the highest concentration detected in soil boring CNC21-B07 at the 5-6 ft. depth interval. DRO was detected in six soil samples at concentrations ranging from 288 µg/kg to 10,400(E) µg/kg with the highest concentration detected in soil boring CNC21-B04 at the 4-5 ft. depth interval. The petroleum constituents identified in the mobile laboratory samples correlate with the boring locations where the highest soil vapor concentrations were detected.

The mobile laboratory soil analysis was used as a screening method to assist in identifying locations for collection of soil samples for fixed base laboratory analysis and locations for groundwater monitoring wells. Soil sample and monitoring well locations were determined in part based on th ese data.

2.3.3 Groundwater Mobile Laboratory Results

A groundwater sample was collected from each of the 26 soil boring locations and was analyzed by a mobile laboratory for BTEX, naphthalene, and DRO using USEPA Method 8020/8015M. Table 6 summarizes the groundwater analytical data from the mobile laboratory.

As shown in Table 6, none of the constituents analyzed were detected in 20 of the 26 groundwater samples collected. In the six groundwater samples in which petroleum hydrocarbon constituents were detected, no benzene or toluene concentrations were detected in any of the mobile laboratory groundwater samples. Ethylbenzene was detected in three groundwater samples at concentrations ranging from 13.7 µg/L to 61.8 µg/L with the highest concentration detected in boring CNC21-B05 which was screened from 7-12 ft. bls. Total xylenes were detected in five groundwater samples at concentrations ranging from 3.2(J) µg/L to 279.7 µg/L with the highest concentration detected in boring CNC21-B05 which was screened from 7-12 ft. bls. The (J) indicates that the concentration of 3.2 µg/L is an estimated value because this concentration was detected above the instruments minimum detection limit, but below the practical quantification limit. Naphthalene was detected in five groundwater samples at concentrations ranging from 10.6 µg/L to 537(E) µg/L with the highest concentration detected in boring CNC21-B04 which was screened from 6-12 ft. bls. As previously described, the (E) indicates an estimated value. DRO was detected in four groundwater samples at concentrations ranging from 26.6 µg/L to 663(E) µg/L with the highest concentration detected in again boring CNC21-B05. As described above, the (E) indicates an estimated value.

The mobile laboratory groundwater analysis was used as a screening method to assist in identifying locations for permanent groundwater monitoring wells.

2.4 CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER

2.4.1 Chemicals of Concern in Soil

Eight subsurface soil samples (including one duplicate sample) were collected from the Site 21 area for determination of CoCs. The soil boring locations are shown on Figure 3, and Table 7 summarizes the CoCs detected in the soil samples. As requested by SCDHEC, the naphthalene concentrations detected in the soil samples shown in Table 7 are actually total naphthalene concentrations. The total naphthalene concentration value was derived by adding the naphthalene concentration detected using EPA Method 8260 with the 2-methylnaphthalene concentration detected using EPA Method 8270, regardless of the practical quantification limit for each method. The RBSL for clay-rich soil was used based on a grain size analysis completed on sample 21SLB080607 (boring CNC21-B08 at the 6-7 ft. depth interval) indicating a clay-rich soil matrix.

No BTEX constituents were detected at the method practical quantification limit in any of the fixed-base laboratory samples, with the exception of sample 21SLB030304 in which toluene was detected at an estimated value of 4(J) µg/kg, as shown in Table 7. As described previously, the (J) indicates an estimated value because the concentration was detected above the instruments minimum detection limit, but below the practical quantification limit.

Benzo(a) anthracene was detected in the soil samples collected from borings CNC21-B04 (at 4-5 ft. bls) and CNC21-B09 (at 7-8 ft. bls) at concentrations of 440 µg/kg and 4,100 µg/kg, respectively. These concentrations are both below benzo(a) anthracene's RBSL of 17,687 µg/kg. Benzo(b) fluoranthene was detected in the soil samples collected from borings CNC21-B04 and CNC21-B09 at concentrations of 370 µg/kg and 4,300 µg/kg, respectively. These concentrations are both below benzo(b) fluoranthene's RBSL of 7,042 µg/kg. Benzo(k) fluoranthene was detected in the soil samples collected from borings CNC21-B04 and CNC21-B09 at concentrations of 200(J) µg/kg and 1,800 µg/kg, respectively. These concentrations are both below benzo(k) fluoranthene's RBSL of 7,042 µg/kg. Chrysene was also detected in the soil samples collected from borings CNC21-B04 and CNC21-B09 at concentrations of 400 µg/kg and 4,100 µg/kg, respectively. The concentration of 4,100 µg/kg detected in boring CNC21-B09 does,

however, exceed chrysene's RBSL of 3,146 µg/kg. No dibenzo(a,h) anthracene concentrations were detected in any of the soil samples at it's method practical quantification limit

Naphthalene was detected in six soil samples (CNC21-B03, CNC21-B04, CNC21-B07, CNC21-B09, CNC21-B11, and CNC21-B12) at concentrations, which exceed naphthalene's RBSL of 210 µg/kg. Naphthalene detected in the soil samples range in concentration from 2,500 µg/kg to 25,055 µg/kg with the highest concentration detected in soil boring CNC21-B09, collected from the 4-5 ft. depth interval. Naphthalene was also detected in one other soil sample (CNC21-B08) at a concentration of 7(J) µg/kg; however, this concentration is well below naphthalene's RBSL.

Soil analytical data sheets and grain size analysis reports are provided in Appendix D. Figure 9 identifies the areal distribution of naphthalene (based on fixed-base laboratory results) detected in site soils during the RA. Figure 9 also includes the chrysene concentration (based on fixed-base laboratory results) detected in soil boring CNC21-B09, but does not show an areal distribution of chrysene detected in site soils. It was determined that a separate map showing the areal distribution of chrysene was not necessary since this CoC was detected in only one soil boring.

2.4.2 Chemicals of Concern in Groundwater

Nine groundwater samples (including one duplicate sample) were collected from the Site 21 area for determination of CoCs. The monitoring well locations are shown on Figure 3, and Table 8 summarizes the CoCs detected in the groundwater samples. As previously described, the naphthalene concentrations detected in the groundwater samples shown in Table 8 are actually total naphthalene concentrations. The total naphthalene concentration value was derived by adding the naphthalene concentration detected using EPA Method 8260 with the 2-methylnaphthalene concentration detected using EPA Method 8270, regardless of the practical quantification limit for each method.

Naphthalene was detected in only one groundwater sample (CNC21-MW01) at a concentration of 160 µg/L. This concentration exceeds the naphthalene RBSL in groundwater of 10 µg/L established for an individual polynuclear aromatic hydrocarbon (PAH) CoC (naphthalene). Well CNC21-MW01 was installed within the former UST-241 location and represents the "worst case" well location at Site 21. No other constituents analyzed were detected in the groundwater samples collected from this well (CNC21-MW01) or any of the remaining wells (CNC21-MW02 through CNC21-MW08), including the deep, vertical delineation well (CNC21M-07D).

Groundwater analytical reports are provided in Appendix D. Figure 10 illustrates the groundwater areal distribution of naphthalene in groundwater for samples analyzed by the fixed-base laboratory.

2.5 ANALYTICAL DATA

All analytical data from the July 1996 Underground Storage Tank Closure Assessment Report are presented in Appendix A. Soil analytical data generated during this RA are summarized in Tables 5 and 7. Groundwater analytical data generated during this RA are summarized in Tables 6 and 8. The soil and groundwater analytical reports from the fixed-base laboratory are included in Appendix D.

2.6 AQUIFER CHARACTERISTICS AND EVALUATION

On August 8, and October 13, 1999, groundwater levels were measured from the site monitoring wells. The groundwater flow direction at the site is primarily to the east-northeast, towards the Cooper River. Potentiometric Surface Maps for August and October are shown in Figures 7 and 8, respectively. As shown in these figures, groundwater in the vicinity of the former UST location and well 21CNC-MW01 may be influenced by a sanitary sewer utility located just southwest of Building 241. However, the influence on the water table from the sanitary sewer line was not investigated further during this assessment. On August 8, 1999, the calculated hydraulic gradient between monitoring wells CNC21-MW05 and CNC21-MW01 is 0.0202 feet per foot (ft/ft).

As part of the Final RCRA Facility Investigation (RFI) Report for Zone E, rising and falling head slug tests were conducted on 20 shallow monitoring wells throughout Zone E to determine the hydraulic conductivity of the surfical aquifer (E/A&H, 1996). The Final RCRA Facility Investigation Report for
Zone E is referenced since Site 21 is located immediately adjacent to and upgradient from Zone E. Slug tests were conducted by instantaneously adding (falling head) or removing (rising head) a volume (slug) of water from the well and measuring the recovering water level with an electronic data logger. A hydraulic conductivity value was then calculated for the rising head test and for the falling head test. The average hydraulic conductivity for each well was determined by calculating the geometric mean of the rising and falling head values. Because hydraulic conductivity data are lognormally distributed, the geometric mean was determined to be the most representative measure of central tendency.

The well construction details and boring logs for each well tested during the RFI were reviewed to determine which wells were most representative of the conditions present at Site 21. To make this determination, the screened interval and proximity to the site were evaluated. Based on this evaluation,

monitoring well NBCEGDE007 was selected as the most representative well. Well NBCEGDE007 is located approximately 250 feet north of the site and is completed to a depth of approximately 13 feet with a 9-foot screened interval. The geometric mean of the rising and falling head conductivities for well NBCEGDE007 was 7.41×10^{-2} feet per day.

Potential movement of groundwater at the site may be described in terms of transportation by natural flow system in the saturated zone, assuming groundwater flow follows Darcy's Law. Darcy's Law may be expressed as:

$$V = \left(\frac{K}{n}\right) x\, i$$

where:

V = average velocity

K = hydraulic conductivity = 7.41×10^{-2} ft/day

n = effective porosity = 0.55
(from sieve results of 55% sand & 10% clay and Figure C1 in SCDHEC, 1998)

i = most recent hydraulic gradient measurement = 0.0202 ft/ft

therefore:

$$V = \left(\frac{7.41 \times 10^{-2}\ \text{ft/day}}{0.55}\right) \text{x } 0.0202\ \text{ft/ft}$$

$$V = 0.003\ \text{ft/day}$$

In summary, the seepage velocity of the surficial aquifer was calculated to be approximately 1.1 feet per year based on a hydraulic conductivity of 7.41×10^{-2} feet per day, a hydraulic gradient of 0.0202 feet per foot, and a porosity of 55% for clay-rich soil. Aquifer characterization graphs and supporting documentation are provided in Appendix E.

2.7 FATE AND TRANSPORT

The Domenico Model was the fate and transport model used to determine groundwater site-specific target levels (SSTLs) in the risk analysis. The Domenico dilution/attenuation model is presented in the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases* (SCDHEC 1998). This model is very conservative in that it assumes an infinite mass, areal source condition through which groundwater flows. The model incorporates biological decay effects through a first-order decay process; however, this mechanism was ignored because SCDHEC guidance specifies that the decay rate must be assumed to be zero if site-specific decay rates have not been determined.

The impacted groundwater source area was modeled as 50 feet (15.00 meters) wide and 6.56 feet (2.0 meters) deep; these values are conservative defaults suggested by the American Society for Testing Materials (ASTM) *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM, 1997). The maximum source concentrations are assumed to exist throughout the source area, further compounding the conservatism of the estimate.

Site-specific data were used for saturated hydraulic conductivity, hydraulic gradient, porosity, and fraction of organic carbon in soil (2.61E-07 m/sec, 0.02020 ft/ft, 0.55 cm^3/cm^3, and 1.09E-2 g-C/g-soil, respectively). The soil bulk density (1.4 g/cm^3) was determined using Figure C1 given in SCDHEC (1998), based on the sieve test results of 55% sand and 10% clay.

The following estimates of dispersivity were used in the Domenico Model as given in SCDHEC (1998):

Parameter	Estimate
Longitudinal Dispersivity, α_x	x/10, where x= distance between the point of exposure and the source or compliance point
Transverse Dispersivity, α_y	$\alpha_x/3$
Vertical Dispersivity, α_z	$\alpha_x/20$

Table 9 summarizes fate and transport parameters used in modeling the SSTLs.

2.8 PREDICTED MIGRATION AND ATTENUATION OF CHEMICALS OF CONCERN

Groundwater flow is primarily to the east-northeast, towards the Cooper River. The current extent of groundwater impact is limited to naphthalene concentrations in well CNC21-M01. Figure 10 shows the areal extent of groundwater impacted by naphthalene. Concentrations of compounds of interest in all of other monitoring wells, including the deep, vertical delineation well, were non-detect.

The Domenico Model was used to predict the distance at which the tip of the plume is attenuated to SCDHEC RBSLs in 10 and 20 years without using degradation due to biological decay. This was done by adjusting the time to 10 years ($3.15x10^8$ sec) and 20 years ($6.31x10^8$ sec) and solving for distance (x) by trial and error. The source was assumed to be well CNC21-M01. The distance was changed until the required distance that is necessary for the concentration to attenuate to the RBSLs was determined. The model estimates that after 10 years, the concentrations of naphthalene will be 0.01 mg/L (RBSL) at an

approximate distance of 0.5 foot. Furthermore, after 20 years, the concentration of naphthalene is 0.010 mg/L at approximately one foot from the source. Because of the very short distance of predicted migration, figures depicting the 10 and 20 year extent of migration were not prepared. The Domenico 10-year and 20-year simulation spreadsheets are presented in Appendix F.

3.0 TIER 1 and 2 EVALUATION

3.1 COMPARISON OF ANALYTICAL RESULTS WITH RBSLs

Soil CoC concentrations in seven samples and one duplicate exceeded the soil leaching RBSLs, and are shown in the table below. The soil RBSLs are presented in the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases* (SCDHEC 1998).

Soil Boring / Sample No.	Benzene (ug/kg)	Naphthalene (ug/kg)	Chrysene (ug/kg)
RBSLs for sandy soil <5 feet	5	52	3,146
CNC21-B03 / 21SLB03 0304	Below RBSL	2,500	Below RBSL
CNC21-B04 / 21SLB04 0405	Below RBSL	11,004	Below RBSL
CNC21-B07 / 21SLB07 0506	<11	7,024	Below RBSL
CNC21-B08 / 21SLB08 0607	<10	Below RBSL	Below RBSL
CNC21-B08 / 21SLB08 0607D (duplicate)	<11	Below RBSL	Below RBSL
CNC21-B09 / 21SLB09 0708	Below RBSL	25,055	4,100
CNC21-B011 / 21SLB011 0506	<10	3,724	Below RBSL
CNC21-B03 / 21SLB03 0304	<11	6,800	Below RBSL

A CoC concentration in one groundwater sample exceeded the RBSLs and is shown in the table below. The groundwater RBSLs are presented in the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases* (SCDHEC 1998).

Monitoring Well / Sample No.	Naphthalene (ug/L)
RBSL	10
CNC21M-01 / 21GLM1201	160

A Site Conceptual Exposure Model (identification of current and future potential receptors and human exposure pathways) is required because RBSLs for naphthalene in groundwater and benzene, chrysene, and naphthalene in soil were exceeded. A comparison of the maximum concentrations of CoCs in soil and groundwater to their respective RBSLs is summarized in Table 10. The Site Conceptual Exposure Model is shown in the following section.

3.2 SITE CONCEPTUAL EXPOSURE MODEL

This section focuses on the current and future land use issues concerning the site. The site formerly served as the Charleston Naval Base Crane Shop. Figure 1 shows that the site is located in and surrounded by the CNC. The area surrounding CNC is "mature urban," having long been developed with commercial, industrial, and residential land use. Commercial areas are primarily west of CNC; industrial areas are primarily to the north of the base along Shipyard Creek. The future use of the property is expected to be industrial or commercial for the foreseeable future after the property is made available for redevelopment under BRAC law.

Drinking water at the site and surrounding properties is provided by the City of Charleston water treatment plants. A survey of groundwater users within a 7-mile radius of the CNC was provided by the South Carolina Water Resources Commission to ascertain the extent of any shallow groundwater usage. The survey identified no drinking water wells that are screened in the shallow aquifer within a 4-mile radius of the CNC.

3.3 EXPOSURE PATHWAY ANALYSIS

This section presents the receptor characterizations of the potentially exposed populations in the vicinity of the site and identifies the potentially complete exposure pathways for those receptors. SCDHEC requires that only those exposure pathways with CoC concentrations exceeding Tier 1 RBSL concentrations be examined in a Tier 2 Risk-Based Corrective Action Report. Tables 11 and 12 present the exposure pathway assessments for current and future use scenarios, respectively.

3.3.1 On-Site Commercial/ Industrial Worker

An on-site commercial or industrial worker is defined as a business employee who works in a commercial/ industrial capacity at the site. The future use of the property is expected to be industrial or commercial for the foreseeable future; therefore, an on-site worker was considered as a potential receptor. Incidental ingestion and dermal contact with impacted soil are expected to be negligible for commercial/industrial workers because they are located inside a building. Drinking water at this site is provided by the city; therefore, ingestion of groundwater is not a complete exposure pathway. Building foundations are assumed sufficient to prevent volatilization from both soil and groundwater into a commercial building, and there is no history of vapors in the commercial building. It is unlikely that any additional exposure pathways will exist for future on-site workers; therefore, no complete pathways exist for either current or future commercial/ industrial workers.

3.3.2 On-Site Visitor

An on-site visitor is defined as any person other than a worker who might come on site. On-site visitors would have the same exposure pathways as commercial workers, but their exposure duration would be much shorter. This receptor does not have to be quantified because a potential on-site visitor's chemical intake would not drive risk or cleanup levels at the site; therefore, an on-site visitor was not considered as a potential receptor.

3.3.3 On-Site Construction Worker

An on-site construction worker is defined as a laborer who would be involved in intrusive activities on or around the site, particularly in the area of subsurface utilities. On-site construction workers could be exposed to constituents in soil by the following pathways: inhalation of volatiles from soil, dermal contact with soil, and incidental ingestion of soil. On-site construction workers could be exposed to constituents in groundwater by the following pathways: inhalation of volatiles from groundwater, dermal contact with groundwater, and incidental ingestion of groundwater. A sanitary sewer line runs adjacent the site; therefore, the point of exposure location for the on-site construction worker was considered to be at the source.

3.3.4 On-Site Resident

An on-site resident is defined as any person making his or her home at the site. This site is expected to remain a commercial/industrial facility; therefore, the on-site resident receptor was not considered further.

3.3.5 Off-Site Resident

An off-site resident is defined as any person making his or her home near the site. This receptor's location is either an actual current residence near the site or is a vacant lot or property on which a residence could be built. The site is located in an area that will likely remain commercial/industrial, including all downgradient properties to the Cooper River. Therefore, this potential receptor was not considered further.

3.3.6 Surface Water

The Cooper River is located approximately 400 feet downgradient, to the east-northeast of the site. Since base-wide groundwater flow is toward the river, this exposure pathway was considered for ingestion of surface water.

3.4 IDENTIFICATION OF DATA REQUIREMENTS

No additional data are required to calculate SSTLs for the site.

3.5 SITE-SPECIFIC TARGET LEVELS

The Site Conceptual Model identified two possible future receptors: a construction worker in a utility trench and the Cooper River. Pathways for the construction worker include (1) possibly ingesting, having dermal contact with, or inhaling volatilized vapors from the groundwater in the utility trench and (2) possibly ingesting or having dermal contact with soil within the trench. The pathway for the Cooper River is groundwater migration to the river from the site.

3.5.1 Soil SSTLs Protective of the On-Site Construction Worker

The Site Conceptual Model identified a potential receptor as a construction worker ingesting or dermally contacting soil while working in a utility trench. For ingestion and dermal contact with soil while working in a utility trench, subsurface soil exposure to a construction worker is similar to surface soil exposure. The RBSLs given by SCDHEC for ingestion and dermal contact with surficial soils by a commercial worker are compared to the site soil concentrations in the following table.

The soil RBSLs presented in the table below were provided in Table B6 in the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases*, 1998. (RBSLs for commercial workers are conservative for construction workers. See note [1] following the tables).

CoC (mg/kg)	RBSL	SB-3	SB-4	SB-5	SB-7	SB-8
Benzene	200	<0.007	<0.006	<0.007	<0.011	<0.010
Toluene	410,000	0.004J	<0.006	<0.007	<0.011	<0.010
Ethylbenzene	200,000	<0.007	<0.006	<0.007	<0.011	<0.010
Xylenes	1,000,000	<0.007	<0.006	<0.007	<0.011	<0.010
Naphthalene	41,000	2.500	11.004J	<0.007	7.024	<0.010
Benzo(a)anthracene	3.9	<0.530	0.440	<0.330	<0.630	<0.630
Benzo(b)fluoranthene	3.9	<0.530	0.370	<0.330	<0.630	<.0630
Benzo(k)fluoranthene	39	<0.530	0.200J	<0.330	<0.630	<0.630
Chrysene	390	<0.530	0.400	<0.330	<0.630	<0.630
Dibenzo(a,h)anthracene	0.39	<0.530	<0.360	<0.330	<0.630	<0.630

CoC (mg/kg)	RBSL	SB-8D	SB-9	SB-11	SB-12	
Benzene	200	<0.011	<0.005	<0.010	<0.011	
Toluene	410,000	<0.011	<0.005	<0.010	<0.011	
Ethylbenzene	200,000	<0.011	<0.005	<0.010	<0.011	
Xylenes	1,000,000	<0.011	<0.005	<0.010	<0.011	
Naphthalene	41,000	0.007J	25.055	3.724	6.800	
Benzo(a)anthracene	3.9	<0.660	4.100	<0.560	<0.590	
Benzo(b)fluoranthene	3.9	<0.660	4.300	<0.560	<0.590	
Benzo(k)fluoranthene	39	<0.660	1.800J	<0.560	<0.590	
Chrysene	390	<0.660	4.100	<0.560	<0.590	
Dibenzo(a,h)anthracene	0.39	<0.660	<3.600	<0.560	<0.590	

(1) A commercial worker has a typically assumed exposure duration (ED) of 25 years and an exposure frequency (EF) of 250 days/year. A construction worker would be expected to have a much lower exposure duration and exposure frequency based on the nature of utility or construction work. The exposure frequency can be assumed to be 90 days/year and the exposure duration can be assumed to be 1 year. These assumptions are based on the nature of utility work. Therefore, the RBSLs for construction workers are expected to be higher than those for commercial workers.

Soil CoC concentrations from seven soil borings exceeded the RBSL for dibenzo(a,h)anthracene. One soil boring exceed the RBSLs for benzo(a)anthracene and benzo(b)fluoranthene. The RBSLs listed in the previous tables were calculated for a commercial worker ingesting or contacting impacted soil (see Note 1 above) and are more stringent than what would be expected for a construction worker. None the less, based on the commercial worker RBSLs, a construction worker contacting or accidentally ingesting soil while working below grade on utility lines adjacent the Site 21 may be at risk to exposure from dibenzo(a,h)anthracene, benzo(a)anthracene, and benzo(b)fluoranthene.

3.5.2 Groundwater SSTLs Protective of the On-Site Construction Worker

Groundwater RBSLs provided by SCDHEC are for ingestion only. Therefore, groundwater RBSLs for a construction worker in a utility trench were calculated for three pathways: dermal contact, incidental

ingestion, and inhalation of volatiles. A target cancer risk of 1×10^{-6} and a target hazard quotient of 1 were used in the calculations. Where possible, site-specific parameters were used for site conditions. Standard defaults were used when available and applicable to a construction worker. When no standard parameters were available, conservative assumptions were used. For all pathways, the exposure frequency was assumed to be 90 days/year and the exposure duration was assumed to be 1 year. These assumptions were considered conservative based on the nature of utility work.

The dermal contact RBSLs were calculated using procedures provided in the *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance* (USEPA Peer Consultation Workshop Draft, 1998). Based on expected limited contact with groundwater, the event frequency was assumed to be 1 event/day and the event duration was assumed to be 1 hour/event. The skin surface area available for contact was 4,500 cm^2, based on one-fourth the skin surface area given in the risk assessment guidance document for a swimming adult.

The incidental ingestion RBSLs were calculated using the equation given in *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Interim Final)*, (USEPA 1989). An incidental ingestion rate of 0.01 L/day was assumed based on a fraction (12.5%) of the incidental ingestion rate for a wading adult (0.01 L/hr), considered for an 8-hour work day. The incidental ingestion rate for wading adults is given in *Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment* (USEPA Region 4, 1995).

Underground utility lines in the area are typically buried 2 to 6 feet deep. The average depth to groundwater at the point of exposure (CNC21-MW01) is 5.65 feet bls, with a range of 3 to 7 feet bls. It was assumed that a construction worker might be exposed to chemicals volatilizing from standing groundwater. The inhalation RBSLs were calculated using Henry's Law:

$$RBSL_{WATER} = RBSL_{AIR}/H$$

Where H = Henry's Law constant [mg/L-air/mg/L-water]

The $RBSL_{AIR}$ for each chemical was calculated using the equation given in the ASTM *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (1997). SCDHEC values were used for Henry's Law constants.

Underground utilities are present in close proximity to the site; therefore the point of exposure location for the on-site construction worker was considered to be at the source, and no fate and transport calculations

were performed to determine the SSTL protective of the construction worker. The minimum RBSL for the three pathways (dermal, incidental ingestion, inhalation) was chosen as the SSTL for the construction worker.

The following table shows the calculated RBSLs for each pathway (dermal, incidental ingestion, inhalation) and the SSTL for the construction worker.

Chemical of Concern	Dermal RBSL (mg/L)	Incidental Ingestion RBSL (mg/L)	Inhalation RBSL (mg/L)	SSTL (Minimum RBSL, mg/L)	Source Maximum Concentration in Well CNC21 MW01 (mg/L)
Benzene	0.85	68.52	0.15	**0.15**	**<0.005**
Naphthalene	1.63	1135.56	2.63	**1.63**	**0.16**
Chrysene	0.32	272.22	2.25E+16	**0.32**	**<0.010**

Appendix F provides the parameters and results of the RBSL calculations.

As shown in the above table, the minimum RBSL for naphthalene is greater than the greatest onsite concentration of naphthalene detected in site groundwater. Therefore, a construction worker exposed to groundwater in a utility trench contaminated by the release at the site is not at risk from naphthalene exposure. A comparison of the maximum groundwater concentrations to SSTLs is shown in Table 13.

3.5.3 Soil SSTLs Protective of a Construction Worker Exposed to Groundwater Leached through Contaminated Soil

An additional pathway considered complete for construction workers was that of leaching to groundwater. The potential construction worker's exposure to groundwater was assumed to consist of three pathways: dermal contact, incidental ingestion, and inhalation of volatiles. Drinking water is provided by the city; therefore, ingestion of groundwater is not a complete pathway.

The SCDHEC Soil Leachability Model was used to calculate a site-specific target level (SSTL) for benzene, naphthalene, and chyrsene leaching to the groundwater. Site-specific parameters were input when available, or SCDHEC defaults for clay-rich soil were used. The minimum calculated groundwater RBSLs for construction worker exposure (0.15 mg/L benzene, 1.63 mg/L naphthalene, and 0.32 mg/L chrysene) were used as opposed to the groundwater RBSL for ingestion, as shown in the table in Section 3.5.2.

The calculated SSTLs as compared to the maximum soil concentration found during the field investigation are shown in the following table.

CoC	Maximum Soil Concentrations (mg/kg)	Soil Leaching SSTL (mg/kg)
Benzene	<0.011	4.36
Naphthalene	25.055	1.46E+7
Chrysene	4.100	1.28E+44

The soil leaching SSTL calculated for the CoCs were all above the maximum concentration found in soil borings onsite. Therefore, benzene, naphthalene, and chrysene leaching from the soil to the groundwater are not a risk to a construction worker in a utility trench exposed to groundwater.

3.5.4 Groundwater SSTLs Protective of Surface Water

SSTLs were developed which would protect the Cooper River from potential impact from discharge of impacted groundwater. The Domenico Model as described in Section 2.7 was used to determine the groundwater SSTLs for naphthalene under steady state conditions. Table 9 provides fate and transport in put parameters used in the model. The groundwater flow direction is primarily to the east-northeast, towards the Cooper River. Monitoring well CNC21-M01 contained naphthalene concentrations greater than the Groundwater Ingestion RBSL (see Section 3.5.2); therefore, the area surrounding this monitoring well was used as the source for predicted migration.

The dissolved naphthalene concentration in well CNC21-M01 was used in the Domenico Model as the source concentration. The distance from well CNC21-M01 to the Cooper River, which is the nearest point of exposure, other than construction worker, was estimated to be approximately 400 feet downgradient from the former UST location. Using the RBSL value of 0.01 mg/L for naphthalene (see Section 3.1) at the point of exposure, the SSTL at well CNC21-M01 was calculated and compared with the source concentration in well CNC21-M01.

The SSTL at an estimated compliance well was also calculated using the values of the RBSLs at the point of exposure. However, there is no actual compliance well at this site; one would be installed during Corrective Action. The distance from the compliance well to the point of exposure was estimated to be 100 feet.

Groundwater SSTLs determined are shown in the following table.

Chemical of Concern	Source Concentration at Monitoring Well CNC21-M01 [mg/L]	Source SSTL [mg/L]	Compliance Point SSTL [mg/L]
Naphthalene	0.160	0.900	0.223

As shown in the above table, the current concentration of naphthalene in groundwater at monitoring well CNC21-M01 is below the calculated SSTL for affecting the Cooper River. Therefore, the Cooper River is not at risk because of the naphthalene concentrations in groundwater at the site. A comparison of the maximum groundwater concentrations to SSTLs is shown in Table 13. Appendix F provides the Domenico Model calculations generating SSTLs.

3.5.5 Selected SSTLs

The selected SSTLs and the source concentrations are:

Media of Concern	Chemical of Concern	Units	SSTL	Maximum Source Concentration	Above SSTLs
Groundwater	Naphthalene	mg/L	0.900	0.160	no
Soil	Benzene	mg/kg	4.36	<0.011	no
	Naphthalene	mg/kg	1.46E+7	25.055	no
	Benzo(a) anthracene	mg/kg	3.9	4.1	**yes**
	Benzo(b) fluoranthene	mg/kg	3.9	4.3	**yes**
	Chyrsene	mg/kg	1.28E+44	4.1	no
	Dibenzo(a,h) anthracene	mg/kg	0.39	<3.6	**yes**

Note that the maximum concentrations found onsite for benzene, naphthalene, and chrysene do not exceed their respective SSTLs, and therefore, do not pose a threat to the identified receptors at the site.

However, the maximum concentrations for benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene do exceed their respective SSTLs, and therefore, may pose a threat to a construction worker in a utility trench exposed to groundwater or soil.

3.6 RECOMMENDATIONS

The concentrations for benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h) anthracene in the soil exceed the their respective SSTLs for dermal contact. Based on the results of the Tier 1 and 2 evaluation, the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases*, 1998 (RBCA guidance), provides three decision options: intrinsic corrective action, active corrective action, and Tier 3 assessment/evaluation. Since benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene in the soil exceed the their respective SSTLs for dermal contact, the decision option satisfying the criteria in the RBCA guidance indicate that an active corrective action should be recommended.

However, the RBSLs provided in the RBCA Guidance for ingestion and dermal contact with surficial soils by a commercial worker assume that a commercial worker will have an exposure duration for 25 years having an exposure frequency of 250 days per year. But, a construction worker would be expected to have a much lower exposure duration and exposure frequency based on the nature of utility, construction, or remediation work. The exposure frequency can be assumed to be 90 days/year or less and the exposure duration can be assumed to be 1 year or less. These assumptions are based on the typical duration of utility work. Furthermore, the maximum source concentrations of benzo(a)anthracene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene detected in soils slightly exceed the calculated SSTLs. As a result, intrinsic corrective action/remediation is a more appropriate decision option for this site. Therefore, Tetra Tech NUS, Inc. recommends that an Intrinsic Corrective Action Plan be prepared for this site.

4.0 REFERENCES

E/A&H (Ensafe/Allen & Hoshall), Inc. 1996. Final RCRA Facility Investigation for Zone H, Naval Base Charleston, Charleston, South Carolina, July 5, 1996.

SCDHEC (South Carolina Department of Health and Environmental Control), 1997. South Carolina Standard Limited Assessment, June 1997.

SCDHEC, 1998. South Carolina Risk-Based Corrective Action for Petroleum Releases, January 1998.

SPORTENDETCHASN (Supervisor of Ship Building Conversion and Repair, United States Navy, Portsmouth, Virginia, Environmental Detachment Charleston), 1998. Underground Storage Tank (UST) Assessment Report UST, Charleston Naval Base Complex, North Charleston, SC, March 4, 1998.

SPORTENDETCHASN, 1999. Personal Contact between Paul Calligan TtNUS and Copes Wannamacker SPORTENDCHASN, June 17, 1999.

TABLES

TABLE 1

GROUNDWATER ELEVATIONS
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL BASE COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well #	Total Depth of Well (ft)	Top of Casing Elevation, ft (MSL)	Date Measured	Depth to Water, ft (BTOC)	Depth to Product, ft (BTOC)	Product Thickness (ft)	Groundwater Elevation (MSL)
CNC21-M01	10.00	8.90	8/8/99	5.65	ND	0.00	3.25
CNC21-M02	14.00	8.76	8/8/99	5.56	ND	0.00	3.20
CNC21-M03	14.00	8.84	8/8/99	4.52	ND	0.00	4.32
CNC21-M04	14.00	9.36	8/8/99	5.19	ND	0.00	4.17
CNC21-M05	13.00	8.52	8/8/99	2.98	ND	0.00	5.54
CNC21-M06	13.00	9.25	8/8/99	4.70	ND	0.00	4.55
CNC21-M07D	33.50	8.95	8/8/99	6.77	ND	0.00	2.18
CNC21-M08	12.00	NA	8/8/99	3.95	ND	0.00	NA

Well #	Total Depth of Well (ft)	Top of Casing Elevation, ft (MSL)	Date Measured	Depth to Water, ft (BTOC)	Depth to Product, ft (BTOC)	Product Thickness (ft)	Groundwater Elevation (MSL)
CNC21-M01	10.00	8.90	10/13/99	5.12	ND	0.00	3.78
CNC21-M02	14.00	8.76	10/13/99	5.17	ND	0.00	3.59
CNC21-M03	14.00	8.84	10/13/99	4.14	ND	0.00	4.70
CNC21-M04	14.00	9.36	10/13/99	5.19	ND	0.00	4.17
CNC21-M05	13.00	8.52	10/13/99	2.69	ND	0.00	5.83
CNC21-M06	13.00	9.25	10/13/99	4.71	ND	0.00	4.54
CNC21-M07D	33.50	8.95	10/13/99	6.02	ND	0.00	2.93

Notes:
MSL - Mean Sea Level
BTOC - Below Top of Casing
NA - Not Applicable
ND- Not Detected
ft - Feet

TABLE 2

GROUNDWATER FIELD MEASUREMENTS
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Purge method	Volume (gallons)	Temp. (° C)	pH	Specific Conductivity (uMHOS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)
CNC21-MW02	8/22/99	PP	4.20	27.7	6.87	1.67	1	2.00
CNC21-MW03	8/22/99	PP	5.40	29.8	6.79	0.758	5	1.41
CNC21-MW05	8/22/99	PP	4.92	27.9	6.96	0.817	0	2.74
CNC21-MW08	8/22/99	PP	0.50	25.9	6.77	21.0	70	1.01
CNC21-MW07D	8/22/99	PP	11.40	28.1	7.11	23.0	64	6.87

Notes:
(°C) - Degrees Celsius
PP - Peristaltic pump, low flow technique
uohms/cm = microohms per centimeter (equilvalent to seimenpercentimeter (S/cm))
NTU - Nephelometric turbidity units
mg/l - milligrams per liter

TABLE 3

GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Dissolved Oxygen (mg/l)	Alkalinity (mg/l)	Carbon Dioxide (mg/l)	Sulfide (mg/l)	Ferrous Iron (mg/l)	Methane (ug/l)	Manganese (mg/l)	Nitrogen/ Nitrate (mg/l)*	Sulfate (mg/l)*
CNC21-MW01	9/8/99	1.20	354	548	0.087	5.10	6,800	4.4	<0.050	5.20
CNC21-MW04	9/8/99	1.48	1,335	720	0.084	5.10	2,700	-0.2	<0.050	53.00
CNC21-MW06	9/8/99	0.49	1,060	670	0.80	3.36	310	0.5	<0.050	64.00

Notes:

mg/l - Milligrams per liter

ug/l - Micrograms per liter

E- Estimated Concentration

NA - Not Analyzed

* Fixed base laboratory analysis

TABLE 4

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 21, BUILDING 241
ZONE F, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (ppm)
CNC21-B01	21SSB0102	2	0
	21SSB0108	8	140
	21SSB0111	11	250
CNC21-B02	21SSB0203	3	0
	21SSB0205	5	100
	21SSB0210	10	130
CNC21-B03	21SSB0303	3	17
	21SSB0305	5	80
CNC21-B04	21SSB0405	5	0
	21SSB0406	6	0
	21SSB0407	7	0
	21SSB0408	8	3000
	21SSB0410	10	5000
CNC21-B05	21SSB0504	4	0
	21SSB0507	7	4
	21SSB0512	12	290
CNC21-B06	21SSB0604	4	0
	21SSB0608	8	110
	21SSB0612	12	10
CNC21-B07D	21SSB0704	4	17
	21SSB0706	6	100
	21SSB0708	8	10
CNC21-B08	21SSB0803	3	0
	21SSB0805	5	8
	21SSB0806	6	150
CNC21-B09	21SSB0907	7	38
CNC21-B10	21SSB1003	3	35
	21SSB1009	9	100
CNC21-B11	21SSB1103	3	20
	21SSB1105	5	10
CNC21-B12	21SSB1203	3	40
	21SSB1205	5	40
	21SSB1208	8	170
CNC21-B13	21SSB1303	3	0
CNC21-B14	21SSB1403	3	0
CNC21-B15	21SSB1503	3	0
CNC21-B16	21SSB1603	3	21
	21SSB1607	7	38
CNC21-B17	21SSB1701	1-9	No Recording
CNC21-B18	21SSB1803	3	70
CNC21-B19	21SSB1903	3	60
	21SSB1907	7	20
	21SSB1909	9	60
CNC21-B20	21SSB2003	3	20
	21SSB2007	7	3

TABLE 4 - CONTINUED

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 21, BUILDING 241
ZONE F, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (ppm)
CNC21-B21	21SSB2103	3	36
	21SSB2107	7	310
CNC21-B22	21SSB2201	1-10	No Recording
CNC21-B23	21SSB2301	1-12	No Recording
CNC21-B24	21SSB2401	1-16	No Recording
CNC21-B25	21SSB2501	1-16	No Recording
CNC21-B26	21SSB2601	1-16	No Recording

Notes:
OVA - Organic vapors were analyzer with a flame ionization detector (FID)
ppm – Parts Per Million

TABLE 5

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
SITE 21, BUILDING 241
ZONE F, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Laboratory Screening Data[1]					
			Benzene (µg/Kg)	Toluene (µg/Kg)	Ethylbenzene (µg/Kg)	Total Xylenes (µg/Kg)	Naphthalene (µg/Kg)	Diesel Range Organics (mg/Kg)
CNC21-B01	21SFB010405	4-5	ND	ND	ND	ND	ND	ND
CNC21-B02	21SFB020405	4-5	ND	ND	ND	ND	ND	ND
CNC21-B03	21SFB030304	3-4	ND	ND	ND	ND	ND	ND
CNC21-B04	21SFB040405	4-5	ND	58.6J	467	1,247E	334	10,400E
CNC21-B05	21SFB050506	5-6	ND	ND	48.8J	441	387	8510
CNC21-B06	21SFB060708	7-8	ND	ND	ND	ND	ND	ND
CNC21-B07	21SFB070506	5-6	ND	ND	ND	647E	465	586
CNC21-B08	21SFB080607	6-7	ND	ND	161	608E	198	1361
CNC21-B09	21SFB090708	7-8	ND	ND	ND	202	228	727
CNC21-B10	21SFB100910	9-10	ND	ND	ND	ND	ND	ND
CNC21-B11	21SFB110506	5-6	ND	ND	30.6	122	108	288
CNC21-B12	21SFB120809	8-9	ND	ND	ND	ND	92.4	ND
CNC21-B13	21SFB130304	3-4	ND	ND	ND	ND	ND	ND
CNC21-B14	21SFB140506	5-6	ND	ND	ND	ND	ND	ND
CNC21-B15	21SFB150304	3-4	ND	ND	ND	ND	ND	ND
CNC21-B16	21SFB160304	3-4	ND	ND	ND	ND	ND	ND
CNC21-B17	21SFB170506	5-6	ND	ND	ND	ND	ND	ND
CNC21-B18	21SFB180304	3-4	ND	ND	ND	ND	ND	ND
CNC21-B19	21SFB190304	3-4	ND	ND	ND	ND	ND	ND
CNC21-B20	21SFB200708	7-8	ND	ND	ND	ND	ND	ND
CNC21-B21	21SFB210708	7-8	ND	ND	ND	ND	ND	ND
CNC21-B22	21SFB220607	6-7	ND	ND	ND	ND	ND	ND
CNC21-B23	21SFB230506	5-6	ND	ND	ND	ND	ND	ND
CNC21-B24	21SFB240506	5-6	ND	ND	ND	ND	ND	ND
CNC21-B25	21SFB250506	5-6	ND	ND	ND	ND	ND	ND
CNC21-B26	21SFB200708	7-8	ND	ND	ND	ND	ND	ND

NOTES:
[1] Laboratory screening data was analyzed using USEPA Method 8020/8015M. Compounds not detected are reported as non-detected (ND)
µg/Kg = micrograms per kilogram
mg/Kg = milligrams per kilogram
J = Estimated value-detection was above the instrument minimum detection level, but below the practical quantification limit.
E = Estimated value-detection exceeded the upper calibration range of the instrument.

TABLE 6

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
SITE 21, BUILDING 241
ZONE F, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Laboratory Screening Data[1]					
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Naphthalene (µg/L)	Diesel Range Organics (mg/L)
CNC21-B01	21GFB010612	6-12	ND	ND	ND	ND	ND	ND
CNC21-B02	21GFB020812	8-12	ND	ND	ND	ND	ND	ND
CNC21-B03	21GFB030812	8-12	ND	ND	ND	ND	ND	ND
CNC21-B03	21GFB031016	10-16	ND	ND	ND	ND	ND	ND
CNC21-B04	21GFB040612	6-12	ND	ND	28.0	147.5	537E	190
CNC21-B05	21GFB050712	7-12	ND	ND	61.8	279.7	283E	663E
CNC21-B06	21GFB061220	12-20	ND	ND	ND	ND	ND	ND
CNC21-B07	21GFB071116	11-16	ND	ND	ND	ND	ND	ND
CNC21-B08	21GFB080816	8-16	ND	ND	ND	ND	ND	ND
CNC21-B09	21GFB090612	6-12	ND	ND	ND	46.6	260	26 6
CNC21-B10	21GFB100916	9-16	ND	ND	ND	ND	ND	ND
CNC21-B11	21GFB110608	6-8	ND	ND	13.7	75	98.8	67.2
CNC21-B12	21GFB120912	9-12	ND	ND	ND	ND	ND	ND
CNC21-B13	21GFB130812	8-12	ND	ND	ND	ND	ND	ND
CNC21-B14	21GFB140812	8-12	ND	ND	ND	ND	ND	ND
CNC21-B15	21GFB150508	5-8	ND	ND	ND	ND	10.6	ND
CNC21-B16	21GFB160610	6-10	ND	ND	ND	ND	ND	ND
CNC21-B17	21GFB170810	8-10	ND	ND	ND	3.2J	ND	ND
CNC21-B18	21GFB180912	9-12	ND	ND	ND	ND	ND	ND
CNC21-B19	21GFB190512	5-12	ND	ND	ND	ND	ND	ND
CNC21-B20	21GFB200612	6-12	ND	ND	ND	ND	ND	ND
CNC21-B21	21GFB210912	9-12	ND	ND	ND	ND	ND	ND
CNC21-B22	21GFB220709	7-9	ND	ND	ND	ND	ND	ND
CNC21-B23	21GFB230816	8-16	ND	ND	ND	ND	ND	ND
CNC21-B24	21GFB240616	6-16	ND	ND	ND	ND	ND	ND
CNC21-B25	21GFB251016	10-16	ND	ND	ND	ND	ND	ND
CNC21-B26	21GFB261016	10-16	ND	ND	ND	ND	ND	ND

NOTES:
[1] Laboratory screening data was analyzed using USEPA Method 8020/8015M. Compounds not detected are reported as non-detected (ND)
µg/Kg = micrograms per kilogram
mg/Kg = milligrams per kilogram
J = Estimated value-detection was above the instrument minimum detection level, but below the practical quantification limit.
E = Estimated value-detection exceeded the upper calibration range of the instrument.

TABLE 7

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Soil Boring/ Sample No.	Sample Date	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-benzene (ug/kg)	Xylenes (total) (ug/kg)	Benzo(a) anthracene (ug/kg)	Benzo(b) fluoranthene (ug/kg)	Benzo(k) fluoranthene (ug/kg)	Chrysene (ug/kg)	Dibenzo(a,h) anthracene (ug/kg)	Naphthalene (ug/kg)
RBSL[1]		5	478	364	11119	17687	7042	55930	3146	21265	52
CNC21-B03 / 21SLB030304	18-Aug-99	<7	4(J)	<7	<7	<530	<530	<530	<530	<530	**2500**
CNC21-B04 / 21SLB040405	23-Jun-99	<6	<6	<6	<6	440	370	200(J)	400	<362	**11004(J)**
CNC21-B05 / 21SLB050506	23-Jun-99	<7	<7	<7	<7	<330	<330	<330	<330	<330	<7
CNC21-B07 / 21SLB070506	18-Aug-99	<11	<11	<11	<11	<630	<630	<630	<630	<630	**7024**
CNC21-B08 / 21SLB080607	23-Jun-99	<10	<10	<10	<10	<630	<630	<630	<630	<630	<10
CNC21-B08 / 21SLB080607D	23-Jun-99	<11	<11	<11	<11	<660	<660	<660	<660	<660	7(J)
CNC21-B09 / 21SLB090708	23-Jun-99	<5	<5	<5	<5	4100	4300	1800(J)	**4100**	<3600	**25055**
CNC21-B11 / 21SLB110506	18-Aug-99	<10	<10	<10	<10	<560	<560	<560	<560	<560	**3724**
CNC21-B12 / 21SLB120708	18-Aug-99	<11	<11	<11	<11	<590	<590	<590	<590	<590	**6800**
CNC21-TL(2) / 21TL00101	18-Aug-99	<5	< 5	< 5	< 5	NA	NA	NA	NA	NA	<5
CNC21-TL(2) / 21TL00201	23-Jun-99	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5

NA - Not analyzed

(1) South Carolina Department of Health and Environmental Control Risk Based Screening Levels for clay-rich soils; depth to groundwater less than 5 feet.

(2) Trip blank

(J) Indicates presence of analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 8

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/ Sample No.	Sample Date	Benzene (ug/L)	Ethyl-benzene (ug/L)	Toluene (ug/L)	Xylenes (total) (ug/L)	Naphthalene (ug/L)	Benzo(a) anthracene (ug/L)	Benzo(b) fluoranthene (ug/L)	Benzo(k) fluoranthene (ug/L)	Chrysene (ug/L)	Dibenzo(a,h) anthracene (ug/L)	MTBE (ug/L)
RBSL[1]		5	700	1000	10000	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	40
CNC21M-01 / 21GLM0101	8-Sep-99	< 5	< 5	< 5	< 5	160	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-02 / 21GLM0201	22-Aug-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-02 / 21GLM0201D	22-Aug-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-03 / 21GLM0301	22-Aug-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-04 / 21GLM0401	8-Sep-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-05 / 21GLM0501	16-Aug-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-06 / 21GLM0601	22-Aug-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-07 / 21GLM07D01	22-Aug-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5
CNC21M-08 / 21GLM0801	22-Aug-99	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 10	< 5

All concentrations are in ug/L.

NA - Not analyzed

[1] South Carolina Department of Health and Environmental Control Risk Based Screening Levels for ground water.

[2] The Risk based screening level for individual PAH CoC is 10 ug/l or 25 ug/l for total PAHs.

[3] Trip blank

[J] Indicates presence of analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 9

FATE AND TRANSPORT INPUT PARAMETERS
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Parameter	Domenico Dilution/Attenuation Model[1]
Hydraulic Conductivity [m/sec]	2.61E-07
Hydraulic Gradient [ft/ft]	0.0202
Porosity [cm^3/cm^3]	0.55
Estimated Plume Length [ft]	NA
Soil Bulk Density[a] [g/cm^3]	1.4
Partition Coefficient [L/kg]	chemical specific
Fraction of Organic Carbon in soil [g/g]	1.09E10-^{2}
First Order Decay Rate [sec^{-1}]	0
Modeled Plume Length [ft]	NA
Modeled Plume Width [ft]	NA
Source Width[b] [m]	15
Source Thickness[b] [m]	2
Soluble Mass [kg]	Infinite[c]

Notes:
(1) - *South Carolina Risk-Based Corrective Action for Petroleum Releases,* South Carolina Department of Health and Environmental Control, 1998 (SCDHEC 1998).
(a) - Determined from Tables C1 and C3 (SCDHEC 1998)
(b) - Default value

TABLE 10

COMPARISON OF MAXIMUM CONCENTRATIONS TO RBSLs
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Concern	Maximum Concentration (Soil) (mg/kg)	RBSLs (Soil) (mg/kg)[a]	Maximum Concentration (GW) (mg/L)	Tier 1 RBSLs (GW) (mg/L)[b]	RBSLs (GW) Protective of On-Site Construction Worker[c]
Benzene	ND	0.005	ND	0.005	0.15
Toluene	0.004[j]	0.478	ND	1	5.38
Ethybenzene	ND	0.364	ND	0.7	6.05
Xylenes (Total)	ND	1.119	ND	10	102.33
Benzo(a)anthracene	4.1	17.687	ND	0.010	-
Benzo(b)fluoranthene	4.3	7.042	ND	0.010	-
Benzo(k)fluoranthene	1.8	5.593	ND	0.010	-
Chyrsene	**4.1**	3.146	ND	0.010	-
Dibenzo(a,h)anthracene	ND	21.265	ND	0.010	-
Naphthalene	**25.1**	0.052	**0.16**	0.010	1.63
MTBE	NA	Not Applicable	ND	0.040	1.63

(a) - From Risk-Based Corrective Action for Petroleum Releases, Table B4, Depth to GW - <5 ft, SCDHEC RBCA Guidelines, 1998.
(b) - From Risk-Based Corrective Action for Petroleum Releases, Table B1, SCDHEC RBCA Guidelines, 1998.
(c) - Calculated for dermal, incidental ingestion, and inhalation routes for the on-site construction worker (see Section 3.5.1 of the text and Appendix H).
(j) - Estimated value
GW - Groundwater
RBSLs - Risk Based Screening Levels
ND - Not detected
NA - Not analyzed
Shaded cell indicates the concentration exceeded one of the RBSLs.
MTBE - Methyl Tertiary Butyl Ether

TABLE 11

EXPOSURE PATHWAY ASSESSMENT - CURRENT USE
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Media	Exposure Route	Pathway Selected for Evaluation? (Yes or No)	Exposure point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation	No	No volatilization to enclosed space.	
	Explosion Hazard	No	No explosion hazard.	
Groundwater	Ingestion	No	No water supply well downgradient or residential basements.	
	Dermal contact	No		
	Inhalation	No		
Surface Water	Ingestion	No	Cooper River approximately 400 feet downgradient. No completed pathway.	No additional data required
	Dermal contact	No		
	Inhalation	No		
Surficial Soil	Ingestion	No	No impacted surface soil.	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	No	No current complete pathway.	
	Dermal contact	No		
	Inhalation	No		
	Leaching to Groundwater	No		

TABLE 12

EXPOSURE PATHWAY ASSESSMENT - FUTURE USE
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Media	Exposure Route	Pathway Selected for Evaluation? (Yes or No)	Exposure point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation	No	No volatilization to enclosed space.	
	Explosion Hazard	No	No explosion hazard.	
Groundwater	Ingestion	Yes	Future use of property expected to be industrial or commercial. Sanitary sewer line within close proximity to the site; therefore, construction worker exposure possible.	
	Dermal contact	Yes		
	Inhalation	Yes		
Surface Water	Ingestion	Yes	Cooper River approximately 400 feet downgradient. No completed pathway.	No additional data required
	Dermal contact	No		
	Inhalation	No		
Surficial Soil	Ingestion	No	No impacted surface soil.	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	Yes	A sanitary sewer line is within close proximity to the site; therefore, construction worker exposure possible. Inhalation hazard discounted based on low levels of benzene in the soil. Presumed that upon excavating the trench, benzene volatilization from exposed soils will reach equilibrium prior to the construction worker entering the trench.	
	Dermal contact	Yes		
	Inhalation	No		
	Leaching to Groundwater	Yes		

TABLE 13

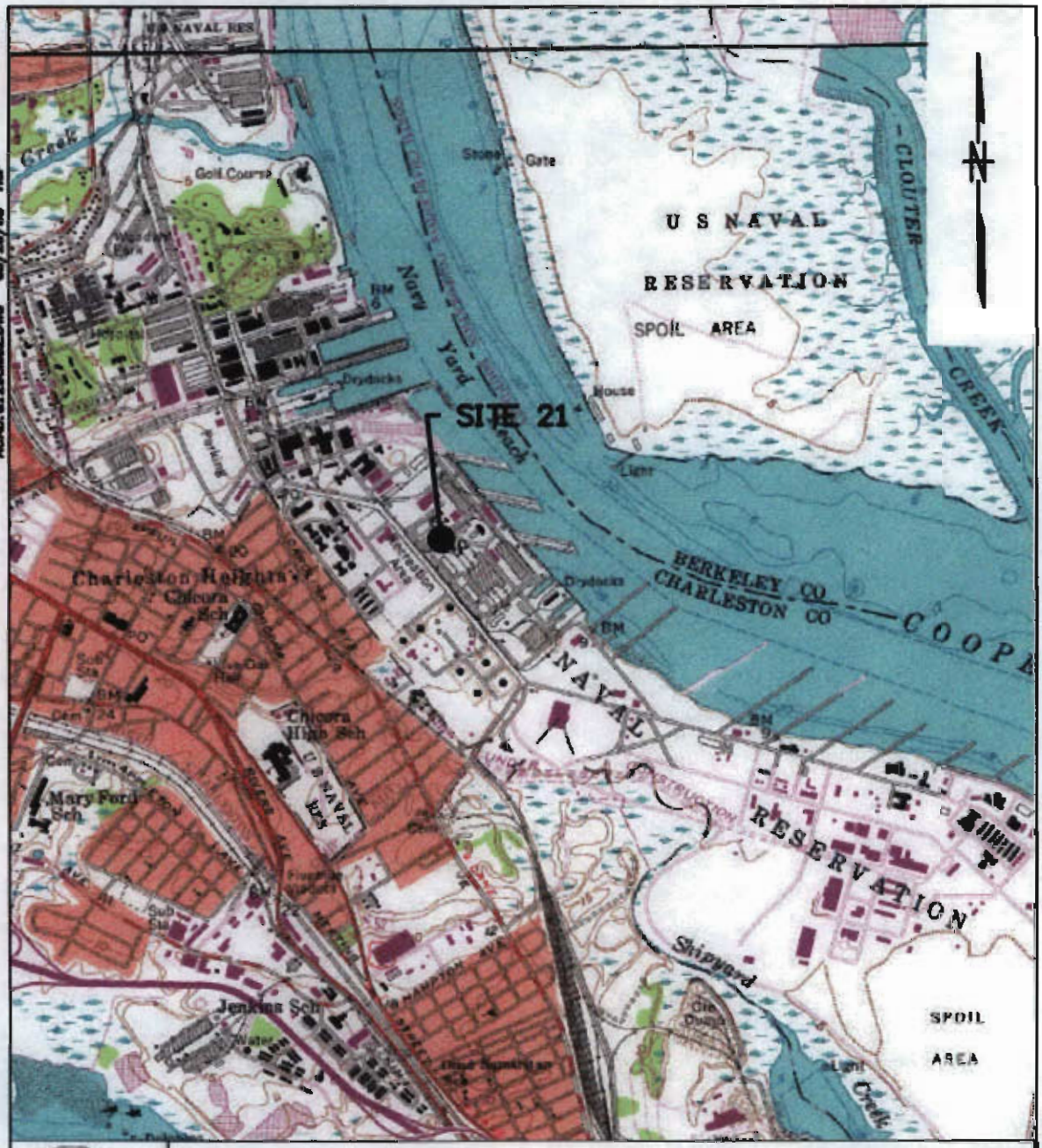
COMPARISON OF MAXIMUM GROUNDWATER CONCENTRATIONS TO SSTLs
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Concern	Source Area Concentration (mg/L)	SSTLs Protective of Surface Water (Cooper River)		SSTLs Protective of Construction Workers	Minimum On-Site SSTLs[a]
		$SSTL_{SOURCE}$ (mg/L)	$SSTL_{COMP}$ (mg/L)	$SSTL_{SOURCE}$ (mg/L)	(mg/L)
Benzene	ND	0.998	0.943	0.15	0.15
Toluene	ND	199.5	188.5	5.38	5.38
Ethylbenzene	ND	139.7	132	6.05	6.05
Xylenes	ND	1995	1885	102.33	102.33
Benzo(a) anthracene	4.10				
Benzo(b) fluoranthene	4.30				
Benzo(k)fluoranthene	1.80				
Chrysene	4.10				
Naphthalene	**25.10**	2	1.89	1.63	1.63

mg/L - milligrams per liter
GW - Groundwater
BOLD text indicates the concentration exceeded the SSTL.
ND - Not Detected

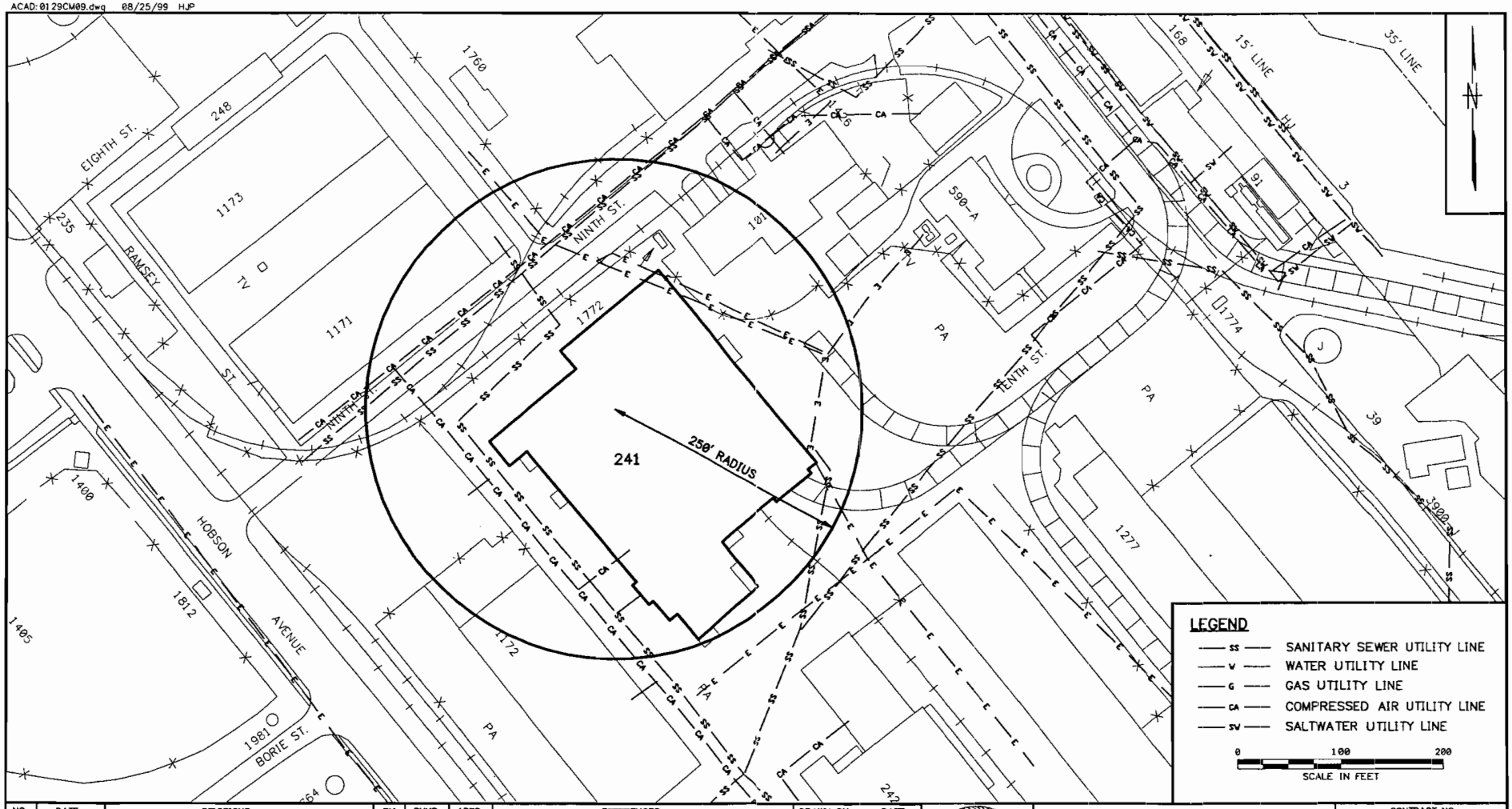
(a) The minimum on-site SSTLs are chosen as those SSTLs protective of both surface water (the Cooper River) and the on-site construction worker.

FIGURES



DRAWN BY HJP DATE 8/20/99		SITE LOCATION MAP SITE 21, BUILDING 241, ZONE F CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SC	CONTRACT NO. N0129
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED--AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1 REV. 0

ACAD: 0129CM09.dwg 08/25/99 HJP



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 8/25/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

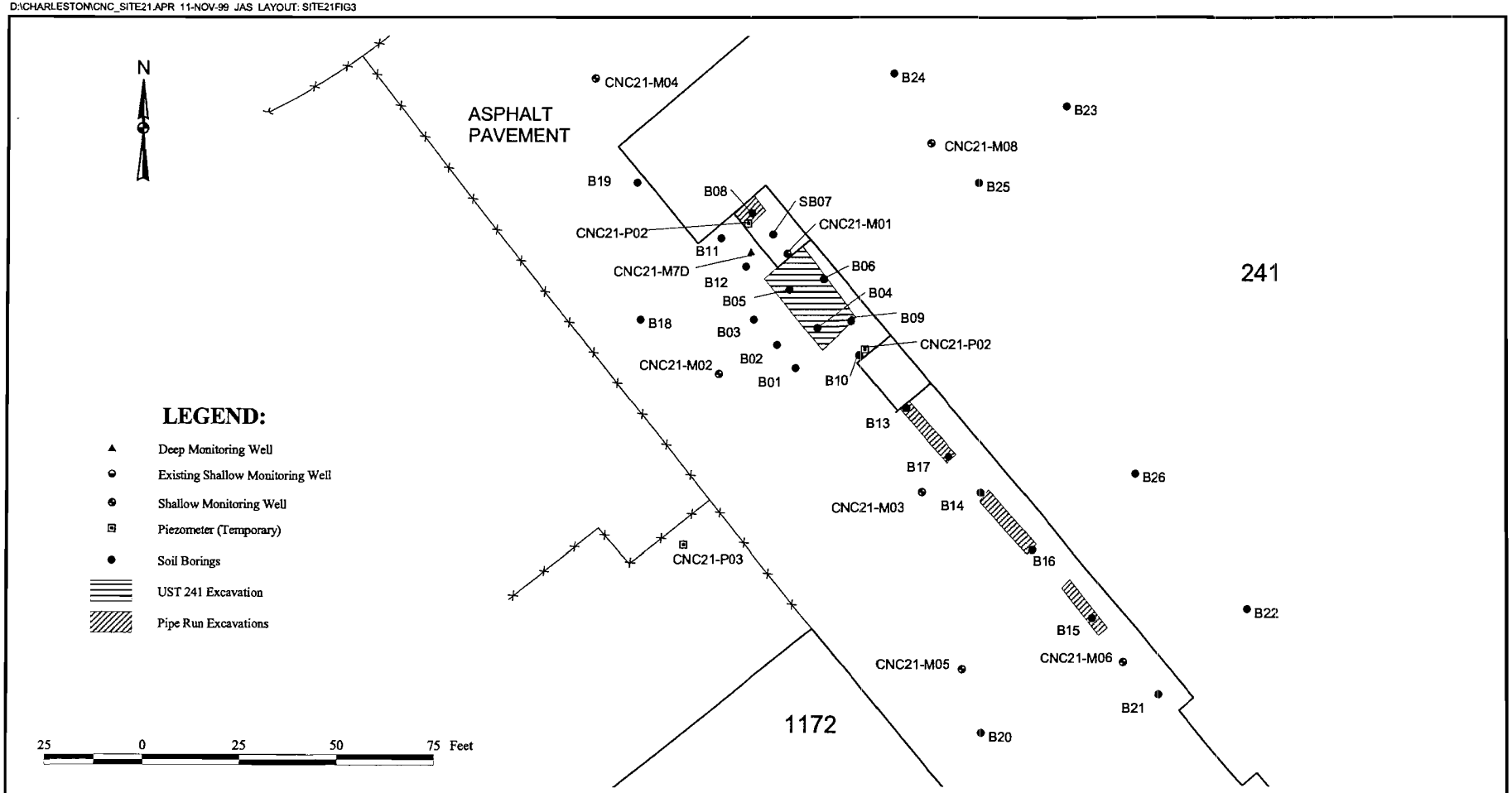
DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMMAND

SITE VICINITY MAP
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0129
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

D:\CHARLESTON\CNC_SITE21.APR 11-NOV-99 JAS LAYOUT: SITE21FIG3



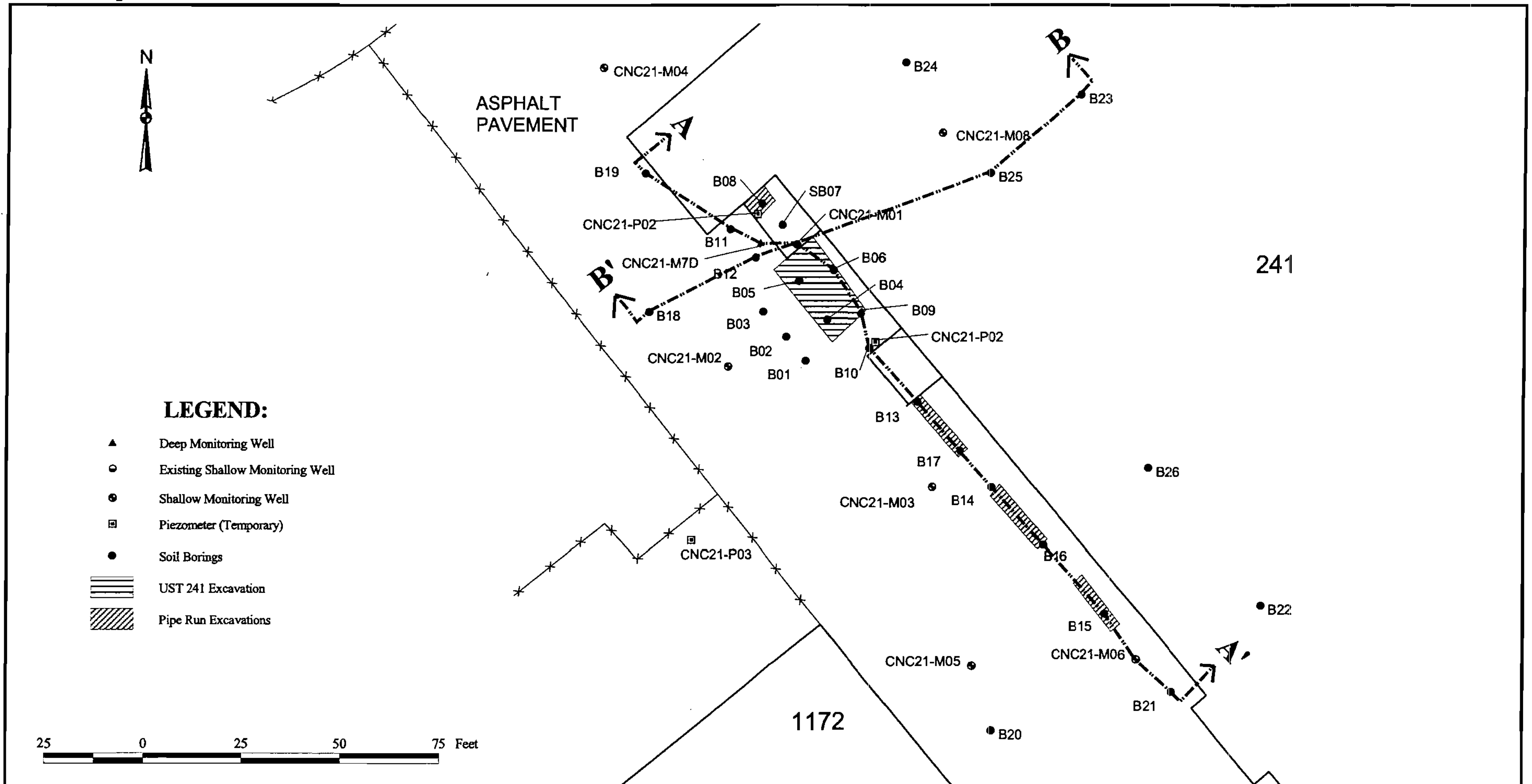
NO.	DATE	REVISIONS	BY	CHKD	APP'D	REFERENCES

DRAWN BY JAS DATE 11-11-99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SITE MAP SHOWING
SAMPLING LOCATIONS
SITE 21 BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO.
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 3
REV. 0

LAYOUT: SITE21FIG4



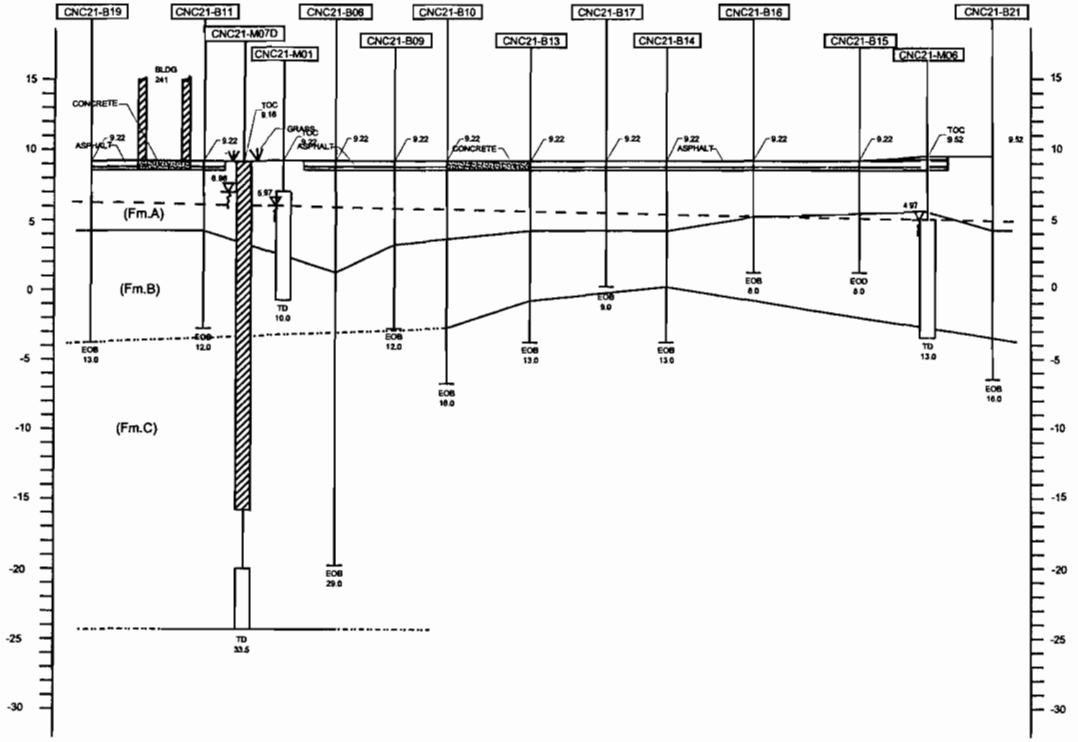
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY JAS — DATE 11-11-99
CHECKED BY — DATE
COST/SCHED-AREA
SCALE AS NOTED

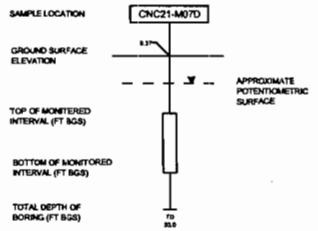
SITE MAP SHOWING
LINES OF CROSS-SECTION
SITE 21 BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0219
APPROVED BY — DATE
APPROVED BY — DATE
DRAWING NO. FIGURE 4 — REV. 0

D:\CHARLESTON\CNC_STIE21.APR 12-NOV-99 JAS LAYOUT: SITE21FIG5



LEGEND



NOTES:

FORMATION(Fm.)=(Fm.A)=LIGHT TO DARK SILTY SAND TO SANDY CLAY
(Fm.B)=LIGHT TO DARK GREY TO BLACK INTERBEDDED CLAYEY SAND, SILTY CLAY TO CLAY
(Fm.C)=OLIVE GREEN INTERBEDDED SILTY SAND, SILTY CLAY, CLAYEY SAND, CLAY (ASHLEY FORMATION)

ND=NO DATA
ELEVATION IN FEET ABOVE MEAN SEA LEVEL (FT AMSL)

20 0 20 40
HORIZONTAL SCALE IN FEET

10 0 10 20
VERTICAL SCALE IN FEET

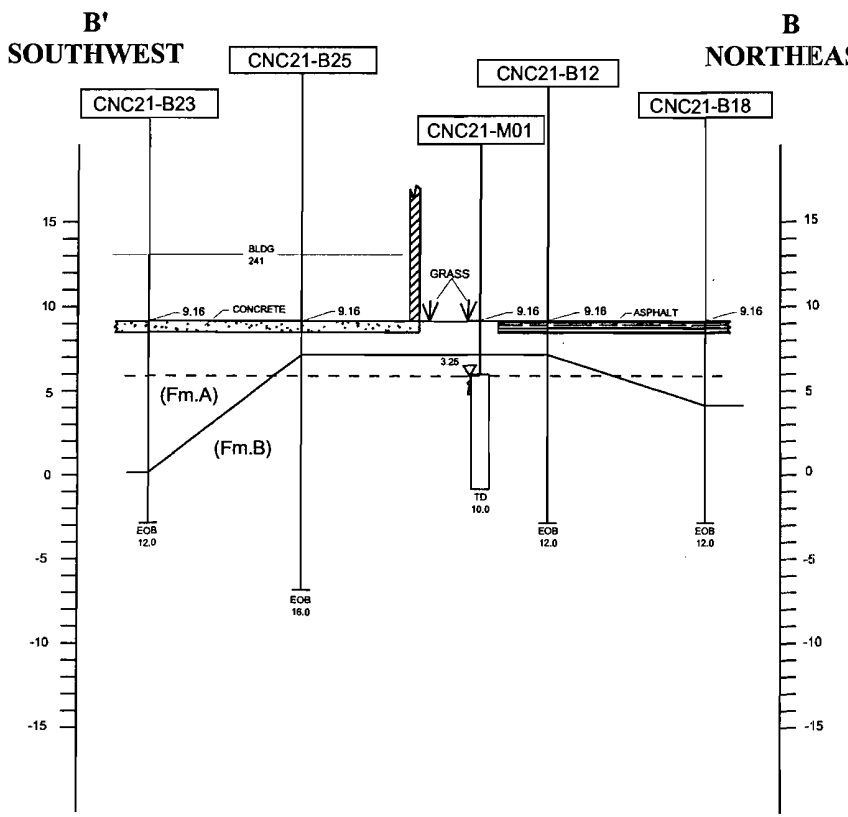
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY JAS	DATE 11-12-99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE AS NOTED	

GEOLOGIC CROSS SECTION A - A'
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0219	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 5	REV. 0

D:\CHARLESTON\CNC_SITE21.APR 15-NOV-99 JAS LAYOUT: SITE21FIG6



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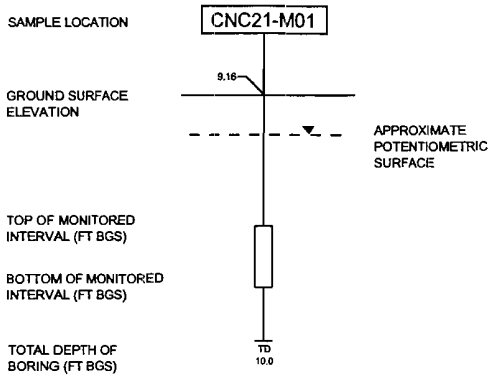


NOTES:

FORMATION=(Fm.)=(Fm.A)=LIGHT TO DARK BROWN SILTY SAND, TO SANDY CLAY

(Fm.B)=LIGHT TO DARK GREY TO BLACK INTERBEDDED CLAYEY SAND, SILTY CLAY, TO CLAY

ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT AMSL)

20 0 20 40

HORIZONTAL SCALE IN FEET

10 0 10 20

VERTICAL SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY JAS — DATE 11-15-99

CHECKED BY — DATE

COST/SCHED-AREA

SCALE AS NOTED

GEOLOGIC CROSS SECTION B - B'
SITE 21, BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0219

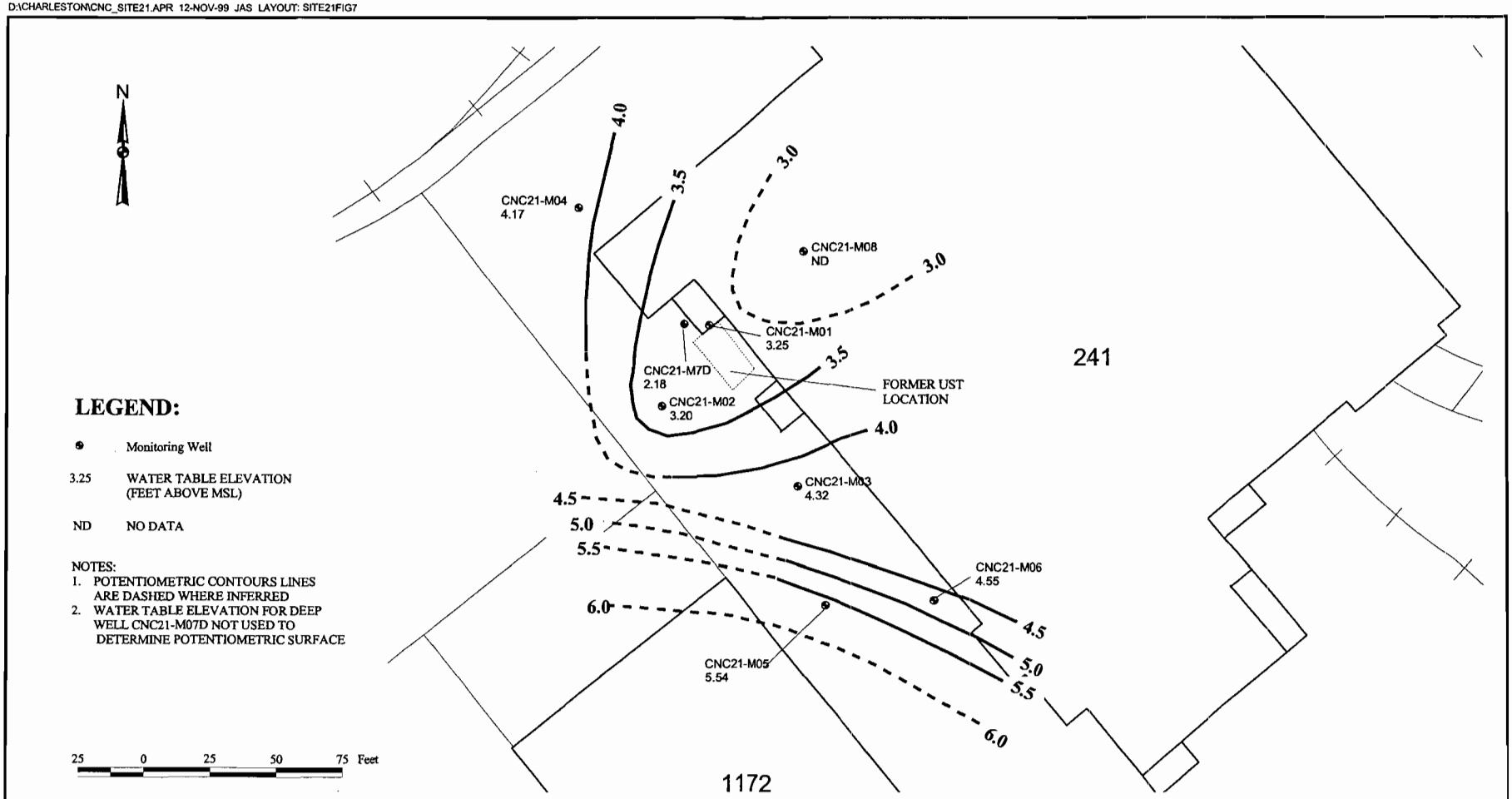
APPROVED BY — DATE

APPROVED BY — DATE

DRAWING NO. FIGURE 6

REV. 0

D:\CHARLESTON\CNC_SITE21.APR 12-NOV-99 JAS LAYOUT: SITE21FIG7



LEGEND:

- ⊙ Monitoring Well
- 3.25 WATER TABLE ELEVATION (FEET ABOVE MSL)
- ND NO DATA

NOTES:
1. POTENTIOMETRIC CONTOURS LINES ARE DASHED WHERE INFERRED
2. WATER TABLE ELEVATION FOR DEEP WELL CNC21-M07D NOT USED TO DETERMINE POTENTIOMETRIC SURFACE

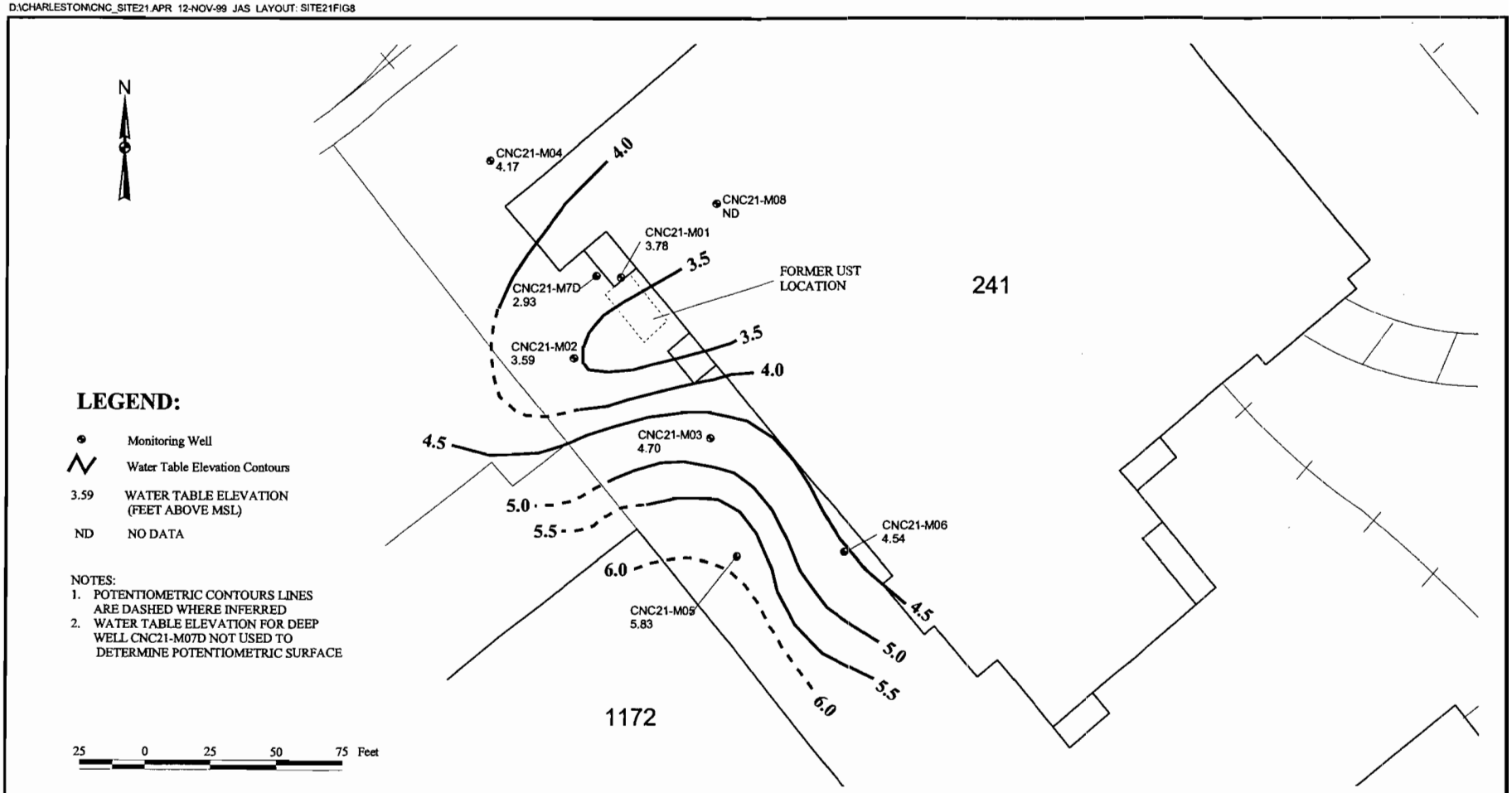
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY	DATE
JAS	11-12-99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE	AS NOTED

GROUNDWATER POTENTIOMETRIC SURFACE MAP
AUGUST 8, 1999
SITE 21 BUILDING 241
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO.	0219
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	FIGURE 7
REV.	0

D:\CHARLESTON\CNC_SITE21.APR 12-NOV-99 JAS LAYOUT: SITE21FIG8



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY	DATE
JAS	12-NOV-99
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE	
AS NOTED	

GROUNDWATER POTENTIOMETRIC SURFACE MAP
OCTOBER 13, 1999
SITE 21 BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO.	0219
APPROVED BY	DATE
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DRAWING NO.	REV.
FIGURE 8	0

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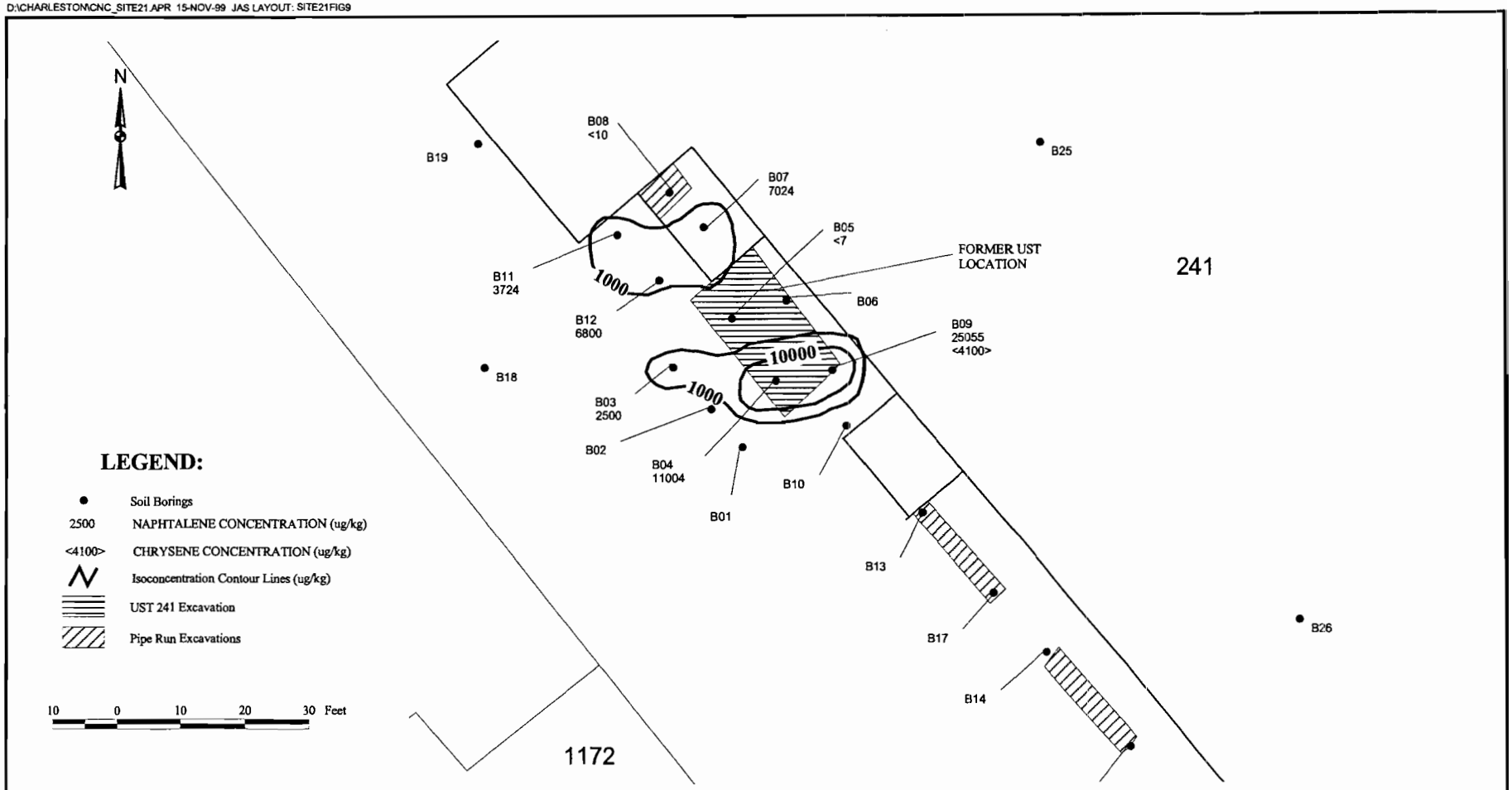


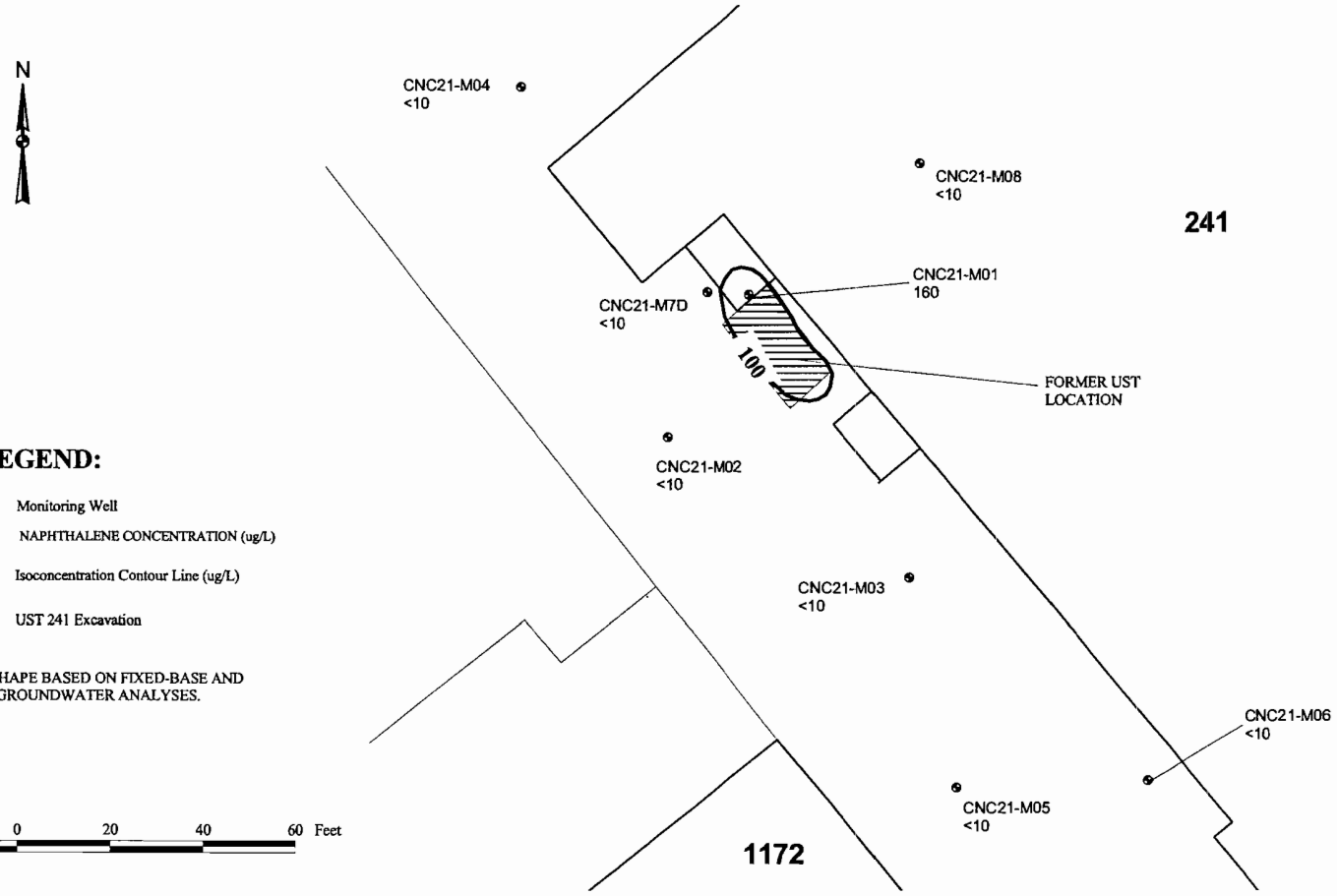
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY JAS DATE 11-15-99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SOIL NAPHTHALENE CONCENTRATION MAP
SITE 21 BUILDING 241
ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0219
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 9
REV. 0

D:\CHARLESTON\CNC_SITE21.APR 15-NOV-99 JAS LAYOUT: SITE21FIG10



LEGEND:

- Monitoring Well
- 160 NAPHTHALENE CONCENTRATION (ug/L)
- Isoconcentration Contour Line (ug/L)
- UST 241 Excavation

NOTES:
PLUME SHAPE BASED ON FIXED-BASE AND MOBILE GROUNDWATER ANALYSES.

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY JAS — DATE 11-NOV-99
CHECKED BY — DATE
COST/SCHED-AREA
SCALE AS NOTED

GROUNDWATER NAPHTHALENE CONCENTRATION MAP
SITE 21 BUILDING 241
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0219
APPROVED BY — DATE
APPROVED BY — DATE
DRAWING NO. FIGURE 10
REV. 0

APPENDIX A

UNDERGROUND STORAGE TANK ASSESSMENT REPORT - UST 241

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201-1708

Mr. Gabriel L. Magwood
Southern Division NFEC
P.O. Box 190010
2155 Eagle Drive
North Charleston, South Carolina 29419-9010

Re: Assessment Report dated December 2, 1996
Charleston Naval Base Building 241 (UST 02-241-001)
(Site Identification # 17706)
Charleston County

Date: January 13, 1997

Dear Mr. Magwood:

The author has completed technical review of the referenced document. As submitted, the report provides analytical results of environmental sampling conducted to determine if releases have occurred from operation of the referenced underground storage tank and/or associated piping system. The results presented indicate elevated levels of polynuclear aromatic hydrocarbons (PAH) were detected in soils grab samples obtained from the tank pit and piping run. Further, based on the qualifiers presented for the groundwater grab sample obtained it appears likely that groundwater impacts have occurred at this site. These results appear to necessitate additional endeavors for remedial actions (soils removal) and contamination characterization (assessment activities, including groundwater investigations), as appropriate. In this regard, assessment/corrective action activities provided in the Tank Management Plan (dated October 18, 1996) should be implemented in an appropriate and timely manner. Please be reminded that groundwater sampling (if necessary) will require construction of sampling points and will need to be submitted for prior review and approval, as appropriate.

Should you have any questions, please contact me at (803) 734-5328.

Sincerely,

Paul L. Bristol, Hydrogeologist
Groundwater Assessment and Development Section
Bureau of Water

cc: Trident District EQC

South Carolina Department of Health and Environmental Control (S.C.D.H.E.C.)
Underground Storage Tank (UST) Assessment Report

Date Received State Use Only

Submit Completed Form to:
UST Regulatory Section
SCDHEC
2600 Bull Street
Columbia, South Carolina 29201
Telephone (803) 734-5331

I OWNERSHIP OF UST(S)

Agency/Owner: Southern Division, Naval Facilities Engineering Command, Caretaker Site Office

Mailing Address: P.O. Box 190010

City: N. Charleston State: SC Zip Code: 29419-9010

Area Code: 803 Telephone Number: 743-9985 Contact Person: LCDR Paul Rose

II SITE IDENTIFICATION AND LOCATION

Site I.D. #: Not regulated

Facility Name: Charleston Naval Base Complex, Bldg 241, UST 02-241-001

Street Address: South Hobson Avenue

City: North Charleston, 29405-2413 County: Charleston

III CLOSURE INFORMATION

Closure Started:8 July 1996 Closure Completed: 22 July 1996

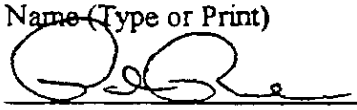
Number of USTs Closed: 1

N/A	SPORTENVDETCHASN
Consultant	UST Removal Contractor

IV. CERTIFICATION (Read and Sign after completing entire submittal)

I certify that I have personally examined and am familiar with the information submitted in this and all attached documents; and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate and complete.

LCDR Paul Rose
Name (Type or Print)



Signature

V. UST INFORMATION

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6
A. Product	#2 Fuel oil					
B. Capacity	6,000gal					
C. Age	1987					
D. Construction Material	Fiberglass					
E. Month/Year of Last Use	4/96					
F. Depth (ft.) To Base of Tank	11'					
G. Spill Prevention Equipment Y/N	N					
H. Overfill Prevention Equipment Y/N	N					
I. Method of Closure Removed/Filled	R					
J. Visible Corrosion or Pitting Y/N	N					
K. Visible Holes Y/N	N					

L. Method of disposal for any USTs removed from the ground (attach disposal manifests)

The UST was removed from the ground, drained, cut open at both ends, cleaned with a steam cleaner, and disposed of at the local municipal landfill. (See Attachment III.)

M. Method of disposal for any liquid petroleum, sludges, or waste waters removed from the USTs (attach disposal manifests)

Nine hundred gallons of free product were removed from the excavation. The free product, waste water, and sludge were recycled. One 55 gallon drum of soil/petroleum mixture was shipped out as non-regulated waste and disposed of by Chem-Met Services, Inc; 1855 Allen Road; Wyandotte, MI 48192. (See Attachment III, Manifest No. 13119, paragraph 11b.)

N. If any corrosion, pitting, or holes were observed, describe the location and extent for each UST

The UST was found to be in good condition. See photo 3, Attachment I.

VI. PIPING INFORMATION

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6
A. Construction Material.....	Steel					
B. Distance from UST to Dispenser.....	Pipe run: A) 21' B) 104'					
C. Number of Dispensers.....	2					
D. Type of System P/S.....	S					
E. Was Piping Removed from the Ground? Y/N....	Y					
F. Visible Corrosion or Pitting Y/N.....	Y					
G. Visible Holes Y/N.....	*Y					
H. Age.....	1987					

* See Attachment I

I. If any corrosion, pitting, or holes were observed, describe the location and extent for each line.

UST 02-241-001 provided fuel to Building 241 via two pipe runs, labeled A and B on the Site Maps in Attachment I. The steel pipes were severely corroded throughout their length wherever their protective coating had become corrupted. Holes were found in numerous locations, but typically adjacent to a mechanical joint. The supply piping T joint at the tank was so corroded the piping was held in place by the surrounding earth (see Attachment I, Photo 2).

Because of the concrete slabs, asphalt paving, and the piping's proximity to the building, the piping was not completely excavated along the pipe runs. Instead, the pipeline was excavated at the coupling/joints and subsequently pulled from the ground. It was then laid out and inspected. Areas where holes were found were excavated for further inspection and sampling. See photographs in Attachment I.

VII. BRIEF SITE DESCRIPTION AND HISTORY

Building 241 served as the Charleston Naval Base Crane Shop after construction was completed in 1987 until base closure. UST 02-241-001 was an unregulated fuel oil tank which provided #2 fuel oil to Building 241. Approximately 900 gallons of free product was pumped out of the excavation during the removal of UST 02-241-001. The site is situated approximately 800 feet from the Cooper River.

VIII. SITE CONDITIONS

		Yes	No	Unk
A.	Were any petroleum-stained or contaminated soils found in the UST excavation, soil borings, trenches, or monitoring wells? If yes, indicate depth and location on the site map.	X		
B.	Were any petroleum odors detected in the excavation, soil borings, trenches, or monitoring wells? If yes, indicate location on site map and describe the odor (strong, mild, etc.)	X		
C.	Was water present in the UST excavation, soil borings, or trenches? If yes, how far below land surface (indicate location and depth)? Bottom of excavation, 10' below GSL, 12" deep	X		
D.	Did contaminated soils remain stockpiled on site after closure? If yes, indicate the stockpile location on the site map. Name of DHEC representative authorizing soil removal: _____		X	
E.	Was a petroleum sheen or free product detected on any excavation or boring waters? [* 8' below GSL, 24" deep] If yes, indicate location and thickness.	*X		

IX. SAMPLE INFORMATION

S.C.D.H.E.C. Lab Certification Number 10120

Sample #	Location	Sample Type (Soil/Water)	Depth*	Date/Time of Collection	Collected By	OVA#
SPORT 0099-1	Center of excavation	Free product	8'	10 July 96 1120	W. Nesbit	Not Taken
SPORT 0099-2	Center of excavation	Water	10'	10 July 96 1230	W. Nesbit	Not Taken
SPORT 0099-3	South end of tank	Soil	11'	10 July 96 1300	W. Nesbit	Not Taken
SPORT 0107-1	Pipe run A	Soil	3' 6"	22 July 96 0815	W. Nesbit	Not Taken
SPORT 0107-2	Pipe run B	Soil	3' 6"	22 July 96 0830	W. Nesbit	Not Taken
SPORT 0107-3	Pipe run B	Soil	3' 6"	22 July 96 0845	W. Nesbit	Not Taken
SPORT 0107-4	Pipe run B	Soil	3' 6"	22 July 96 0900	W. Nesbit	Not Taken
SPORT 0107-5	Pipe run B	Soil	3' 6"	22 July 96 0915	W. Nesbit	Not Taken
SPORT 0107-6	Pipe run B	Soil	3' 6"	22 July 96 0930	W. Nesbit	Not Taken

* = Depth Below the Surrounding Land Surface

X. SAMPLING METHODOLOGY

Provide a detailed description of the methods used to collect and store (preserve) the samples.

After the removal of UST 02-241-001 free product, soil, and ground water samples were taken. Sampling was performed in accordance with SC DHEC R.61-92 Part 280 and SC DHEC UST Assessment Guidelines.

The samples are identified as follows:

	Detachment Charleston		General-Engineering Labs
Free Product Sample	UST 241-1	=	SPORT -0099-1
Ground Water Sample	UST 241-2	=	SPORT -0099-2
Soil Sample	UST 241-3	=	SPORT -0099-4
Soil Sample	UST 241-4	=	.....
Soil Sample	UST 241-5	=	SPORT -0107-1
Soil Sample	UST 241-6	=	SPORT -0107-2
Soil Sample	UST 241-7	=	SPORT -0107-3
Soil Sample	UST 241-8	=	SPORT -0107-4
Soil Sample	UST 241-9	=	SPORT -0107-5
Soil Sample	UST 241-10	=	SPORT -0107-6

Sample UST 241-4 was determined unacceptable due to its predominant composition of pea gravel.

Sample jars were prepared by the testing laboratory. The grab method was utilized to fill the sample containers leaving as little head space as possible and immediately capped. Soil samples were extracted at the tank ends just above ground water level. Ground water samples were taken from the bottom center of the excavation where the tank had rested. UST piping soil samples were taken under the piping at the mechanical connections and/or beneath the holes in the piping.

The samples were marked, logged, and immediately placed in sample coolers packed with ice to maintain an approximate temperature of 4° C. Tools were thoroughly cleaned and decontaminated with organic-free soap and water after each sample.

The samples remained in the custody of SPORTENVDETCHASN until they were transferred to General Engineering Laboratories for analysis as documented in the attached Chain-of-Custody Record.

XI. RECEPTORS

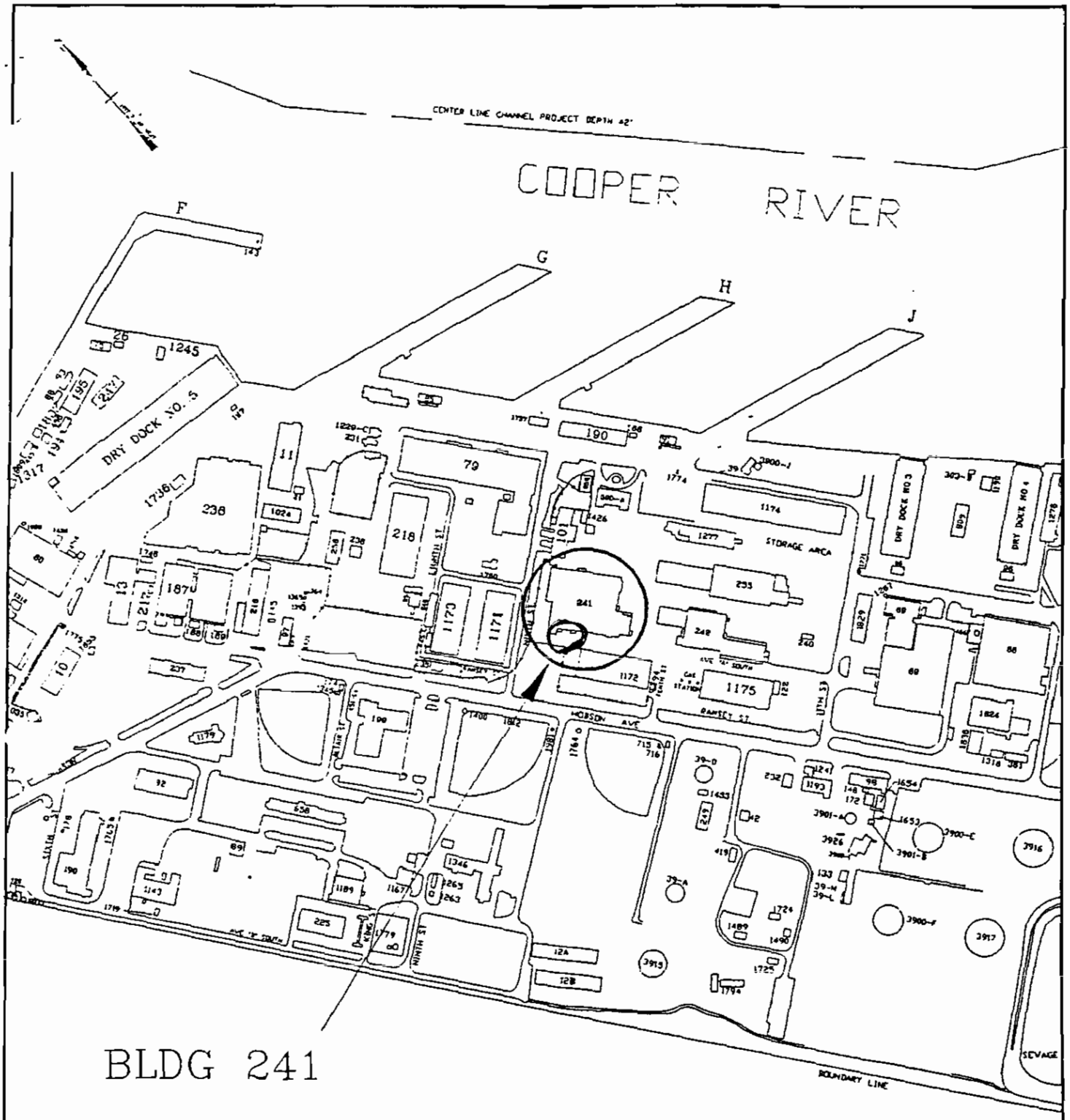
		Yes	No
A.	Are there any lakes, ponds, streams, or wetlands located within 1000 feet of the UST system? [* Cooper R. 804'] If yes, indicate type of receptor, distance, and direction on site map.	*X	
B.	Are there any public, private, or irrigation water supply wells within 1000 feet of the UST system? If yes, indicate type of well, distance, and direction on site map.		X
C.	Are there any underground structures (e.g., basements) located within 100 feet of the UST system? If yes, indicate the type of structure, distance, and direction on site map.		X
D.	Are there any underground utilities (e.g., telephone, electricity, gas, water, sewer, storm drain) located within 100 feet of the UST system that could potentially come in contact with the contamination? [*storm drain] If yes, indicate the type of utility, distance, and direction on the site map.	*X	
E.	Has contaminated soil been identified at a depth of less than 3 feet below land surface in an area that is not capped by asphalt or concrete? If yes, indicate the area of contaminated soil on the site map. [*2']	*X	

Attachment I

SITE MAP

You must supply a scaled site map. It should include all buildings, road names, utilities, tank and pump island locations, sample locations, extent of excavation, and any other pertinent information.

Site Maps 1 through 5
Photographs 1 through 6



CHARLESTON NAVAL SHIPYARD
CHARLESTON, SC

300 0 300 600

GRAPHIC SCALE

Figure: Site Map 1
UST 02-241-001
Charleston Naval Base
Charleston, SC

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

DWG DATE: 3 Oct 1996

DWG NAME: B241_1

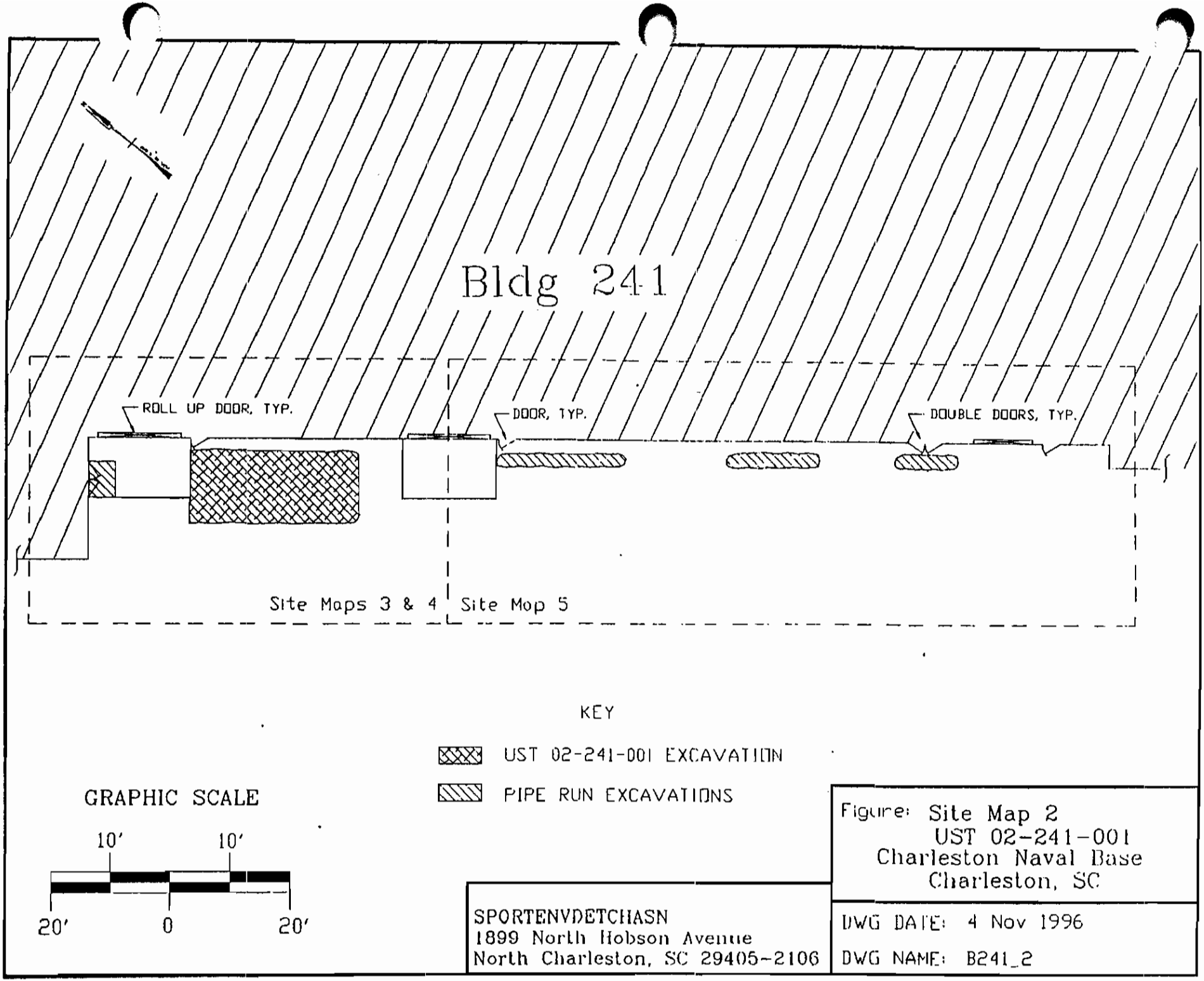


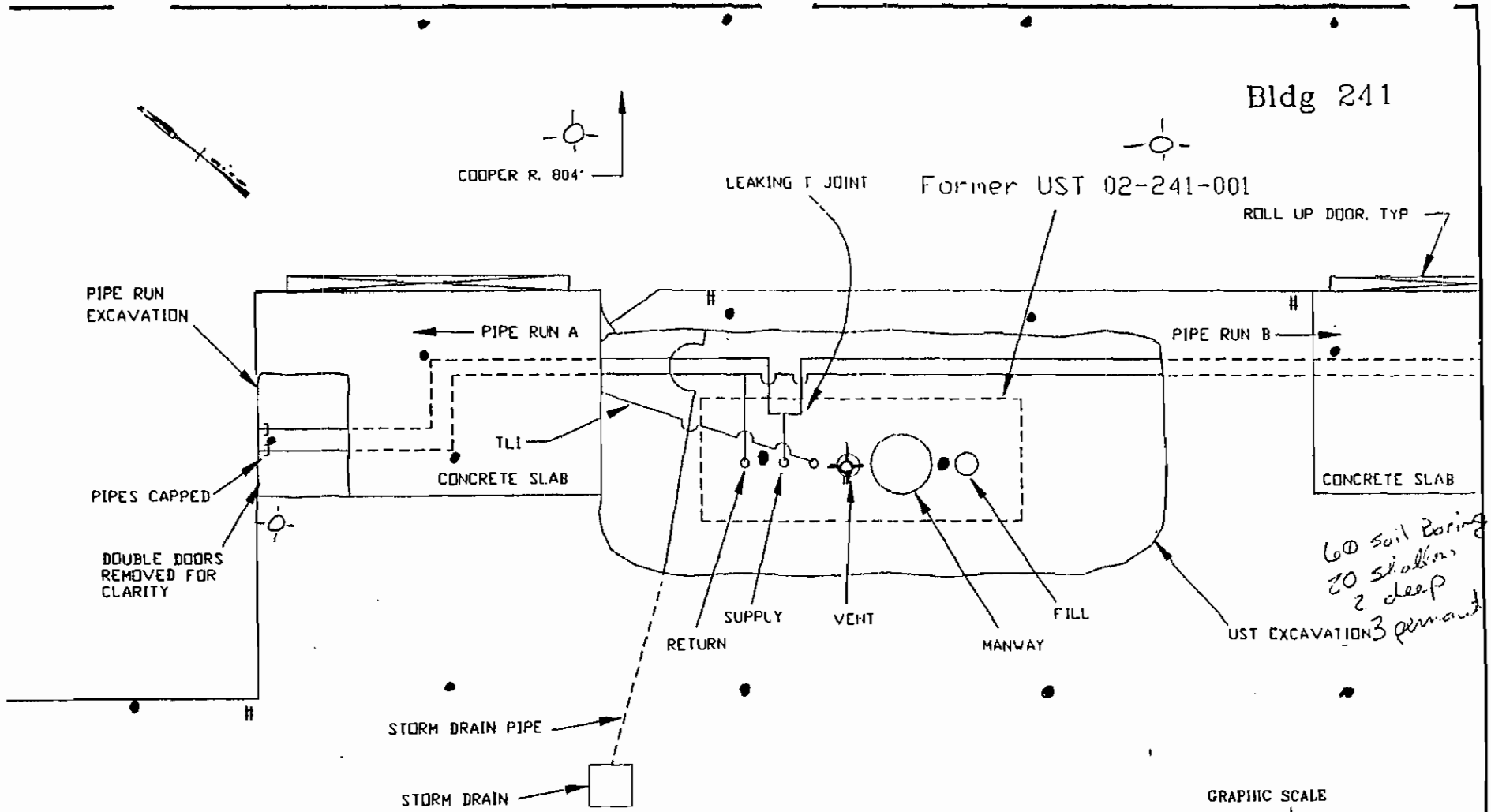
Figure: Site Map 2
UST 02-241-001
Charleston Naval Base
Charleston, SC

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

DWG DATE: 4 Nov 1996

DWG NAME: B241_2

~15-foot spacing



NOTE:

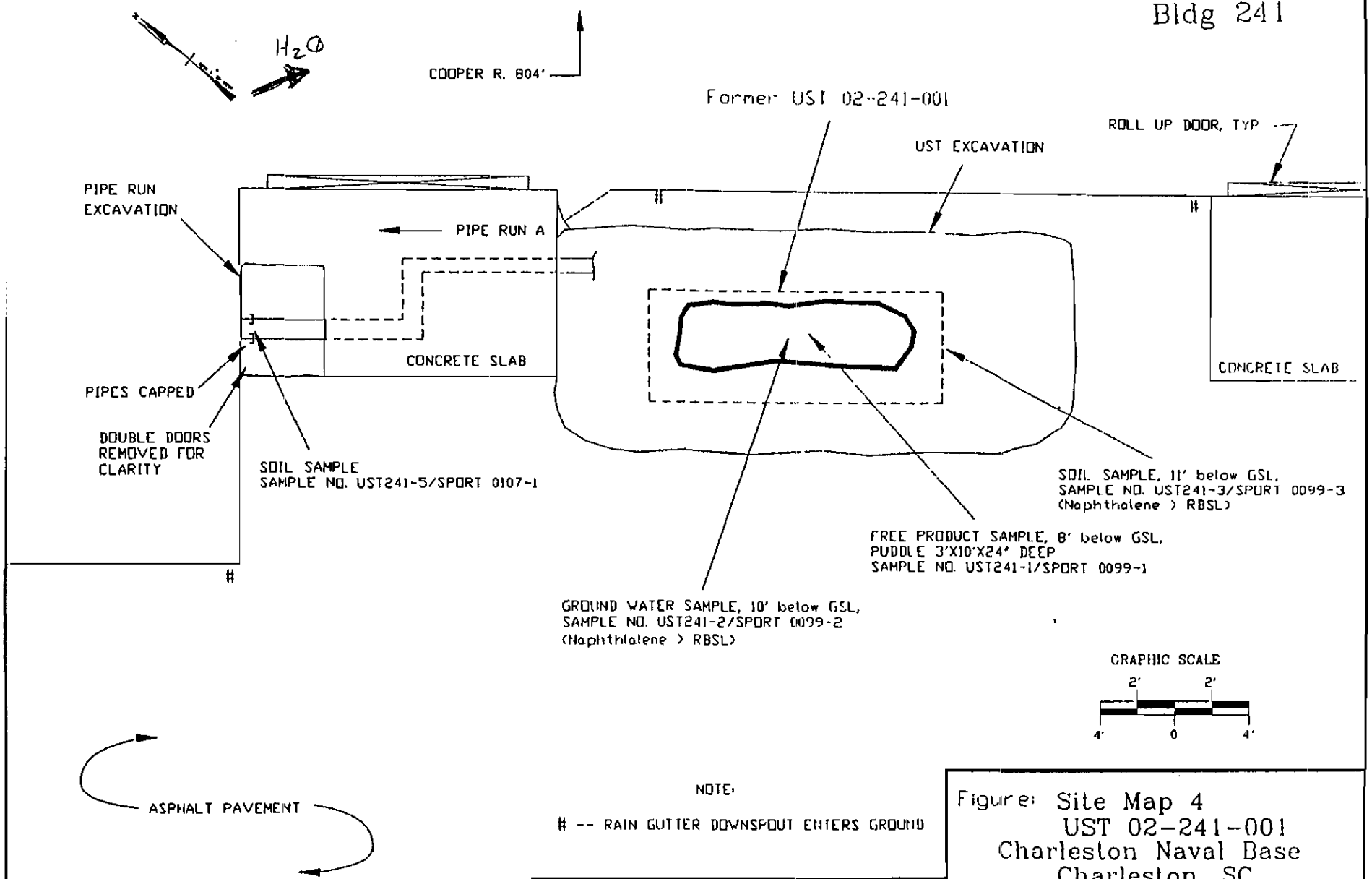
-- RAIN GUTTER DOWNSPOUT ENTERS GROUND

Figure: Site Map 3
UST 02-241-001
Charleston Naval Base
Charleston, SC

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

DWG DATE: 24 Oct 1996

DWG NAME: B241_3



NOTE:

-- RAIN GUTTER DOWNSPOUT ENTERS GROUND

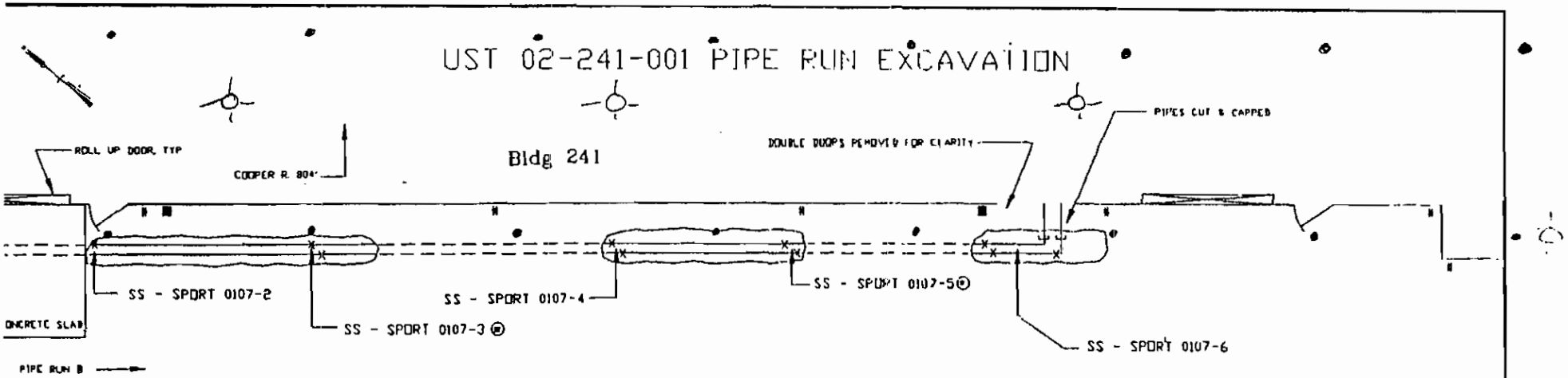
Figure: Site Map 4
UST 02-241-001
Charleston Naval Base
Charleston, SC

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

DWG DATE: 23 Oct 1996

DWG NAME: B241_4

UST 02-241-001 PIPE RUN EXCAVATION



NOTE

Pipes were pulled out of the ground between trenches

KEY

- ■ -- ELECTRICAL BOX CONDUIT ENTERS GROUND
- ⊛ -- NAPHTHALENE > RBSL
- ⬭ -- PIPE RUN EXCAVATION
- R -- RAIN GUTTER DOWNSPOUT ENTERS GROUND
- S -- SEWER MANHOLE
- SS -- SOIL SAMPLE
- SD -- STORM DRAIN
- X -- MECHANICAL JOINT/LEAK

GRAPHIC SCALE

4' 4'

8' 0 8'

S

Figure: Site Map 5
UST 02-241-001
Charleston Naval Base
Charleston, SC

DWG DATE: 24 Oct 1996

DWG NAME: 8241_

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

UST 02-241-001
(AKA UST 241)

Photo 1: UST 241 excavation in progress.

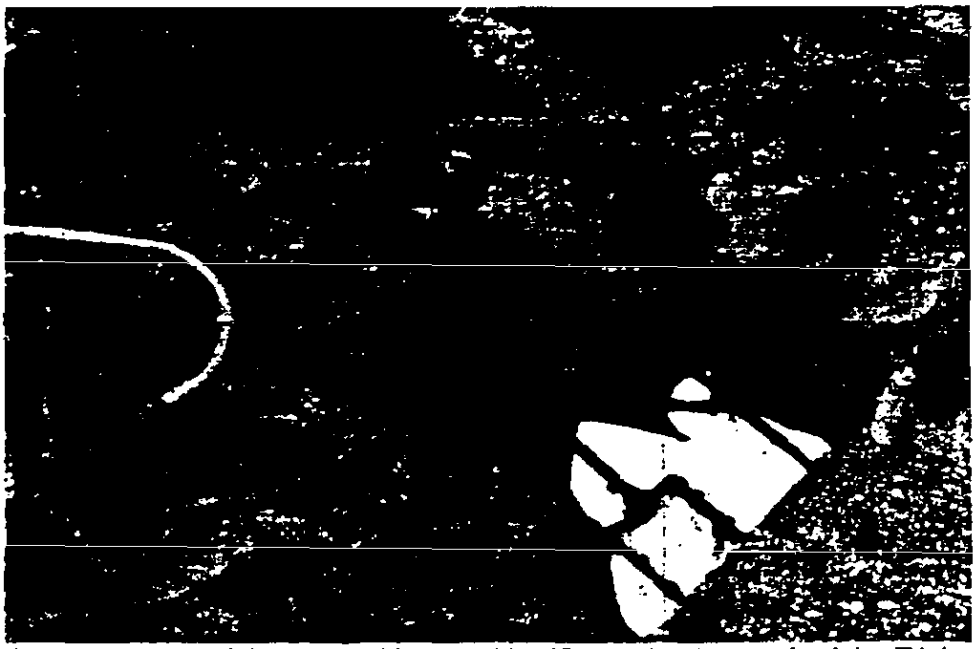


Photo 2: UST 241 piping . The white cloth identifies the leaking supply piping T joint.

UST 02-241-001
(AKA UST 241)

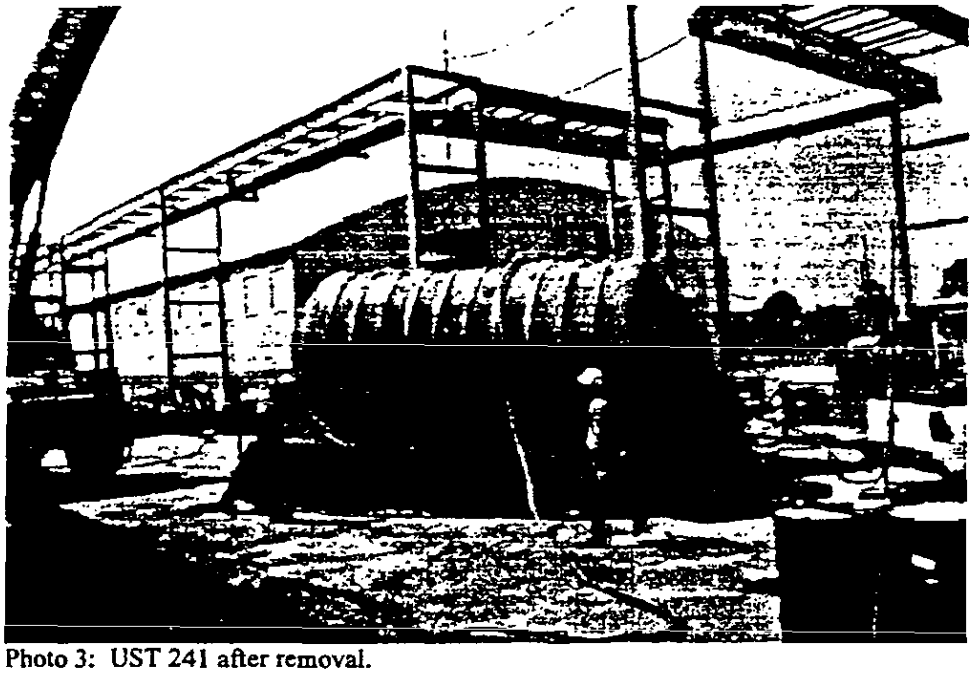


Photo 3: UST 241 after removal.

Photo 4. UST 241 excavation. Note free product in the bottom of the excavation.

UST 02-241-001
(AKA UST 241)

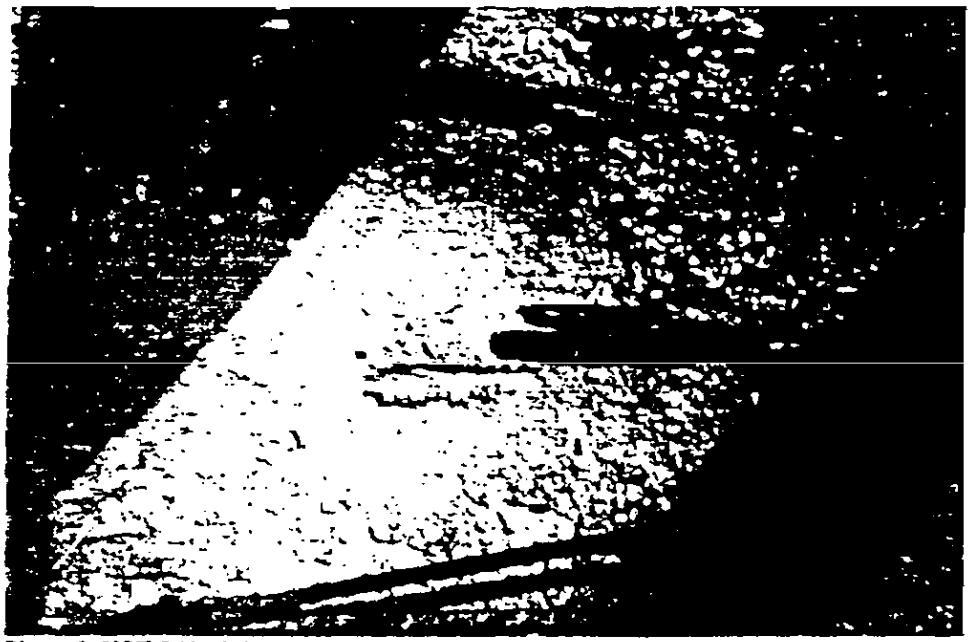


Photo 5: UST 241 piping.

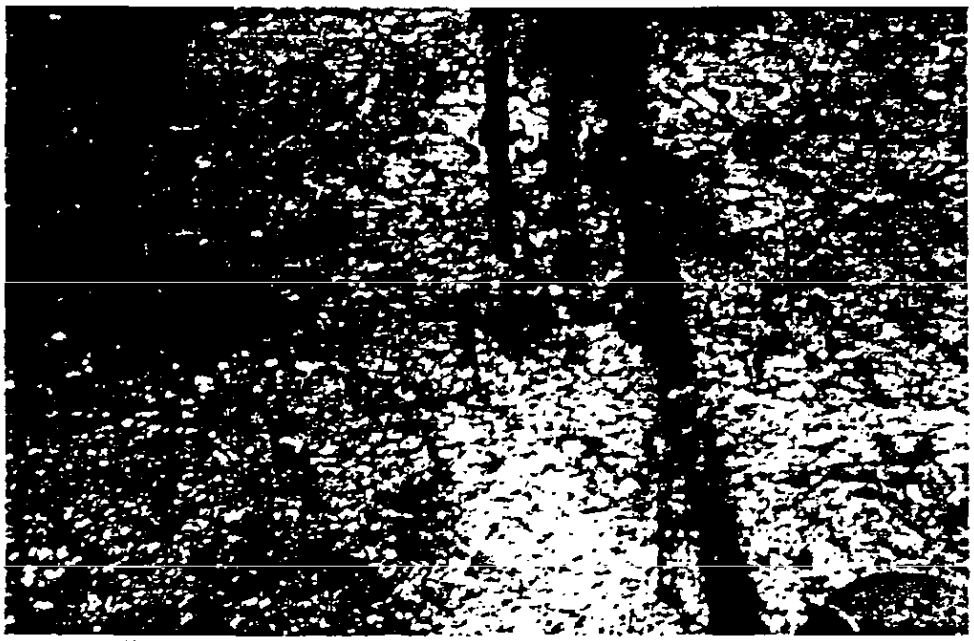


Photo 6: UST 241 piping.

Attachment II

ANALYTICAL RESULTS

You must submit the laboratory report and chain-of-custody form for the samples. These samples must be analyzed by a South Carolina certified laboratory.

Certified Analytical Results
Chain-of-Custody

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-1
Lab ID : 9607181-01
Matrix : Oil
Date Collected : 07/10/96
Date Received : 07/10/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
PCB analysis - 7 items											
PCB-1016	U	0.00	1.25	1.56	mg/kg	1.0	JPA	07/12/96	0934	87124	1
PCB-1221	U	0.00	1.25	1.56	mg/kg	1.0					
PCB-1232	U	0.00	1.25	1.56	mg/kg	1.0					
PCB-1242	U	0.00	1.25	1.56	mg/kg	1.0					
PCB-1248	U	0.00	1.25	1.56	mg/kg	1.0					
PCB-1254	U	0.00	1.25	1.56	mg/kg	1.0					
PCB-1260	U	0.00	1.25	1.56	mg/kg	1.0					
Metals Analysis											
Silver	U	-0.299	0.390	2.50	mg/kg	1.0	JSS	07/17/96	1154	87225	2
Arsenic	U	-5.21	2.11	15.0	mg/kg	1.0					
Barium	U	0.0330	0.110	2.50	mg/kg	1.0					
Cadmium	U	0.0565	0.165	2.00	mg/kg	1.0					
Chromium	U	0.164	0.210	2.50	mg/kg	1.0					
Lead	U	0.860	1.82	5.00	mg/kg	1.0					
Selenium	U	0.634	4.21	15.0	mg/kg	1.0					
Mercury	J	3.23	2.18	29.4	ug/kg	1.0	RMJ	07/17/96	0056	87221	N
General Chemistry											
Flash Point, Setaflash (200F)		176	200	200	F	1.0	JBH	07/16/96	1500	87295	3
pH - 2 items											
pH		5.73	0.0100	0.0100	SU	1.0	JHC	07/10/96	1726	87095	4
pH Temperature		24.9	0.100	0.100	C	1.0					
Extractable Organic Halides	U	-10.2	4.67	14.5	mg/kg	1.0	SJ	07/16/96	1353	87137	5

The following prep procedures were performed:

PCB's	JPA	07/11/96	1500	87124 5
ICP	FGD	07/16/96	1530	87225 6

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Mercury							RMJ	07/16/96	1300	87221	7

Surrogate Recovery	Test	Percent%	Acceptable Limits
4CMX	PCB	96.0	(41.0 - 161.)

M = Method	Method Description
M 1	EPA 8080
M 2	EPA 6010A
M 3	SW 846 1020
M 4	EPA 9045
M 5	GEL
M 6	EPA 3050
M 7	EPA 7471

Notes:
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* Indicate that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-1

GEL Laboratory Certifications		EPI Laboratory Certifications	
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-231	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
NJ - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen F. Green

Analytical Report Specialist

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2105
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-2
Lab ID : 9607181-02
Matrix : GroundH2O
Date Collected : 07/10/96
Date Received : 07/10/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	2500	5000	ug/l	2500	RMB	07/17/96	1445	87312	1
Ethylbenzene	U	250	2500	5000	ug/l	2500					
Toluene	U	0.00	2500	5000	ug/l	2500					
Xylenes (TOTAL)	U	575	2500	5000	ug/l	2500					
Methyl Tert Butyl Ether	U	0.00	5000	5000	ug/l	2500					
Naphthalene	J	4000	2500	5000	ug/l	2500					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	11100	22200	ug/l	1000	BDG	07/15/96	2213	87205	2
Acenaphthylene	U	0.00	11100	22200	ug/l	1000					
Anthracene	U	0.00	11100	22200	ug/l	1000					
Benzo(a)anthracene	U	0.00	11100	22200	ug/l	1000					
Benzo(a)pyrene	U	0.00	11100	22200	ug/l	1000					
Benzo(b)fluoranthene	U	0.00	11100	22200	ug/l	1000					
Benzo(ghi)perylene	U	0.00	11100	22200	ug/l	1000					
Benzo(k)fluoranthene	U	0.00	11100	22200	ug/l	1000					
Chrysene	U	0.00	11100	22200	ug/l	1000					
Dibenzo(a,h)anthracene	U	0.00	11100	22200	ug/l	1000					
Fluoranthene	U	0.00	11100	22200	ug/l	1000					
Fluorene	U	0.00	11100	22200	ug/l	1000					
Indeno(1,2,3-c,d)pyrene	U	0.00	11100	22200	ug/l	1000					
Naphthalene	U	0.00	11100	22200	ug/l	1000					
Phenanthrene	U	0.00	11100	22200	ug/l	1000					
Pyrene	U	0.00	11100	22200	ug/l	1000					

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1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
The following prep procedures were performed:											
GC/MS Base/Neutral Compounds							TNF	07/15/96	0930	87205	3

Comments:
Dilution was required for Volatile Organics due to a high concentration of hydrocarbons.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(43.0 - 108.)
Nitrobenzene-d5	M610	0.00*	(35.0 - 111.)
p-Terphenyl-d14	M610	0.00*	(33.0 - 125.)
Bromofluorobenzene	BTEX-8260	85.6	(80.0 - 128.)
Dibromofluoromethane	BTEX-8260	94.4	(67.7 - 135.)
Toluene-d8	BTEX-8260	96.0	(76.8 - 122.)
Bromofluorobenzene	MTBE-8260	85.6	(80.0 - 128.)
Dibromofluoromethane	MTBE-8260	94.4	(67.7 - 135.)
Toluene-d8	MTBE-8260	96.0	(76.8 - 122.)
Bromofluorobenzene	NAP-8260	85.6	(80.0 - 128.)
Dibromofluoromethane	NAP-8260	94.4	(67.7 - 135.)
Toluene-d8	NAP-8260	96.0	(76.8 - 122.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 3510

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1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-2

M = Method	Method-Description

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPT Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-2

GEL Laboratory Certifications EPI Laboratory Certifications

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer F. Green

Analytical Report Specialist

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1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NFWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-3
Lab ID : 9607181-03
Matrix : Soil
Date Collected : 07/10/96
Date Received : 07/10/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	60.0	120	ug/kg	60.	JAC	07/16/96	1610	87252	1
Ethylbenzene		576	60.0	120	ug/kg	60.					
Toluene	U	0.00	60.0	120	ug/kg	60.					
Xylenes (TOTAL)	U	0.00	60.0	120	ug/kg	60.					
Naphthalene		1130	80.0	160	ug/kg	80.	JAC	07/17/96	1115	87252	1
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	I	1550	970	1940	ug/kg	1.0	BDG	07/16/96	2227	87316	2
Acenaphthylene	U	0.00	970	1940	ug/kg	1.0					
Anthracene	U	0.00	970	1940	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	970	1940	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	970	1940	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	970	1940	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	970	1940	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	970	1940	ug/kg	1.0					
Chrysene	U	0.00	970	1940	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	970	1940	ug/kg	1.0					
Fluoranthene	U	0.00	970	1940	ug/kg	1.0					
Fluorene	U	0.00	970	1940	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	970	1940	ug/kg	1.0					
Naphthalene	U	0.00	970	1940	ug/kg	1.0					
Phenanthrene		3610	970	1940	ug/kg	1.0					
Pyrene	U	0.00	970	1940	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds TNF 07/16/96 1500 87316 3

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

oc: NFWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M

Comments:
A dilution was required for Volatile Organics due to a high concentration of target compounds.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	74.2	(30.0 - 115.)
Nitrobenzene-d5	M610	70.0	(23.0 - 120.)
p-Terphenyl-d14	M610	71.4	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	131.	(39.7 - 159.)
Dibromofluoromethane	BTEX-8260	97.6	(74.0 - 128.)
Toluene-d8	BTEX-8260	92.4	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	131.	(39.7 - 159.)
Dibromofluoromethane	NAP-8260	97.6	(74.0 - 128.)
Toluene-d8	NAP-8260	92.4	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

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GEL Laboratory Certifications EPI Laboratory Certifications

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 18, 1996

Sample ID : SPORT0099-3

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen J. Greene

Analytical Report Specialist

P O Box 30712 • Charleston, SC 29417 • (803) 556-8171 • Fax (803) 766-1178

GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-1
Lab ID : 9607396-01
Matrix : Soil
Date Collected : 07/22/96
Date Received : 07/22/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
tile Organics											
EX - 4 items											
enzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	07/23/96	2328	87670	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	165	330	ug/kg	1.0	BDG	07/24/96	2305	87660	2
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene		343	165	330	ug/kg	1.0					
Benzo(a)pyrene	J	228	165	330	ug/kg	1.0					
Benzo(b)fluoranthene		413	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	J	294	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene		1030	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene		363	165	330	ug/kg	1.0					
Pyrene		617	165	330	ug/kg	1.0					

e following prep procedures were performed:

GC/MS Base/Neutral Compounds TSD 07/23/96 1530 87660 3

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

Sample ID : SPORT0107-1

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	91.9	(30.0 - 115.)
Nitrobenzene-d5	M610	85.1	(23.0 - 120.)
p-Terphenyl-d14	M610	75.5	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	123.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	116.	(74.0 - 128.)
Toluene-d8	BTEX-8260	129.	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	123.	(59.7 - 159.)
Bromofluoromethane	NAP-8260	116.	(74.0 - 128.)
Toluene-d8	NAP-8260	129.	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-1

GEL Laboratory Certifications		EPI Laboratory Certifications	
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
99887790			

data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer F. Sease
Analytical Report Specialist

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID	: SPORT0107-2
Lab ID	: 9607396-02
Matrix	: Soil
Date Collected	: 07/22/96
Date Received	: 07/22/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
EX - 4 items											
nzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	07/24/96	0003	87670	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	165	330	ug/kg	1.0	BDG	07/24/96	2337	87660	2
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	165	330	ug/kg	1.0					
Benzo(b)fluoranthene	J	234	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	U	0.00	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene	J	270	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene	U	0.00	165	330	ug/kg	1.0					
Pyrene	J	174	165	330	ug/kg	1.0					

: following prep procedures were performed:
GC/MS Base/Neutral Compounds TSD 07/23/96 1530 87660 3

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	77.1	(30.0 - 115.)
Nitrobenzene-d5	M610	66.7	(23.0 - 120.)
p-Terphenyl-d14	M610	66.9	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	111.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	101.	(74.0 - 128.)
Toluene-d8	BTEX-8260	114.	(53.4 - 163.)
mofluorobenzene	NAP-8260	111.	(59.7 - 159.)
romofluoromethane	NAP-8260	101.	(74.0 - 128.)
uene-d8	NAP-8260	114.	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).

U indicates that the analyte was not detected at a concentration greater than the detection limit.

* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056.	CT - PH-0175

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-2

GEL Laboratory Certifications		EPI Laboratory Certifications	
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

Data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer F. Sweet
Analytical Report Specialist

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

NPWC00196 Report Date: July 29, 1996 Page 1 of 3

Sample ID : SPORT0107-3
Lab ID : 9607396-03
Matrix : Soil
Date Collected : 07/22/96
Date Received : 07/22/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Organics											
- 4 items											
Benzene	U	0.00	10.0	20.0	ug/kg	10.	JGS	07/24/96	0038	87670	1
Ethylbenzene		40.5	10.0	20.0	ug/kg	10.					
Toluene		37.2	10.0	20.0	ug/kg	10.					
Xylenes (TOTAL)		324	10.0	20.0	ug/kg	10.					
Naphthalene		327	10.0	20.0	ug/kg	10.					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	166	332	ug/kg	1.0	BDG	07/25/96	0010	87660	2
Acenaphthylene	U	0.00	166	332	ug/kg	1.0					
Anthracene	U	0.00	166	332	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	166	332	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	166	332	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	166	332	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	166	332	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	166	332	ug/kg	1.0					
Chrysene	U	0.00	166	332	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	166	332	ug/kg	1.0					
Fluoranthene	U	0.00	166	332	ug/kg	1.0					
Fluorene	U	0.00	166	332	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	166	332	ug/kg	1.0					
Naphthalene	U	0.00	166	332	ug/kg	1.0					
Phenanthrene	U	0.00	166	332	ug/kg	1.0					
Pyrene	U	0.00	166	332	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds TSD 07/23/96 1530 87660 3

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M

Comments:
A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. As a result, the detection limits are elevated.

rrogate Recovery	Test	Percent%	Acceptable Limits
-Fluorobiphenyl	M610	92.5	(30.0 - 115.)
Nitrobenzene-d5	M610	83.1	(23.0 - 120.)
p-Terphenyl-d14	M610	67.0	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	123.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	115.	(74.0 - 128.)
Toluene-d8	BTEX-8260	124.	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	123.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	115.	(74.0 - 128.)
Toluene-d8	NAP-8260	124.	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
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J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications EPI Laboratory Certifications

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-3

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
02934	UT - E-251	WA - C225	NJ - 79002
- 00151	WA - C223	PA - 68-485	WV - 235
· 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer J. Greene

Analytical Report Specialist

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1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-4
Lab ID : 9607396-04
Matrix : Soil
Date Collected : 07/22/96
Date Received : 07/22/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
TEX - 4 items											
enzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	07/24/96	0113	87670	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	J	1.16	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	165	330	ug/kg	1.0	BDG	07/25/96	0042	87660	2
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	165	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	U	0.00	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene	U	0.00	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene	U	0.00	165	330	ug/kg	1.0					
Pyrene	U	0.00	165	330	ug/kg	1.0					

e following prep procedures were performed:
CMS Base/Neutral Compounds TSD 07/23/96 1530 87660 3

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-4

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	93.2	(30.0 - 115.)
Nitrobenzene-d5	M610	84.8	(23.0 - 120.)
p-Terphenyl-d14	M610	72.7	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	132.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	116.	(74.0 - 128.)
Toluene-d8	BTEX-8260	139.	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	132.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	116.	(74.0 - 128.)
Toluene-d8	NAP-8260	139.	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-4

GEL Laboratory Certifications		EPI Laboratory Certifications	
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

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Jennifer F. Greene

Analytical Report Specialist

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-5
Lab ID : 9607396-05
Matrix : Soil
Date Collected : 07/22/96
Date Received : 07/22/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
X - 4 items											
Benzene	U	0.00	10.0	20.0	ug/kg	10.	JGS	07/24/96	0147	87670	1
Ethylbenzene	U	9.80	10.0	20.0	ug/kg	10.					
Toluene	U	0.00	10.0	20.0	ug/kg	10.					
Xylenes (TOTAL)	U	0.00	10.0	20.0	ug/kg	10.					
Naphthalene		214	10.0	20.0	ug/kg	10.					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	J	238	165	330	ug/kg	1.0	BDG	07/25/96	0114	87660	2
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	165	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	U	0.00	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene	U	0.00	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene		805	165	330	ug/kg	1.0					
Pyrene	J	221	165	330	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds TSD 07/23/96 1530 87660 3

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-5

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M

Comments:
A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
Fluorobiphenyl	M610	95.5	(30.0 - 115.)
Nitrobenzene-d5	M610	89.9	(23.0 - 120.)
p-Terphenyl-d14	M610	59.3	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	120.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	108.	(74.0 - 128.)
Toluene-d8	BTEX-8260	121.	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	120.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	108.	(74.0 - 128.)
Toluene-d8	NAP-8260	121.	(53.4 - 163.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

SCDHEC Laboratory Certifications EPA Laboratory Certifications

GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-5

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
[illegible]233	NY - 11501	SC - 10582	TN - 02934
[illegible]5	SC - 10120	UT - E-227	VA - 00111
02934	UT - E-251	WA - C225	NJ - 79002
00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer F. Sweat

Analytical Report Specialist

GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

:: NPWC00196 Report Date: July 29, 1996

Sample ID	: SPORT0107-6
Lab ID	: 9607396-06
Matrix	: Soil
Date Collected	: 07/22/96
Date Received	: 07/22/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	07/24/96	0222	87670	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.950	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	165	330	ug/kg	1.0	BDG	07/25/96	0147	87660	2
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	165	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	U	0.00	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene	U	0.00	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene	U	0.00	165	330	ug/kg	1.0					
Pyrene	U	0.00	165	330	ug/kg	1.0					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds TSD 07/23/96 1530 87660

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-6

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	91.3	(30.0 - 115.)
Nitrobenzene-d5	M610	85.0	(23.0 - 120.)
p-Terphenyl-d14	M610	73.4	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	119.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	108.	(74.0 - 128.)
ene-d8	BTEX-8260	122.	(53.4 - 163.)
romofluorobenzene	NAP-8260	119.	(59.7 - 159.)
romofluoromethane	NAP-8260	108.	(74.0 - 128.)
oluene-d8	NAP-8260	122.	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
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* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 29, 1996

Sample ID : SPORT0107-6

GEL Laboratory Certifications		EPI Laboratory Certifications	
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

, data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer J. Sheen

Analytical Report Specialist

CHAIN OF CUSTODY RECORD

2040 Savage Road
Charleston, South Ca
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

Page 1 of ____ 9607181

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDETCHASN

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH	TOC/DOC	FOX EOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	RCRA METALS - specify	Pesticide	Herbicide	BTEX NAPTHALENE	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	PAH	Coliform - specify type	FLASHPOINT	BTEX + NAPTHALENE + MTBE	Remarks
01	SPORT0099-1	7/10/96	1120				X	3	X		X				X							X				X		UST-241-X WKH 7/10/96 FREE PRODUCT .1
02	SPORT0099-2	7/10/96	1230				X	5																X			X	UST-241-X WKH 7/10/96 GROUND H2O .2
03	SPORT0099-3	7/10/96	1300				X	2									X							X				UST-241-X WKH 7/10/96 SOIL .3
04	SPORT0099-4	7/10/96	1120				X	3																			X	UST-241 VOA TRIP BLANK .4

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
W. R. Hiers, Jr.	7/10/96	1340	W. R. Hiers, Jr.	W. R. Hiers, Jr.	7/10/96	1425	Michael Patton
Michael Patton	7/10/96	1444	Paige Kincaid		7/10/96	1444	

Remarks:

White = sample collector Yellow = file Pink = with report

NPTSC 00146

CHAIN OF CUSTODY RECORD

Page 1 of 1 9600739G

General Engineering [illegible]orties, Inc.
2040 Savage Road
Charleston, South Caro[illegible], 29414
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDETCHASN

CCL 22391

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type	BTEX AND NAPTHALENE	PAH	Remarks	
01	SPORT0107-1	7/22/96	0815		X		X	2																X	X	UST-241-5	.1
02	SPORT0107-2	7/22/96	0830		X		X	2																X	X	UST-241-6	.1
03	SPORT0107-3	7/22/96	0845		X		X	2																X	X	UST-241-7	.1
04	SPORT0107-4	7/22/96	0900		X		X	2																X	X	UST-241-8	.1
05	SPORT0107-5	7/22/96	0915		X		X	2																X	X	UST-241-9	.1
06	SPORT0107-6	7/22/96	0930		X		X	2																X	X	UST-241-10	.1
07	SPORT0107-7	7/22/96	0815				X	3																X		UST-241 VOA TRIP BLANK	.2

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
W.R. Hines	7/22/96	0955	W.R. Hines, Jr.	W.R. Hines, Jr.	7/22/96	1410	Michael Pate
Michael Pate	7/24/96	1731	R Deramie	7-24-96	1435		

Remarks:

White = s[illegible] collector Yellow = file Pink = with report

Attachment III

Certificate of Disposal (tank)
Disposal Manifest No. 13119 (soil)

UST Certificate of Disposal

CONTRACTOR

Supervisor of Shipbuilding, Conversion and Repair, USN
Portsmouth, VA
Environmental Detachment Charleston
1899 North Hobson Avenue
North Charleston 29405-2106

Telephone (803) 743-6482

TANK ID & LOCATION

UST 02-241-001, BLDG 241, Naval Base Charleston, N. Charleston, SC

DISPOSAL LOCATION

Bldg. 1601 Tank Cleaning
& Disposal Area
Charleston Naval Complex

TYPE OF TANK	SIZE (GAL)
Fuel Oil	6,000 gal.

CLEANING/DISPOSAL METHOD

The tank was cut open on both ends, cleaned with a steam cleaner, and disposed of at the local municipal landfill.

DISPOSAL CERTIFICATION

I certify that the above tank has been properly cleaned and disposed of.

O.S. Wilson / 10/21/96
(Name) (Date)

DNR

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

DO NOT WRITE IN THIS SPACE

ATT. ☐ DIS. ☐ REJ. ☐ PR. ☐

Required under authority of Act 64, P.A. 1979, as amended and Act 136, P.A. 1969.

Failure to file is punishable under section 299.548 MCL or Section 10 of Act 136, P.A. 1969.

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039 Expires 9-30-96

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. S D 0 1 7 0 1 2 2 5 6 0 — Manifest Document No. 13717

2. Page 1 of 1

Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
SOUTHDIVNAVFACENGCOM Attn:Rick Nelson
Caretaker site office P.O. box 190010
N.Charleston, SC 29405

4. Generator's Phone (803) 743-9985

A. State Manifest Document Number: MI 405697

B. State Generator's ID:

5. Transporter 1 Company Name: Robbie D. Wood

6. US EPA ID Number: A L D 0 6 7 1 3 8 8 9 1

C. State Transporter's ID: 40067

D. Transporter's Phone: 205-744-8440

7. Transporter 2 Company Name:

8. US EPA ID Number:

E. State Transporter's ID:

F. Transporter's Phone:

9. Designated Facility Name and Site Address
Chem-Met Services
18550 Allen Rd
Wyandotte, MI 48192

10. US EPA ID Number: M I D 0 9 6 9 6 3 1 9 4

G. State Facility's ID:

H. Facility's Phone: 313-282-9250

11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID NUMBER). HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.	N/H
a. X RQ, Hazardous Waste Solid,n.o.s.(Lead) 9, NA9077, PG III (D008)	0 0 5	D	13725	P	D 0 0 8	H
b. Non-Regulated Material (Soil)	0 0 1	D	02678	P	0 2 9 L	N
c. Non-Regulated Material (Spill Debris)	0 0 7	D	02628	P	0 2 9 L	N
Non-Regulated Material (Latex Paint)	0 0 1	D	02611	P	0 2 9 L	N

J. Additional Descriptions for Materials Listed Above
1. APPLCHA560EA ERG# 31
2. APPLCHA560EB ERG#
3. APPLCHA560ED ERG#
4. APPLCHA560BC ERG#

K. Handling Codes for Wastes Listed Above
a. M111
b. M111
c. M111
d. M111

a/ /
b/ /
c/ /
d/ /

15. Special Handling Instructions and Additional Information: CSI Emert 803-696-7958
Send signed originals to Gen./copies to CSI Environmental Inc.5778 W 74th St,Indianapolis,IN 46278

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR; if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: COR Richard G. Nielson — Signature — Date: 10/21/96

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Alfred B. Miller — Signature — Date: 10/23/96

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Date

Discrepancy Indication Space

Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name — Signature — Date

APPENDIX B

GEOLOGIC BORING LOGS

BORING LOG

Page 1 of 1

OJECT NAME: CNE Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: ~~Geoprobe~~ Stratoprobe

BORING NUMBER: ZIBØ1
DATE: 6/3/99
GEOLOGIST:
DRILLER: Randy Brand

Sample No. and Type or RQD	Depth (FL) 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 B.Z	Borehole**	Driller B.Z
	1						2" asphalt						
	2						1' fill/gravel/sand		dry	Ø			
	3												
X	4		1.15'/4'						ZISFBØ1Ø4Ø5				
X	5												
	6			6'4									
	7												
	8		.75'/4'			black	silty clay		~~slightly moist~~ moderately stiff			140 ppm	
	9			~1'		dkgr.	silty clay		soft/sticky				
	10												
	11			~1'		lkgray/red mottled	sandy clay		moderately stiff			250 ppm	
	12		2.5'/4'						~~sticky~~				
				EOB									

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read

Drilling Area Background (ppm):

Remarks:

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

BORING LOG

Page ___ of ___

PROJECT NAME: Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe

BORING NUMBER: CNC21B02
DATE: 6 3 95
GEOLOGIST: RF
DRILLER: Randy Brand

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**
	1						2" asphalt						
	2						1' fill/gravel/sand		dry				
	3						6" silty sand			0	0		
1@5	4		2.5/4			bk	6" silty clay		~~moist~~ soft				
	5						coarse sand			100	0		
	6				dkgr.		sandy clay		soft				
	7				dk		silty clay		soft				
2@5	8		4/4			gr.	↓ sandy clay		moist				
	9			8.6	dkgr.		silty clay		wet				
	10				olive					130	0		
	11				olive				saturated				
3@5	12		3.7/4		olive		↓		↓				
				EOB									

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read

Drilling Area Background (ppm):

Remarks:

Converted to Well. Yes ___ No ___ Well I.D. #:

BORING LOG

Page ___ of ___

PROJECT NAME: Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe

BORING NUMBER: CNCB03 (21)
DATE: 6 3 99
GEOLOGIST:
DRILLER: Randy Brand

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**
	1						2" asphalt						
	2						1.2 fill/gravel/sand		dry				
	3									17	0		0
	4		2.9/4		dk gr.		1' silty clay		soft				
	5				dk gr		silty clay		petrol. odor	80	0		0
	6						w/sand		moist				
	7						↓		to wet				
	8		3.3/4				↓					300+	
	9												
	10												
	11												
	12												
				~~8~~ 8									

* 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): ____

Remarks: ____

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

BORING LOG

Page ___ of ___

PROJECT NAME: Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe

BORING NUMBER: CNC21B04
DATE: 6 3 99
GEOLOGIST:
DRILLER: Randy Braund

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**
	1						Sand		dry				
	2						fill / sand / gravel		dry				
	3						some clay						
X	4		1.5/4										
X	5						6" gravel						
	6		6.4S				1' fine sand				Ø		
	7										Ø		
S	8		1.3/4		b	lk	6" gravel like asphalt		Strong pet. odor			3000	ppm bore
	9				b	lk	gravel " "		V. Strong odor				
	10						appears to be		product			5000+	ppm headspace
	11												
	12		2/4										
				EOB									

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read

Drilling Area Background (ppm): Ø

Remarks:

Converted to Well: Yes ___ No ___ Well I.D. #: ___

BORING LOG

Page ___ of ___

PROJECT NAME: Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe
BORING NUMBER: CNC21B05
DATE: 6 3 99
GEOLOGIST:
DRILLER: Randy Brand

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**
	1				lt	br.	Sand - fine roots		dry				
	2												
	3												
5	4		3/4							0			
	5					lt. br.	fine sand		dry				
	6												
	7			6.9						4			
12	8		1/4		bk.		2" gravel / like asphalt		moist petro. odor				
	9												
	10												
	11												
17	12		0/4									290	
				EOB									

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read

Drilling Area Background (ppm): 0

Remarks:

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

BORING LOG

Page ___ of ___

PROJECT NAME: Bone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: CNC21B06
DATE: 6 3 99
GEOLOGIST:
DRILLER: Randy Brand

Sample No. and Type or RQD	Depth (FL) 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	Sample/BZ	Borehole**	Drilling BZ**
	1				ltbr.		fine sand		dry				
	2												
	3												
	4		1.3/4		ltbr.		6" silty sand			0			
	5												
	6					br.	silty sand						
	7												
	8		1/4		blk		2" sandy clay		moist	11			
	9												
	10				bk./br.		mixed clay and sand		moist				
	11						silty fine sand						
	12		1.3/4	12.5						10			
	13												
	14												
	15												
	17												
	19												
	20												
	21												
	22												
	23												
	24												
	25												
	26												
	29			EOB 29'									

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read

Drilling Area Background (ppm): 0

Remarks:

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

BORING LOG

PROJECT NAME: _____ BORING NUMBER: CNC 21 B07

PROJECT NUMBER: _____ DATE: 6 16 99

DRILLING COMPANY: Columbia GEOLOGIST: _____

DRILLING RIG: Strata DRILLER: Randy Bray

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	Sample BZ	Borehole BZ	Driller BZ
	1						Base		dry				
	2					dk gr	silty clay		slightly moist				
	3					oli	↓		↓				
10	4		3/4			gr.	↓		↓	17			
X	5				lt	gr.	clayey sand		moist				
X	6				dk	ol.	silty clay		↓	100			
	7					↓	↓		↓				
16	8		3.5/4			↓	↓		↓	17			
	9					dk	silty clay w/ water		saturated				
	10					gr	↓ ↓		↓				
	11			11.5		↓	↓ ↓		↓				
	12		3.5/4			ol.	silty clay		↓				
	13					dk gr	silty clay		↓				
	14						↓		↓				
	15					ol. or.	sandy clay		↓				
	16		4/4			mottled	↓						

* When rock coring, enter rock brokeness.

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

Drilling Area Background (ppm): 0

Remarks: _____

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

BORING LOG

Page 1 of 1

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: 21B08
DATE: 6/16/99
GEOLOGIST:
DRILLER: V. Brand

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 BZ	Sampler BZ	Borehole**	Drilling BZ**
	1					Lt. Brn.	Silty Sand		Dry				
	2					Olive Gray	Sandy Clay		↓				
	3						—		—	0			
1457	4		2.7/4				—		—				
	5					Gray	Silty Clay		Dry	9			
	6					↓	Silty Sand		Moist	150			
	7					↓	Sandy Clay		Saturated				
0951	9		3.4/4				—		—				
	9					DK Gray	Silty Clay w/wood		↓				
	10					↓	↓		↓				
	11					↓	↓		↓				
1154	12		3.3/4				—						

* 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):

Remarks:

Converted to Well: Yes Temp/Piezometer No Well I.D. #: CNC 21-802(m) P01

BORING LOG

Page 1 of 1

PROJECT NAME: CVC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: ZIB09
DATE: 6/16/99
GEOLOGIST:
DRILLER: R. Brand

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	Sample BZ	Borehole	Drillin BZ
	1					Brn	Silty Sand		D.Y				
	2					White	Sand, Gravel - building		Fractu ↓				
	3						—		—				
	4		2/4				—		—				
	5					BLK	Sand & Gravel - Petro/odor		Saturated				
	6						—		—				
	7						—		—	38			
	8		0.1/4				—		—				
	9					BLK	Sand & Gravel - Petro/odor		Saturated				
	10						—		—				
	11						—		—				
	12		0.1/4				—		—				

* 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 Temp No _____ Well I.D. #: _____

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: 21 B10
DATE: 6/16/99
GEOLOGIST:
DRILLER: R Brand

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	Sample	Borehole	Drilling Equip.
	1					White	Asphalt w/base		Dry				
	2					Olive Gray	Sandy Clay		↓				
	3					↓	↓		↓	35			
54'	4		3/4										
	5					↓	Silty Sandy Clay		↓				
	6						—						
	7						—						
42'	8		0.5/4				—						
X	9					Gray	Clay		Saturated	100			
	10					↓							
	11					DK Gray	Clayey Sand						
5'	12		4/4			olive	Silty Sand		↓				
	13												
	14												
	15												
	16		4/4										

* 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): ____

Remarks: ____

Converted to Well: Yes Temp/Piezometer No ____ Well I.D. #: CNC21-P02

BORING LOG

Page 1 of 1

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: 2/B11
DATE: 6/21/99
GEOLOGIST:
DRILLER: K. Braud

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	Sample Headspace	Background	Drilling Area
	1						Asphalt w/base		Dry				
	2					Pale Brown	Silty clay						
	3									20			
	4		3.4/4										
1500	5						—			10			
X	6								Moist				
	7												
	8		1.5/4										
502	9												
	10												
	11												
	12		1/4										

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Converted to Well: Yes Temp No Well I.D. #:

BORING LOG

Page 1 of 1

PROJECT NAME: CVC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Straitpush

BORING NUMBER: 21B12
DATE: 6/21/99
GEOLOGIST:
DRILLER: R. Brand

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	Sample Bz	Borehole	Drilling Bz
	1						Asphalt w/base		Dry				
	2					DK Gray	Silty Clay						
	3									40			
	4		3.9/4										
816	5								Moist	210			
	6								~~Moist~~ ↓				
	7								& Saturated				
	8		4/4						BGS ↓	170			
520 820	9												
	10												
	11												
	12		3.7/4										
5824													

* 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):

Remarks:

Converted to Well: Yes Temp No Well I.D. #:

BORING LOG

PROJECT NAME: Cove Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Straddle
BORING NUMBER: 21313
DATE: 6/29/99
GEOLOGIST:
DRILLER:

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 B.Z.	Borehole**	Drillers B.Z.
	1			Hand Auger		Brn	Silty Sand		Moist				
	2												
	3									0	0	0	0
X	4		4/4										
	5					Brn/Gray	Silty Clay						
	6												
	7												
	8		4/4			Brn	Recovery						
	9		0/4										
	10					Gray	Silty Clay		Saturated				
	11												
	12						Clayey Sand						
	13		4/4										

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read

Drilling Area Background (ppm): 0

Remarks:

Converted to Well: Yes Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CNC Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: 21B14
DATE: 6/29/94
GEOLOGIST:
DRILLER: R. Brand

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	Sample Bkgd	Borehole**	Drilling Bkgd**
	1					Lt. Brn	Silty Sand/Fill		Moist				
	2						Some Clay						
	3									0			
	4			Hand Aug		Brn	Silty Clay						
	5					Gray							
X	6												
	7					Brn	Clayey Sand		Saturated				
	8					Dk Gray							
	9		4/4										
	10						Sandy Clay						
	11												
	12		3/4										
	13												

* 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 Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: 21315
DATE: 6/30/99
GEOLOGIST:
DRILLER: R. Brand

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	Blankets	Borehole	Drilling Area
	1					Brn	Clayey Sand w/Gravel		Moist				
	2												
X	3			Hand Auger						0	0	0	0
X	4						Sandy Clay w/Gravel						
	5					gray	Silty Clay		Saturated				
	6					gray	Sandy Clay						
	7												
	8		4/4						C				

* 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 Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Cedarside
DRILLING RIG: Strato probe
BORING NUMBER: 21B16
DATE: 6/30/99
GEOLOGIST:
DRILLER: R. Brand

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): Cuttings	Sample Jar	Borehole	Drilling Area
	1					Brn	Silty Sand		Moist				
	2					↓	↓		↓				
	3		X			↓	↓		↓	21	0	0	0
	4		X			Dk Gray	Sandy Clay		↓				
	5					↓	↓		Saturated				
	6					↓	↓		↓				
	7					↓	Silty Clay		↓	38	0	0	0
	8		4/4			↓	↓		↓				

* 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 Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe

BORING NUMBER: CNC2B17
DATE: 7/1/99
GEOLOGIST:
DRILLER: K. Brant

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	Sample Duplicate	Borehole	Drilling Blank
	1			Auger		dkbr	silty sand		moist				
	2					↓	↓						
	3					—	fill material						
	4					br.	sandy clay		moist				
X	5					dkgr.	clay/crumbly		moist				
	6						↓						
	7					dkgr	soft clay		wet				
	8						↓		↓				
	9			Hand		grey	↓		↓				

* When rock coring, enter rock brokeness.

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

Drilling Area Background (ppm): 0

Remarks:

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

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: 21 B18
DATE: 7/1/99
GEOLOGIST:
DRILLER: R. Brand

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: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Headspace	Samples	Borehole	Drilling Area
	1				DK Grey	Sandy Clay w/Gravel		Moist				
	2											
X	3				Brn				10	0	0	0
	4		4/4	Hand Auger	Brn	Clayey Sand						
	5				—	—						
	6											
	7							Saturated				
	8		3.5/4									
	9											
	10					Clay w/ woodchips						
	11											
	12		3/4									

* 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):

Converted to Well: Yes Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CVC
PROJECT NUMBER:
DRILLING COMPANY: Calcon Sim
DRILLING RIG: Stratoprobe
BORING NUMBER: 21B19
DATE: 2/11/99
GEOLOGIST:
DRILLER: K. Brand

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)			
	1			Hand Auger			Asphalt w/Base		Dry				
	2					Brn	Sandy Clay		Moist				
X	3					Grey				60	0	0	0
X	4												
	5												
	6					Dk Grey	Silty Sand Clay		Saturated				
	7					Brn	Clayey Sand		Petr. Odor	22	0	60	0
	8					Dk Grey	Silty Clay						
	9		3.5/4				Silty Clay w/wood				0	60	0
	10												
	11												
	12												
	13		4/4										

* 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 Temp No Well I.D. #:

BORING LOG

PROJECT NAME: Cave Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe

BORING NUMBER: ZIB2B
DATE: 7/7/94
GEOLOGIST:
DRILLER: R. Brown

Sample No. and Type of Core	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithologic Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	Probe Reading (ppm) Probe	Breathing Zone	Background	Drilling Area
							asphalt						
	1			Hand Auger		blk	Clay (crumbly)		dry				
	2					dkgr	Clay		moist				
	3									20	0	.	0
	4												
	5												
	6						Silty Clay						
	7									3	0		0
	8												
	9		4.2/4				w/ wood chips						
	10								Saturated				
	11												
	12					Brn	Silty Clay						
	13		3.5/4			olive	Clayey Sand						

* When rock coring, enter rock brittleness

** Include monitor reading in 5 foot intervals @ boreholes. Increase reading frequency if elevated response read

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes Temp No Well I.D. #:

BORING LOG

Page 1 of 1

PROJECT NAME: CNC Zone F
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strato probe
BORING NUMBER: 62/BZ#1
DATE: 7/7/99
GEOLOGIST:
DRILLER: R. Brand

Sample No. and Type of ROD	Depth (Ft.) or Run No	Blows / 6" or ROD (%)	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	Sample BZ	Borehole*	Bkgrnd BZ*
	1			Hand Auger			Asphalt w/base		Dry				
	2					Brn	Sandy Clay						
	3					Blk				36	ϕ	ϕ	ϕ
	4												
	5					Grey	Silty Clay		Moist				
	6												
X	7									310	0	140	0
X	8												
	9		4/4										
	10								Saturated				
	11												
	12												
	13		4/4			Gray							
	14												
	15					Brown							
	16		3/4										

* 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): ϕ

Converted to Well: Yes Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG:

BORING NUMBER: 21B22
DATE: 7/23/94
GEOLOGIST:
DRILLER: R. Bland

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	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1						Concrete						
	2					Gray	Silty Clay		Dry				
	3								↓				
	4								Moist				
X	5								↓				
X	6												
	7												
	8								↓				
	9								Saturated				
	10					↓	↓		↓				

* 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 Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CMC
PROJECT NUMBER:
DRILLING COMPANY: Calscope
DRILLING RIG: Stratoprobe
BORING NUMBER: 21BZ3
DATE: 7/23/99
GEOLOGIST:
DRILLER: T. Brand

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**
	1			Hand Auger			Concrete						
	2					Brn	Silty Sand		Dry				
	3								Moist				
	4												
	5												
	6												
	7						Clayey Sand						
	8		2/4			Brn/Gry	Silty Clay / Silty Sand						
	9												
	10					Gry	Silty Clay						
	11								Saturated				
	12												

*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 Temp No Well I.D. #:

BORING LOG

Page 1 of 1

PROJECT NAME: CVC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe

BORING NUMBER: 21132B4
DATE: 7/23/99
GEOLOGIST:
DRILLER: D. Kunel

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**
	1			Hwd			Concrete						
	2			Hwd		Gry	Sandy Clay		Dry				
	3			Hwd					Moist				
	4												
	5												
	6						Silty Clay						
	7												
	8		4/4										
	9												
	10								Saturated				
	11												
	12		4.5/4										
	13												
	14												
	15												
	16		4.5/4										

* 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 Temp No _____ Well I.D. #: _____

BORING LOG

PROJECT NAME: CCE
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Starfire
BORING NUMBER: 2 1B 2 4 5
DATE: 7/23/91
GEOLOGIST:
DRILLER: A. Bunch

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**
	1			Hard			Cement						
	2			Asp		Grey	Silty Clay		Dry				
	3								Moist				
	4												
	5												
	6												
	7												
	8		4/4										
	9								Saturated				
	10												
	11						Clayey Sand						
	12		4/4				Silty Clay						
	13												
	14												
	15												
	16		3/4										

* 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):

Converted to Well: Yes Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CVP
PROJECT NUMBER:
DRILLING COMPANY: Columbia Structural
DRILLING RIG:
BORING NUMBER: 21BZ16
DATE: 7/23/91
GEOLOGIST:
DRILLER: L. Burk

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 5" 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**
	1			Hand Auger			Cement						
	2						Cement						
	3					Brn	Silty Clay		Dry				
	4					Grey			Moist				
	5												
X	6												
	7												
	8		4/4										
	9												
	10												
	11												
	12						Stiff						
	13												
	14												
	15												
	16		4/4										

* 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 Temp No Well I.D. #:

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Custom Drilling
DRILLING RIG: BK57 Mobile
BORING NUMBER: CNC21-MW07D
DATE: 8/3/99
GEOLOGIST: Gerald Goode
DRILLER: Rod Fuhr

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**	
	26													
X	27	2/2	1'0"			olive	Silty Sand,	CL	no petroleum				0	ppm
SS	28	2/2	100% Recovery				cohesive, trace to fine gravel		odors or staining evident from 27 to 31' bls.					
X	29	5/3	100% Recovery			olive	As above	CL					0	ppm
SS	30	3/3												
	31													
	32													
	33													
					E.O.B.									

* 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):

Remarks:

Converted to Well: Yes No Well I.D. #: CNC21-MW07D

BORING LOG

Page ___ of ___ 29

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Custom Drilling
DRILLING RIG: Mobile B-57
BORING NUMBER: CNC21-MW07D
DATE: 7/14/99
GEOLOGIST: Mark Dennington
DRILLER: Rod Fuller.

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): PID	FID		
	5				Grey		Silty sand - mixed		Strong petro.	39.1	0	27	0
	20			20.0'			w/ "pea" gravel, &		odor.				
①	20	6/7			Olive		Silty clay - cohesive,	CL	No petro. odors	182.0	0	0	
		8/9					pliable but not plastic,		or discolor.				
							no shells or fossils						
	22'												
②	22	4/4			Olive		(as above)	CL	(as above)	19.4			
		4/5					("Cooper Group -						
							Ashley Fm.)						
	24												
③	24	4/5			Olive		(as above) contains	CL	(as above)				
		6/7					V, V-F grain sand.						
							("Cooper Group -						
	26						Ashley Fm.)						
				EOB									
0-5	Silty Clay -				Clay		Back fill, no odors/discolor						
5-20	"Pea" Gravel -				Black discolor/strong Petro. odor.								
20-25	Silty clay -				Olive colored, no odors/discolor.								
			⑩		To set 6" ID PVC Surface Case to 25 ft. bls.								
							Continue Log on Page 2 of 2						

* When rock coring, enter rock brokeness.

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

Remarks: "Pea" Gravel @ 10' bls = 132.1 ppm (FID)

Drilling Area Background (ppm): 1.2
Driller B.Z. (ppm) (2.7)

Converted to Well: Yes ✓ No ___ Well I.D. #: CNC21-MW07D

BORING LOG

PROJECT NAME: CUC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: [illegible]
BORING NUMBER: ~~[illegible]~~ MW08
DATE: 7/23/9?
GEOLOGIST:
DRILLER: [illegible]

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**
	1			Hand Aug			Cement						
	2					Gry	Silty Clay		Dry				
	3								Moist				
	4												
	5												
	6												
	7												
	8		4/4										
	9								Saturated				
	10												
	11						Clayey Sand						
	12		4/4				Silty Clay						
	13												
	14												
	15												
	16		3/4										

* [illegible] rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): Ø

Remarks:

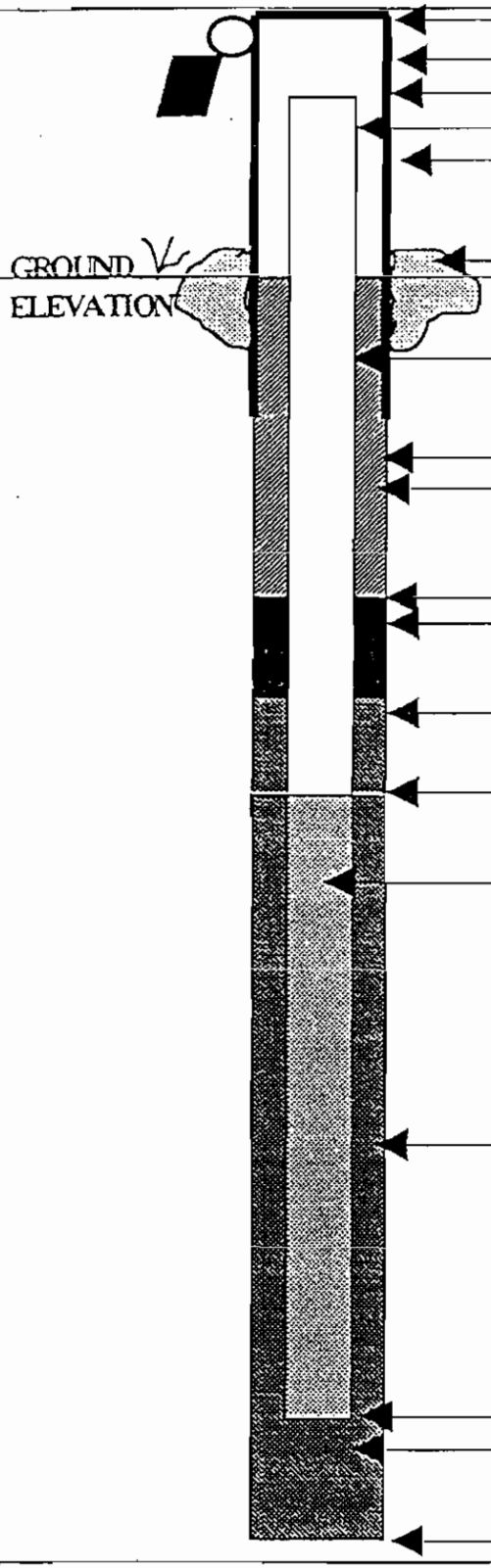
Converted to Well: Yes Temp No

Well I.D. #:

BORING NO.: CNC21-B08/ CNC21-P01

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC - Chevron	LOCATION: Site 21	DRILLER Brand	
PROJECT NO. 0219	BORING CNC21-B08/P01	METHOD: DPT	
ELEVATION	DATE 6/16/99	DRILLING	
FIELD GEOLOGIST R. Franklin		DEVELOPMENT: NA	
(Boring converted to piezometer)			



ELEVATION OF TOP OF SURFACE CASING: NA

ELEVATION OF TOP OF RISER PIPE: NA

STICK -UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: None.

TYPE OF SURFACE SEAL: None.

RISER PIPE I.D.: 1.5"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 1.5"

TYPE OF SEAL: None

ELEVATION / DEPTH OF SEAL: —

TYPE OS SEAL: None

DEPTH TOP OF SAND PACK:

ELEVATION / DEPTH TOP OF SCREEN: —16'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 0.010 x 10ft

I.D. OF SCREEN: 1.25"

TYPE OF SAND PACK: None.

ELEVATION / DEPTHBOTTOM OF SCREEN: 116'

ELEVATION / DEPTH BOTTOM OF SAND PACK: —

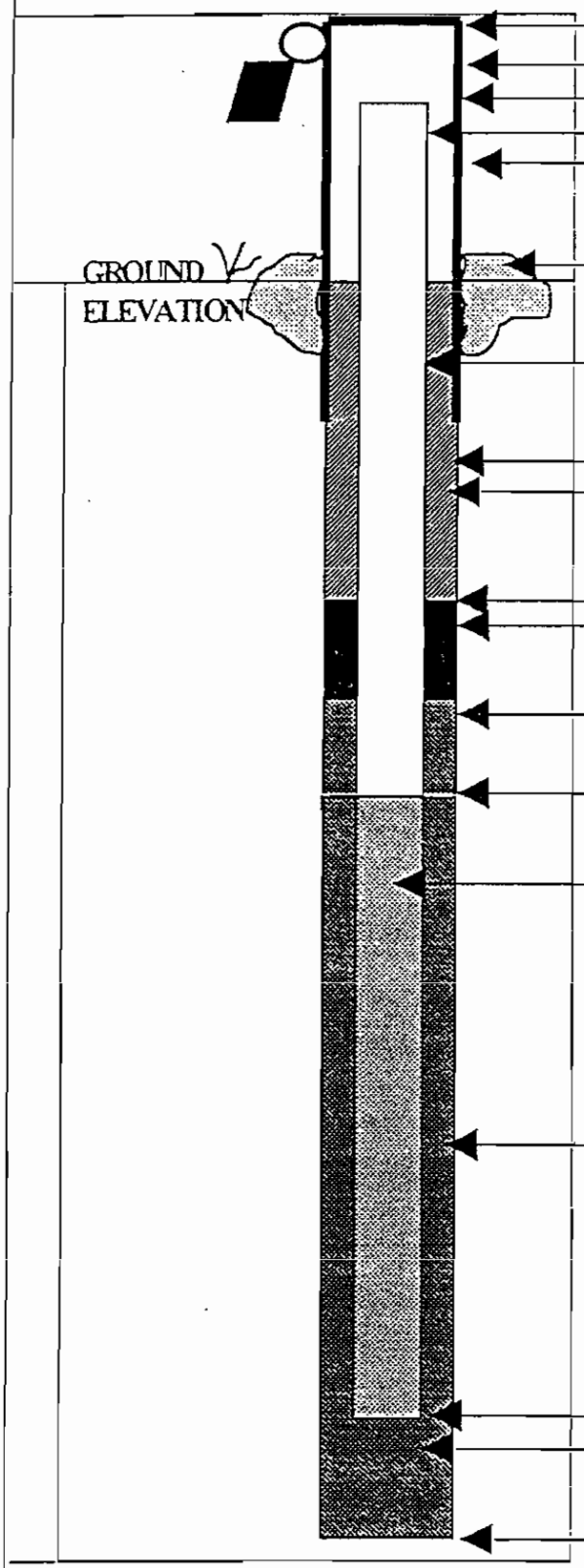
TYPE OF BACKFILL BELOW OBSERVATION WELL: None

ELEVATION / DEPTH OF HOLE: 116'

BORING NO.: CNC21-B10/ CNC21-P02

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC - Chas	LOCATION: Site 21	DRILLER Boart.
PROJECT NO. 0219	BORING CNC21-1310/P02	METHOD: DPT
ELEVATION	DATE 6/16/99	DRILLING
FIELD GEOLOGIST E. Franklin		DEVELOPMENT: NA
(Boring converted to piezometer)		



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL:

RISER PIPE I.D.: 1.25"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 1.5"

TYPE OF SEAL: None

ELEVATION / DEPTH OF SEAL: None

TYPE OS SEAL: none

DEPTH TOP OF SAND PACK: none

ELEVATION / DEPTH TOP OF SCREEN: 16'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 0.010 x 10ft

I.D. OF SCREEN: 1.25"

TYPE OF SAND PACK: None (natural)

ELEVATION / DEPTHBOTTOM OF SCREEN: 116'

ELEVATION / DEPTH BOTTOM OF SAND PACK: -

TYPE OF BACKFILL BELOW OBSERVATION WELL: None.

ELEVATION / DEPTH OF HOLE: 116'

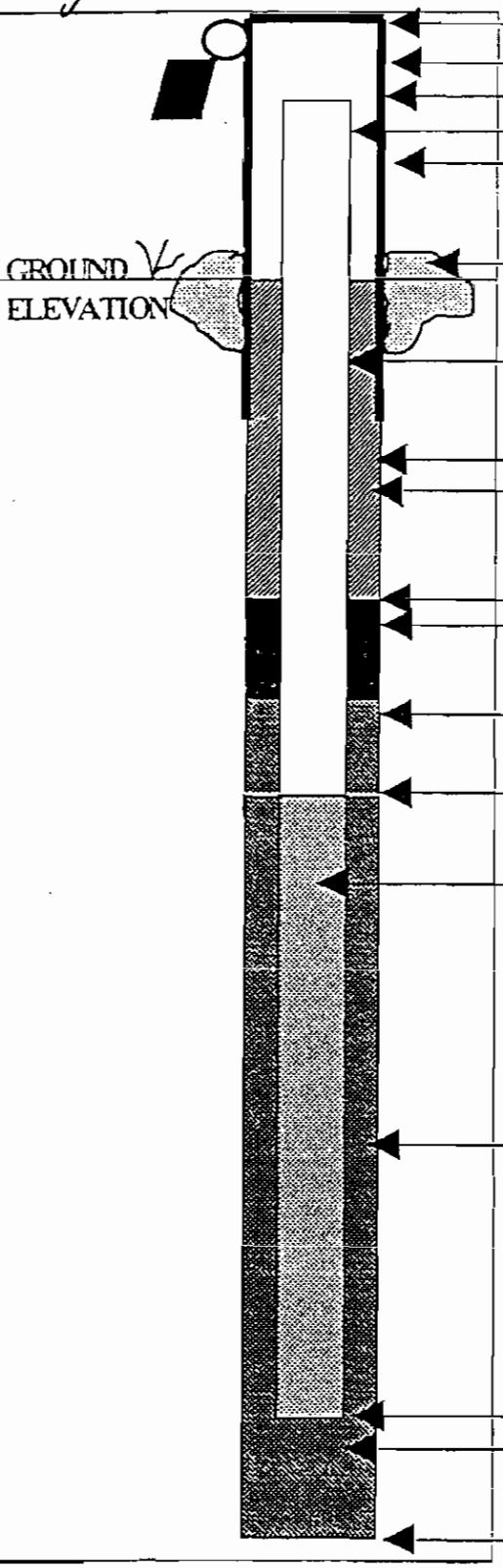
CNC21-P03

BORING NO. ~~CNC21-B10~~ / ~~CNC21-P02~~

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC - Chas	LOCATION: Site 21 P03	DRILLER Brand E.
PROJECT NO. 0219	BORING ~~CNC21-B10/P02~~	METHOD: DPT
ELEVATION	DATE 6/16/99	DRILLING
FIELD GEOLOGIST R. Franklin		DEVELOPMENT: NA

(~~Boring converted to piezometer~~) Piezometer only — NO previous soil boring



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK -UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: None

RISER PIPE I.D.: 1.25"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 1.5"

TYPE OF SEAL: None

ELEVATION / DEPTH OF SEAL: —

TYPE OS SEAL: None

DEPTH TOP OF SAND PACK: —

ELEVATION / DEPTH TOP OF SCREEN: 16'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 0.010 x 10'

I.D. OF SCREEN: 1.25"

TYPE OF SAND PACK: None (natural)

ELEVATION / DEPTHBOTTOM OF SCREEN: 106'

ELEVATION / DEPTH BOTTOM OF SAND PACK: —

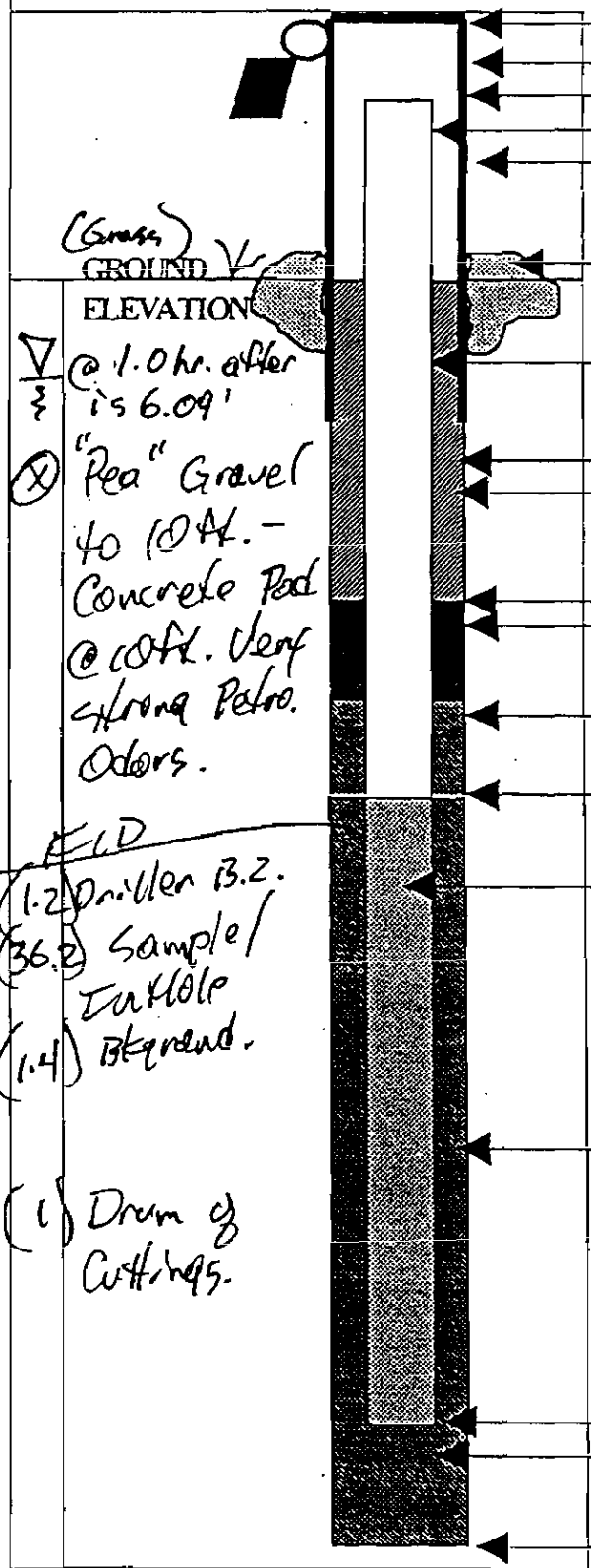
TYPE OF BACKFILL BELOW OBSERVATION WELL: None

ELEVATION / DEPTH OF HOLE: 106'

BORING NO. CNC21-MW01

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC 21 - MW	LOCATION CNC 21 - MW01	DRILLER Cascade Drilling	
PROJECT NO.	BORING CNC21-MW01	METHOD: ~~DPT~~ 4.25" HSA	
ELEVATION	DATE 7/12/99	DRILLING Rod Fuller.	
FIELD GEOLOGIST Mark Darrington		DEVELOPMENT: NA	

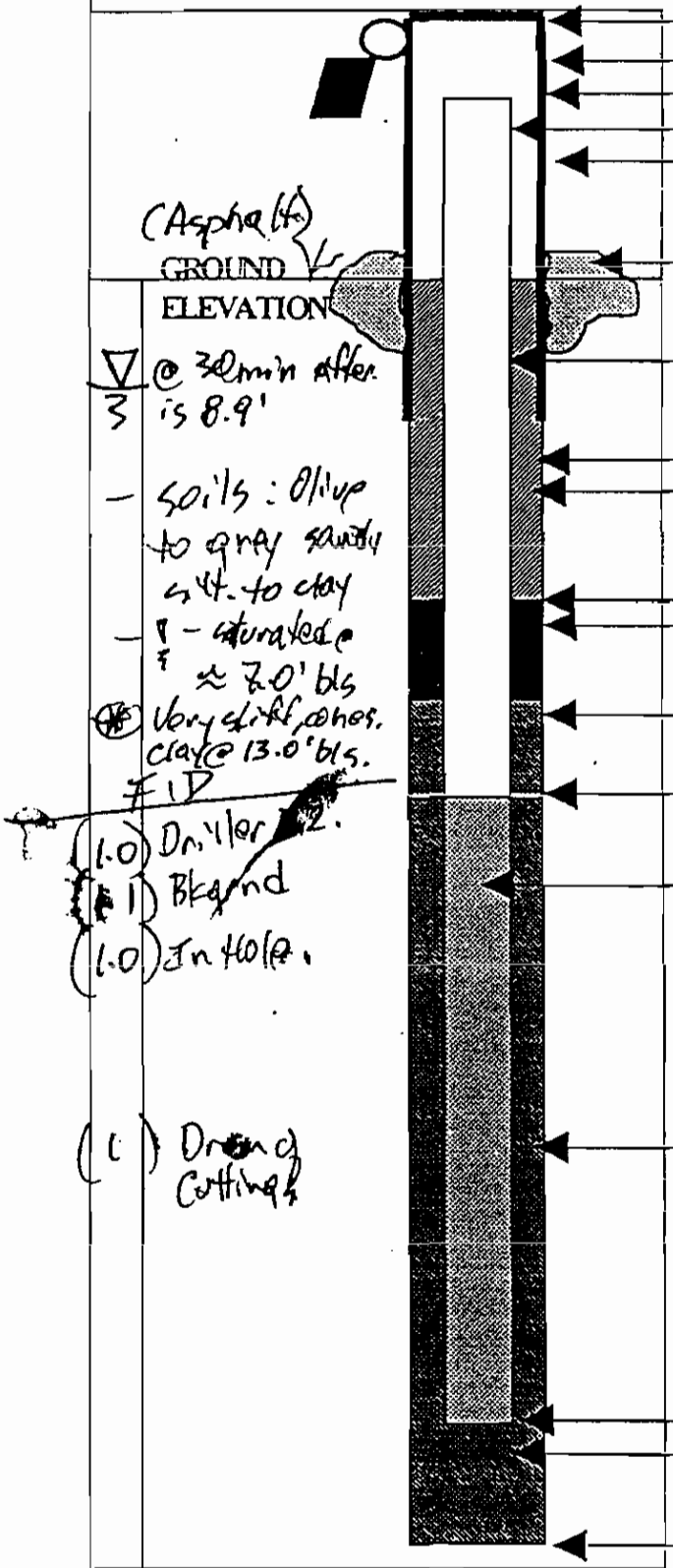


- ELEVATION OF TOP OF SURFACE CASING:
- ELEVATION OF TOP OF RISER PIPE:
- STICK-UP TOP OF SURFACE CASING: Flush
- STICK-UP RISER PIPE: Flush
- I.D. OF SURFACE CASING: 8" ID x 10" OD
- TYPE OF SURFACE CASING: Steel Cover w/ Bolt-on lid/flush (PEMCO)
- TYPE OF SURFACE SEAL: Concrete Pad (Quikcrete) 2'x2'x6"
- RISER PIPE I.D.: 2 in.
- TYPE OF RISER PIPE: PVC Sch. 40, Flush Thread (F.T.)
- BOREHOLE DIAMETER: 8.25 in (4.25" ID HSA)
- TYPE OF SEAL: Portland Cement Type I
- ELEVATION / DEPTH OF SEAL: 11'
- TYPE OS SEAL: "Choke Sand" (30/65) UF Qtz. Sand.
- DEPTH TOP OF SAND PACK: 2'
- ELEVATION / DEPTH TOP OF SCREEN: 13'
- TYPE OF SCREEN: PVC, Sch. 40, F.T.
- SLOT SIZE X LENGTH: 0.010" x 7 Ft.
- I.D. OF SCREEN: 2 in.
- TYPE OF SAND PACK: (20/30) F Qtz. Sand (Standard sand)
- ELEVATION / DEPTH BOTTOM OF SCREEN: 110'
- ELEVATION / DEPTH BOTTOM OF SAND PACK: 110'
- TYPE OF BACKFILL BELOW OBSERVATION WELL: (20/30) Qtz. Sand.
- ELEVATION / DEPTH OF HOLE: 110'

OVERBURDEN MONITORING WELL SHEET

BORING NO.: CNC21-[redacted]02 Under/adj. Steamline

PROJECT CNC	LOCATION: CNC 21	DRILLER Custom Drilling
PROJECT NO.	BORING CNC21-MW02	METHOD: ~~DPT~~ 4.25" HSA
ELEVATION	DATE 7/12/99	DRILLING Rod Fuller
FIELD GEOLOGIST Mark [redacted]ington		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING: [redacted]

ELEVATION OF TOP OF RISER PIPE: [redacted]

STICK-UP TOP OF SURFACE CASING: Flush

STICK-UP RISER PIPE: Flush

I.D. OF SURFACE CASING: 8" ID x 10" OD

TYPE OF SURFACE CASING: Steel Cover w/ bolt-down [redacted]sh (PEMCO)

TYPE OF [redacted] SEAL: Concrete Pad (Quik[redacted] 18" x 6"

RISER PIPE I.D.: 2"in

TYPE OF RISER PIPE: PVC, Sch. 40, Flush Thread

BOREHOLE DIAMETER: 8.25" (4.25" HSA)

TYPE OF SEAL: Portland Cement-Type I

ELEVATION / DEPTH OF SEAL: 12.0'

TYPE OS SEAL: "Choke Sand" (30/65) VF Qtz. sand

DEPTH TOP OF SAND PACK: 3.0'

ELEVATION / DEPTH TOP OF SCREEN: [redacted]

TYPE OF SCREEN: PVC, Sch. 40, F.T.

SLOT SIZE X LENGTH: 0.010"in x

I.D. OF SCREEN: 2"in.

TYPE OF SAND PACK: (20/30) F Qtz. sand (Standard Sand)

ELEVATION / DEPTHBOTTOM OF SCREEN: 114.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 114.0'

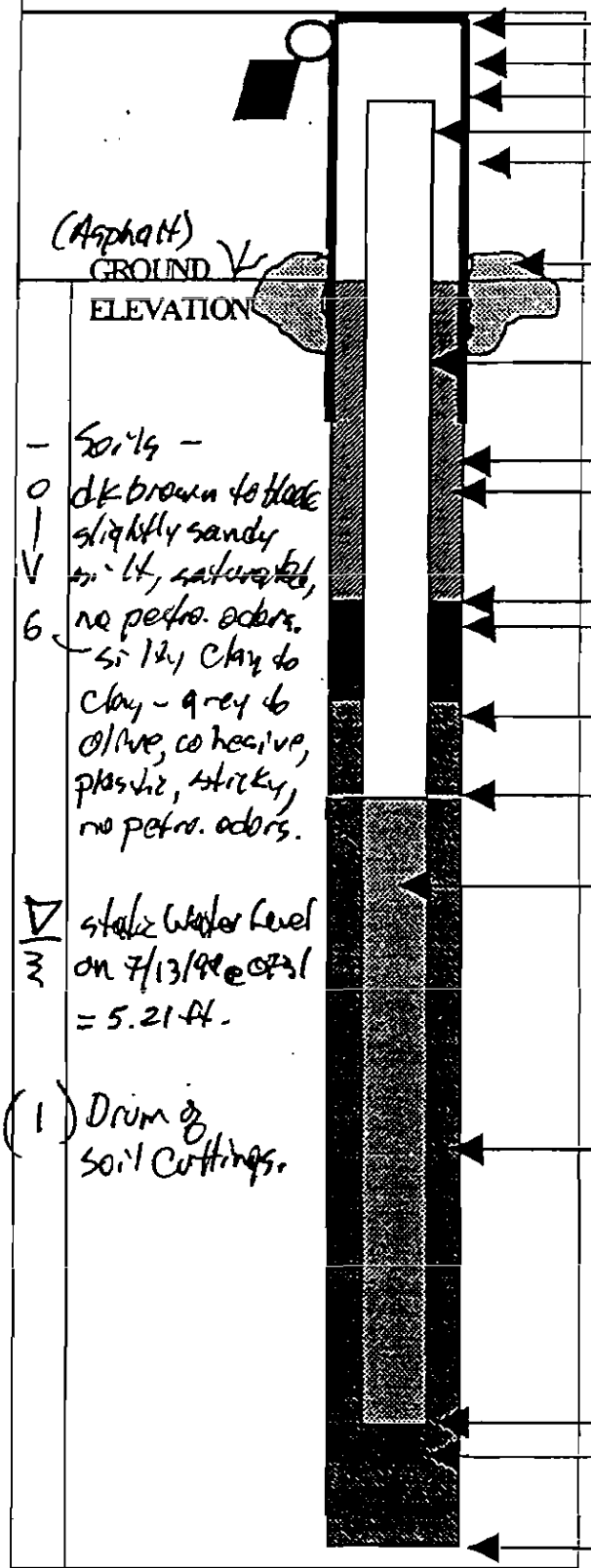
TYPE OF BACKFILL BELOW OBSERVATION WELL: (20/30) Qtz. Sand

ELEVATION / DEPTH OF HOLE: 114.0'

BORING NO.: CNC21-MW03

OVERBURDEN MONITORING WELL SHEET

PROJECT: CNC	LOCATION: S.Yard/Zone F	DRILLER: Custom Drilling
PROJECT NO.: 0129	BORING: CNC21-MW03	METHOD: ~~DPT~~ 4.25" HSA
ELEVATION:	DATE: 7/12/99	DRILLING: Rod Eagle
FIELD GEOLOGIST: Mark Domingo		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING: ____

ELEVATION OF TOP OF RISER PIPE: ____

STICK-UP TOP OF SURFACE CASING: Flush

STICK-UP RISER PIPE: Flush

I.D. OF SURFACE CASING: 8" ID x 10" OD

TYPE OF SURFACE CASING: Steel Cover w/ Bolt on lid / Flush (PEMCO)

TYPE OF SURFACE SEAL: Concrete Pad (Quickcrete) 2' x 2'

RISER PIPE I.D.: 2 in

TYPE OF RISER PIPE: PVC, Sch. 40 Flush Threaded (F.T.)

BOREHOLE DIAMETER: 8.25 in (4.25" ID HSA)

TYPE OF SEAL: Portland Cement Type I

ELEVATION / DEPTH OF SEAL: 12'

TYPE OS SEAL: "Choke Sand" VE Qtz sand.

DEPTH TOP OF SAND PACK: 3'

ELEVATION / DEPTH TOP OF SCREEN: 14'

TYPE OF SCREEN: PVC, Sch. 40, F.T.

SLOT SIZE X LENGTH: 0.010 in x 10 ft.

I.D. OF SCREEN: 2 in.

TYPE OF SAND PACK: (20/30) F Qtz. sand (Standard Sand)

ELEVATION / DEPTHBOTTOM OF SCREEN: 114.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 119.0'

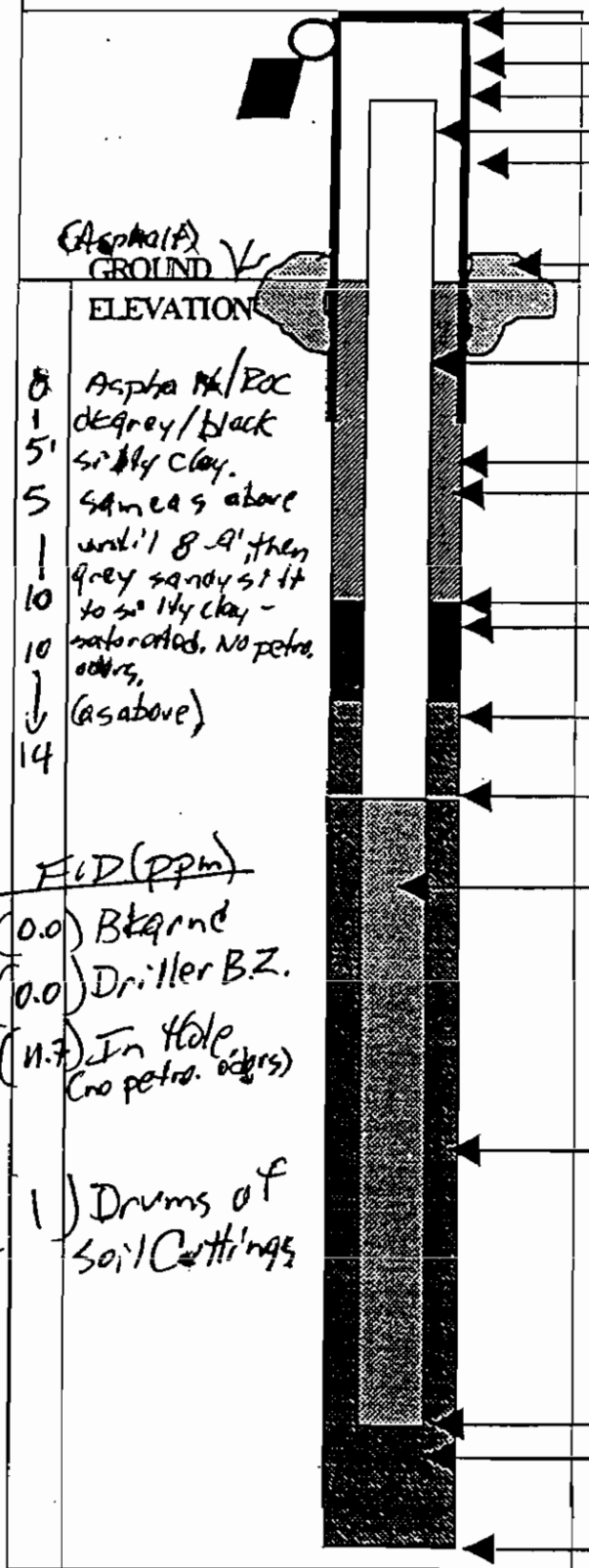
TYPE OF BACKFILL BELOW OBSERVATION WELL: (20/30) Qtz. Sand

ELEVATION / DEPTH OF HOLE: 114.0'

BORING NO. CNC21-mw04

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC		LOCATION: Site 21/Zone F	DRILLER Custom Drilling
PROJECT NO.	0129	BORING CNC21-mw04	METHOD ~~DPT~~ 4.25" HSA
ELEVATION		DATE 7/13/99	DRILLING Rod Fuller
FIELD GEOLOGIST	Mark Darrington		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING: ____

ELEVATION OF TOP OF RISER PIPE: ____

STICK -UP TOP OF SURFACE CASING: Flush

STICK-UP RISER PIPE: Flush

I.D. OF SURFACE CASING: 8" ID x 10"OD

TYPE OF SURFACE CASING: Steel Cover w/ bolt-on lid/Plug (FEMCO)

TYPE OF SURFACE SEAL: Concrete Pad (Quikcrete) 2'x2'x6"

RISER PIPE I.D.: 2 in.

TYPE OF RISER PIPE: PVC, Sch. 40, Flush Threaded (F.T.)

BOREHOLE DIAMETER: 8.25 in (4.25 in HSA)

TYPE OF SEAL: Portland Cement Type I

ELEVATION / DEPTH OF SEAL: 12

TYPE OS SEAL: "Choke Sand" (30/65) VF Qtz. sand

DEPTH TOP OF SAND PACK: 3

ELEVATION / DEPTH TOP OF SCREEN: 14'

TYPE OF SCREEN: PVC, Sch 40, F.T.

SLOT SIZE X LENGTH: 0.010 in x 10 ft.

I.D. OF SCREEN: 2 in.

TYPE OF SAND PACK: (20/30) F Qtz. sand (Standard Sand & Gravel)

ELEVATION / DEPTHBOTTOM OF SCREEN: 1141

ELEVATION / DEPTH BOTTOM OF SAND PACK: 1141

TYPE OF BACKFILL BELOW OBSERVATION WELL: (20/30) F Qtz. sand.

ELEVATION / DEPTH OF HOLE: 1141

FID (ppm)

(0.0) Bkgrnd

(0.0) Driller B.Z.

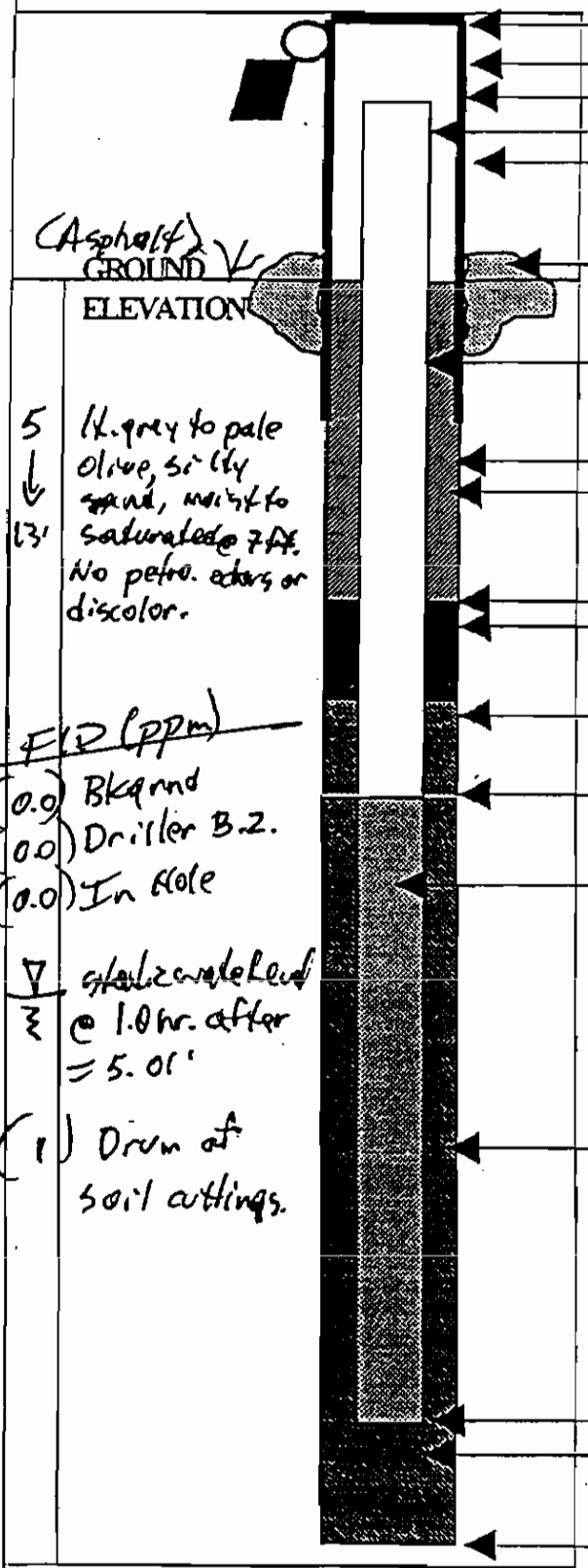
(11.7) In Hole (no petro. odors)

(1) Drums of Soil/Cuttings

BORING NO.: CNC21-MW5

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC	LOCATION: Site 21/Zone F	DRILLER Custom Drilling
PROJECT NO. 0129	BORING CNC21-MW05	METHOD: ~~DRT-4.25" ID HSA~~
ELEVATION	DATE 7/13/99	DRILLING Rod Fulton
FIELD GEOLOGIST Mark Darrington		DEVELOPMENT: NA

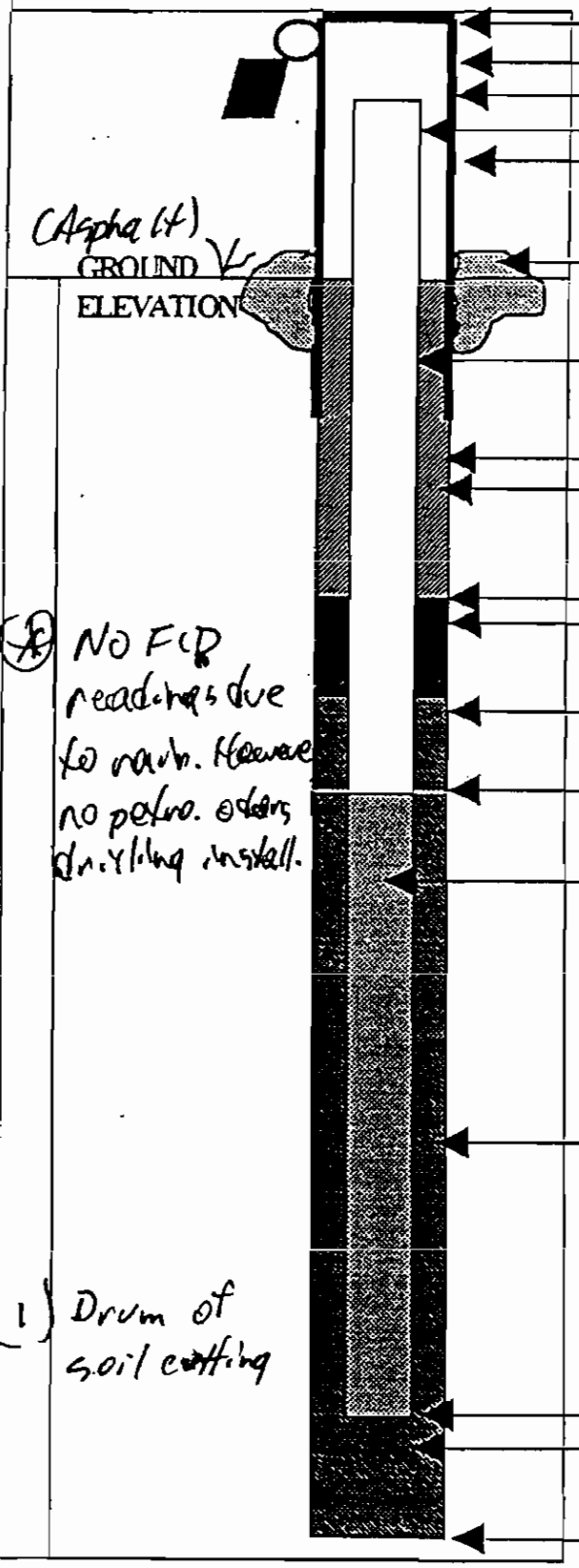


- ELEVATION OF TOP OF SURFACE CASING: ____
- ELEVATION OF TOP OF RISER PIPE: ____
- STICK-UP TOP OF SURFACE CASING: Flush
- STICK-UP RISER PIPE: Flush
- I.D. OF SURFACE CASING: 8" ID x 10" OD
- TYPE OF SURFACE CASING: Steel Cover w/ Bolt-on lid/Flush (REMCO)
- TYPE OF SURFACE SEAL: Concrete Pad (Quickcrete) 2' x 2' x 6"
- RISER PIPE I.D.: 2 in.
- TYPE OF RISER PIPE: PVC, Sch. 40, Flush Threaded (F.T.)
- BOREHOLE DIAMETER: ~~8.25 in (4.25" ID HSA)~~
- TYPE OF SEAL: ~~"Choke Sand" (30/65)~~ (and) ~~VF Qtz. Sand~~ Portland Cement Type I
- ELEVATION / DEPTH OF SEAL: 11.5
- TYPE OS SEAL: "Choke Sand" VF Qtz. Sand (30/65)
- DEPTH TOP OF SAND PACK: 2
- ELEVATION / DEPTH TOP OF SCREEN: 13
- TYPE OF SCREEN: PVC, Sch. 40, F.T.
- SLOT SIZE X LENGTH: 0.010 in x 10ft.
- I.D. OF SCREEN: 2 in.
- TYPE OF SAND PACK: (20/30) F Qtz. Sand (Standard Sand (CW))
- ELEVATION / DEPTHBOTTOM OF SCREEN: 113
- ELEVATION / DEPTH BOTTOM OF SAND PACK: 113
- TYPE OF BACKFILL BELOW OBSERVATION WELL: (20/30) Qtz. Sand.
- ELEVATION / DEPTH OF HOLE: 113

BORING NO.: CNC21-MW

OVERBURDEN MONITORING WELL SHEET

PROJECT CNC	LOCATION: Site 21/Zone F	DRILLER Custom Drilling	
PROJECT NO. 10129	BORING CNC21-MW6	METHOD: ~~DPT~~ 4.25 in ID HSA	
ELEVATION	DATE 9/13/[illegible]	DRILLING Rod Puller	
FIELD GEOLOGIST Mark Darrington		DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING: ____

ELEVATION OF TOP OF RISER PIPE: ____

STICK-UP TOP OF SURFACE CASING: Flush

STICK-UP RISER PIPE: Flush

I.D. OF SURFACE CASING: 8"ID x 10"OD

TYPE OF SURFACE CASING: Steel/Hoover w/ bolt-on lid Flush (PEMCO)

TYPE OF SURFACE SEAL: Concrete Pad (Quickcrete) 2'x2'x6"

RISER PIPE I.D.: 2 in

TYPE OF RISER PIPE: PVC, Sch. 40, Flush Threaded (F.T.)

BOREHOLE DIAMETER: 8.25 in

TYPE OF SEAL: Portland Cement Type I

ELEVATION / DEPTH OF SEAL: 11.5

TYPE OS SEAL: "Choke sand" VF Qtz. sand (30/65)

DEPTH TOP OF SAND PACK: 2

ELEVATION / DEPTH TOP OF SCREEN: 13

TYPE OF SCREEN: PVC, Sch. 40, F.T.

SLOT SIZE X LENGTH: 0.010 in x 10 ft.

I.D. OF SCREEN: 2 in.

TYPE OF SAND PACK: (20/30) F Qtz. sand (Standard sand (TM))

ELEVATION / DEPTHBOTTOM OF SCREEN: 113

ELEVATION / DEPTH BOTTOM OF SAND PACK: 113

TYPE OF BACKFILL BELOW OBSERVATION WELL: (20/30) F Qtz. Sand

ELEVATION / DEPTH OF HOLE: 113

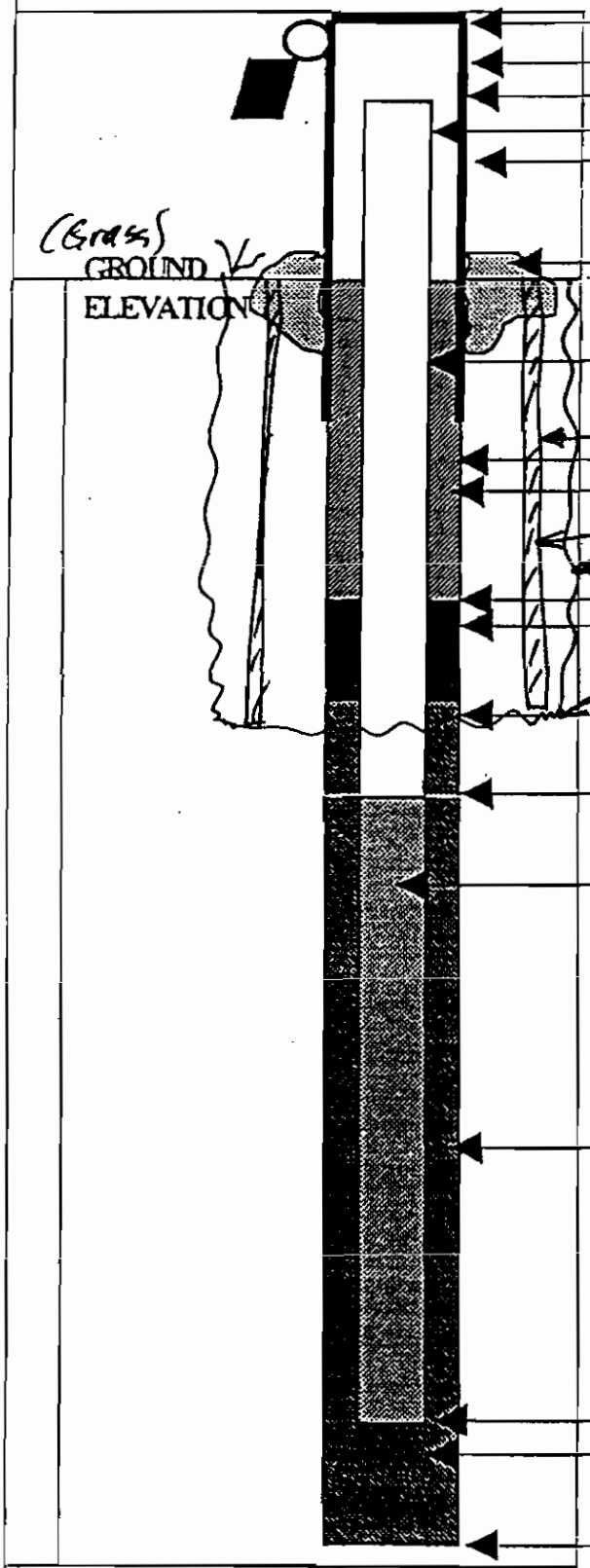
(A) NO FID readings due to rain. However no petro. odors during drilling/install.

(1) Drum of soil cuttings

BORING NO. CWC21-MW07

OVERBURDEN MONITORING WELL SHEET

PROJECT CWC	LOCATION S.Yard/Tower	DRILLER Custom Drilling
PROJECT NO.	BORING CWC21-MW07D	METHOD: ~~DPT~~ 8.25" HSA
ELEVATION	DATE 7/14/99 - 8/3/99	DRILLING Rod Fuller
FIELD GEOLOGIST Mark Darrington / Gerald Condo		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: FC-1.1

STICK-UP RISER PIPE: FC-1.1

I.D. OF SURFACE CASING: 8-inch Steel manhole

TYPE OF SURFACE CASING: Lid/Pedestal

TYPE OF SURFACE SEAL: Concrete Mix (Cement)

RISER PIPE I.D.: Sch 40 PVC (2-inch)

TYPE OF RISER PIPE: Sch 40 PVC

Surface Case Dia. 6 in.

BOREHOLE DIAMETER: 10 inch

TYPE OF SEAL: Pellet Type 1 Cement

Type of Surface Case: PVC, Sch. 40

Borehole Diam. 12.25 in.

ELEVATION / DEPTH OF SEAL: 1

TYPE OS SEAL:

Bottom of Surface Case. 25.0'

Bentonite seal 25 to 26' / Grout placed surface to 25' bgs

DEPTH TOP OF SAND PACK: 26' BGS

ELEVATION / DEPTH TOP OF SCREEN: 28' BGS

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE X LENGTH: .010-in x 5 FT

I.D. OF SCREEN: 2-inch

TYPE OF SAND PACK: 20/30 Standard Silica Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 33' BGS

ELEVATION / DEPTH BOTTOM OF SAND PACK: 33.5' BGS

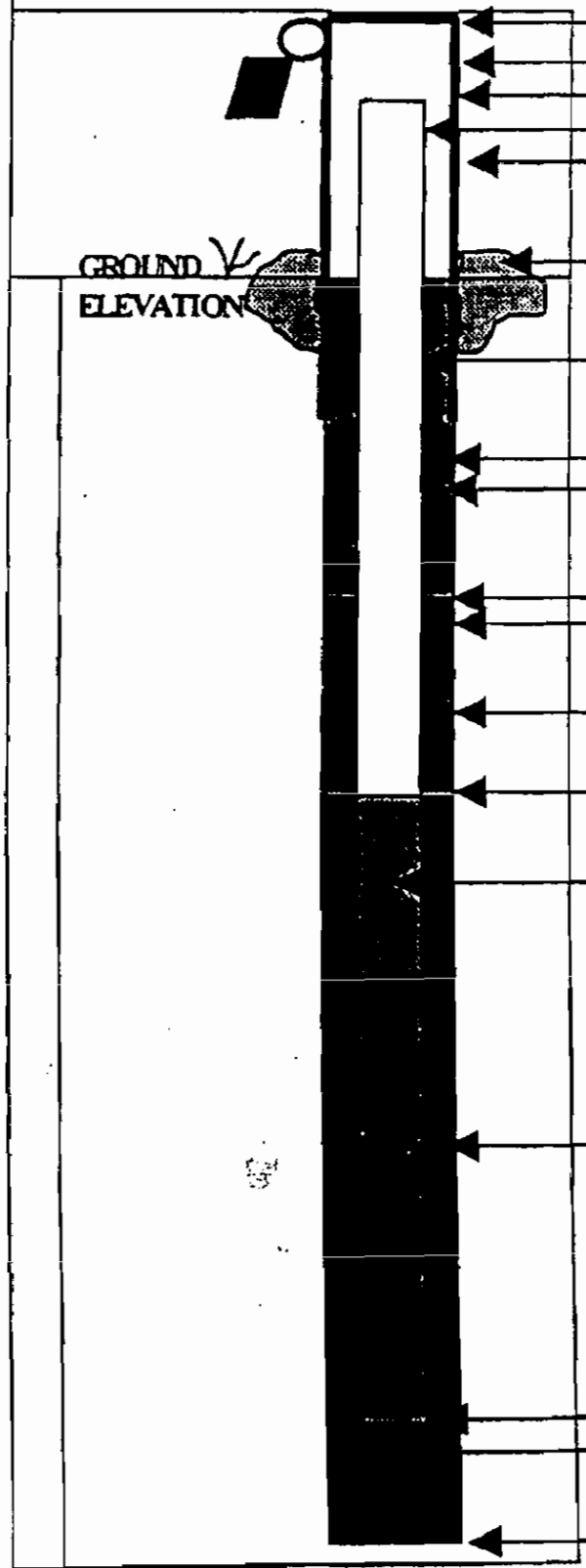
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Standard Silica Sand

ELEVATION / DEPTH OF HOLE: 33.5' BGS

BORING NO.: MW08

OVERBURDEN MONITORING WELL SHEET

PROJECT	CWC	LOCATION: Site 21	DRILLER
PROJECT NO.		BORING MW08	METHOD: DPT
ELEVATION		DATE 8/5/99	DRILLING
FIELD GEOLOGIST			DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Concrete - Flush

RISER PIPE I.D.: 4" PVC

TYPE OF RISER PIPE:

BOREHOLE DIAMETER:

TYPE OF SEAL:

ELEVATION / DEPTH OF SEAL: 16'

TYPE OS SEAL: FineSand

DEPTH TOP OF SAND PACK: 9'

ELEVATION / DEPTH TOP OF SCREEN: 12'

TYPE OF SCREEN: 4" PVC

SLOT SIZE X LENGTH: 0.01" X 10'

I.D. OF SCREEN: 1.25".

TYPE OF SAND PACK: Medium

ELEVATION / DEPTHBOTTOM OF SCREEN: 112'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 112'

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: 112'

SW BTEX B 1

APPENDIX C

FIELD SAMPLING DATA SHEETS

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CAX21
Project No.:

Sample ID No.: 21SLB03B304
Sample Location: B-03
Sampled By: ORIA
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 8-18-99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1010	3.0'-4.0	Greenish Gray	silty clay Tr. of gravel
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX, EDB	4-ENCORES	8-18-99	
PAH	1-4oz Glass	"	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

J. Orth

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: CWE
Project No.:

Sample ID No.: 21SLB04040
Sample Location: 21B04
Sampled By: R. Franklin
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 6/23/99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0755	4-5'	Brown	Sand w/ Gravel
Method: DPT			
Monitor Reading (ppm): 20			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX/EDB	5g Encore		
PAH/Naphthalene	4oz		
TPH	4oz		

OBSERVATIONS / NOTES:

Duplicate TPH only.

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: 21SLB04040SD

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: CWE
Project No.:

Sample ID No.: 215213d5d56
Sample Location: 215213d5
Sampled By: T. Franklin
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 6/23/99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0815	5-6'	Brown	Sand & Gravel
Method: DPT			
Monitor Reading (ppm): 10			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX/EDB	5g Encore		
PAH/Naphthalene	4 oz		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: ~~GNC22~~ GNC21
Project No.:

Sample ID No.: 21SB070506
Sample Location: B07
Sampled By: JBN
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 8-18-99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0900	5.0'-6.0'	Greenish Gray	silty clay
Method: DPT			
Monitor Reading (ppm): 100 ppm			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX PAH	4-EnCore	8-18-99	
	1-4oz Glass	"	

OBSERVATIONS / NOTES:

Total Depth = 8.0'
H.S. w/o Filter = 250 ppm
w/ Filter = 150 ppm

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): J.R. Hill

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: CWC
Project No.:

Sample ID No.: Z1SLB04060Ø7
Sample Location: Z1B04
Sampled By: R. Franklin
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 6/23/99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0950	6-7	Grey	Silty Clay - Moist
Method: DPT			
Monitor Reading (ppm): 130			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX / EDB	5 - 5ml vials		
PAH / Naphthalene	4 oz		
TOC / Foc	8 oz		
Grain Size	16 oz		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
	Z1SLB04060Ø7D

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: _____
Project No.: _____

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

Sample ID No.: 215LB09078
Sample Location: 215B09
Sampled By: R. Franklin
C.O.C. No.: _____

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

GRAB SAMPLE DATA:

Date: 6/23/99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0930	7-8'	Brown w/Black Staining	Sand & Gravel - wet
Method: DPT			
Monitor Reading (ppm): 2			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX/EDB	5g Encore		
PAH/Naphthalene	4 oz		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): R. Franklin

SOIL & SEDIMENT SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: CNC 21
Project No.:

Sample ID No.: 3152B1/0505
Sample Location: B-11
Sampled By: JRH
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 8-18-98	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0920	5.0'-6.0'	Greenish Grey	silty clay
Method: DPT			
Monitor Reading (ppm): 150			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX, EDB	4-EnCores	8-18-98	

OBSERVATIONS / NOTES:

Total Depth = 8.0'
w/o Filter = 170ppm
w/ " = 20ppm

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

J. R. Hall

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC21
Project No.:

Sample ID No.: 215LB12Ø7Ø8
Sample Location: B-12
Sampled By: JRH
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 8-18-99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0945	7.0-8.0'	Greenish Gray	silty clay
Method: DPT			
Monitor Reading (ppm): 50 ppm			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX, EDB	4- EnCores	8-18-99	
PAH	1-402 glass	"	

OBSERVATIONS / NOTES:

T/D = 8.0'
W/o Filter = 140 ppm
W/ " = 90 ppm

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

J. R Hill

MONITORING WELL DEVELOPMENT RECORD

Well: MW#1
Site: 21
Date Installed: 7/12/99
Date Developed: 8/5/99
Dev. Method: Pump
Pump Type: Centrifugal

Depth to Bottom (ft.): 10'
Static Water Level Before (ft.): 5.65'
Static Water Level After (ft.):
Screen Length (ft.): 7'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: R. Franklin
Drilling Co.: Custom Drilling
Project Name: CWC
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1130		30	6.55	27.4	6.74	1.17	126	Orange, Gas Odor, Sheen - reduced pump rate
1136		35	5.82	29.1	6.6	1.17	58	Odor

MONITORING WELL DEVELOPMENT RECORD

Well: MW #2
Site: Z1
Date Installed: 7/12/99
Date Developed: 8/8/99
Dev. Method: Pump
Pump Type: Centrifugal

Depth to Bottom (ft.): 14
Static Water Level Before (ft.): 5.56
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: A. Franklin
Drilling Co.: Custom Drilling
Project Name: EMC
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1033		1	12.91	30.1	7.57	1.47	114	Organic
1042		2.5	13.30	30.6	7.22	1.76	144	Organic
1047		2.75	13.75	35.5	7.36	1.80	208	Slightly Cloudy
1056	Turned pump off.					~~1.82~~	~~166~~	
1105		4	10.55	39.4	7.35	1.82	166	Organic
1112		5	11.64			1.79	167	organic
1121		5.5	11.67	40.1	7.50	1.72	105	Organic

MONITORING WELL DEVELOPMENT RECORD

Well: MW03
Site: 21
Date Installed: 7/12/99
Date Developed: 8/18/99
Dev. Method: Pump
Pump Type: Centrifical

Depth to Bottom (ft.): 14'
Static Water Level Before (ft.): 4.52
Static Water Level After (ft.): 12.9
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: A. Franklin
Drilling Co.: Eastern Drilling
Project Name: CNL
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
0928		1	11.85	28.6	6.44	1.67	999	Cloudy
0934		3	12.46	29.4	7.23	1.84	999	Cloudy
0940		3.5	12.89	31.1	7.32	1.90	999	Cloudy
0946		4	12.64	33.9	7.35	1.60	999	Cloudy
0953		5	12.76	35.6	7.36	1.37	999	Cloudy
1001		7	13.59	35.5	7.30	1.10	266	Less cloudy
1007		6	13.58	36.5	7.36	0.929	192	Opaque
1013		9	12.90	37.2	7.36	0.904	116	Opaque
1018		9.5	12.90	36.4	7.46	0.887	82	Opaque

MONITORING WELL DEVELOPMENT RECORD

Well: mw04
Site: 21
Date Installed: 7/13/99
Date Developed: 8/4/99
Dev. Method: Pump
Pump Type: Centrifical

Depth to Bottom (ft.): 14.2'
Static Water Level Before (ft.): 5.19
Static Water Level After (ft.): 14.1'
Screen Length (ft.): 10'
Specific Capacity: —
Casing ID (in.): 2"

Responsible Personnel: R. Franklin
Drilling Co.: Custom Drilling
Project Name: CWC
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1334			14.1	27.5	6.04	22.90	64	Clear
	Pumped almost dry.							

MONITORING WELL DEVELOPMENT RECORD

Well: MW-5
Site: 21
Date Installed: 7/13/99
Date Developed: 8/18/99
Dev. Method: Pump
Pump Type: Centrifical

Depth to Bottom (ft.): 13
Static Water Level Before (ft.): 2.94
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: A. Franklin
Drilling Co.: Custom Drilling
Project Name: CWE
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
0838		3	12.55	26.4	7.21	1.24	409	Cloudy
0839	Well pumped dry.						~~535~~	~~Cloudy~~
0855		3.5	6.23	29.2	7.54	1.09	533	Cloudy
0901		4	11.91	27.9	7.31	1.09	331	Slightly Cloudy
0906		5	12.68	29.2	7.38	0.904	294	" "
0913		5.5	12.67	31.0	7.52	0.90	112	Orange
0917		6	11.83	31.9	7.55	0.899	15	Clear

MONITORING WELL DEVELOPMENT RECORD

Well: MW06
Site: 21
Date Installed: 7/13/99
Date Developed: 8/8/99
Dev. Method: Pump
Pump Type: Centrifugal

Depth to Bottom (ft.): 13
Static Water Level Before (ft.): 4.71
Static Water Level After (ft.):
Screen Length (ft.): 10'
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: R. Franklin
Drilling Co.: Custom Drilling
Project Name: CNC
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
0824		4	12.09	26.0	6.95	6.76	41	Clear

MONITORING WELL DEVELOPMENT RECORD

2.9' stick up

Well: MW07D
Site: 21
Date Installed: ____
Date Developed: 8/8/99
Dev. Method: Pump
Pump Type: Centrifical

Depth to Bottom (ft.): 33.5'
Static Water Level Before (ft.): 6.77 TOC
Static Water Level After (ft.): ____
Screen Length (ft.): 5.5'
Specific Capacity: ____
Casing ID (in.): 2"

Responsible Personnel: R. Franklin
Drilling Co.: Custom Drilling
Project Name: CNC
Project Number: ____

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1333		1.5	21.51	39.0	7.46	1.32	799	Cloudy
	Pump unable	to pump	water once wl	Dropped.				

MONITORING WELL DEVELOPMENT RECORD

Well: MW #7D
Site: 21
Date Installed: 8/3/99
Date Developed: 8/9/99
Dev. Method: Pump
Pump Type: Centrifugal

Depth to Bottom (ft.): 33.5
Static Water Level Before (ft.): 9.21'
Static Water Level After (ft.):
Screen Length (ft.): 5'
Specific Capacity: —
Casing ID (in.): 2"

Responsible Personnel: R. Franklin
Drilling Co.: Custom Drilling
Project Neme: CVC
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1353		3	28.78	31.1	6.87	12.8	206	Cloudy
1400		5	27.0	33.6	6.71	13.3	303	Cloudy
1411		5.5	23.45	38.3	6.73	13.6	354	Cloudy
1417		6	22.25	39.4	6.63	13.1	363	Cloudy
	Pump cannot draw water.							
1605	Began bailing well.							
1627	Started —	5	31.55	25.16	6.90	19.1	932	Cloudy
1659		7	30.1	24.4	7.99	12.4	265	Orange
1716		8	Dry	23.7	7.53	13.4	113	Orange

MONITORING WELL DEVELOPMENT RECORD

Well: mw68
Site: 21
Date Installed: _____
Date Developed: 8/18/99
Dev. Method: Pump
Pump Type: _____

Depth to Bottom (ft.): 12'
Static Water Level Before (ft.): 3.95'
Static Water Level After (ft.): _____
Screen Length (ft.): _____
Specific Capacity: _____
Casing ID (in.): _____

Responsible Personnel: _____
Drilling Co.: _____
Project Name: _____
Project Number: _____

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)

MONITORING WELL DEVELOPMENT RECORD

Well: MW 68
Site: 21
Date Installed: 8/5/94
Date Developed: 8/19/94
Dev. Method: Pump
Pump Type: Centrifical

Depth to Bottom (ft.): 12'
Static Water Level Before (ft.): 6.58'
Static Water Level After (ft.): ____
Screen Length (ft.): 10'
Specific Capacity: ____
Casing ID (in.): 1.25"

Responsible Personnel: R. Franklin
Drilling Co.: Custom Drilling
Project Name: CRC
Project Number: ____

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductence (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1449		0.25	7.01	36.6	6.50	10.4	365	Cloudy

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: CNC - Charleston
Project No.:

Sample ID No.: 216LM0201
Sample Location: MW-02
Sampled By: RH | EH
C.O.C. No.:

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

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

SAMPLING DATA:

Date: 6/22/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 0955	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Slow flow								

PURGE DATA:

Date: 8/22/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow purge	Initial	6.72	1.69	27.1	12	2.00		
Monitor Reading (ppm):	1	6.82	1.76	28.2	0	1.80		
Well Casing Diameter & Material	2	6.85	1.72	27.9	0	1.85		
Type: 2" PVC	3	6.87	1.67	27.7	1	2.53		
Total Well Depth (TD):	14.00							
Static Water Level (WL):	5.41							
One Casing Volume(gal/L):	1.4kgal							
Start Purge (hrs):	0840							
End Purge (hrs):	0954							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, MTBE, EDB, naph	HCl	3 x 40mL Vial	8/22/99
PAH	—	2 x 1L amber	8/22/99

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD | Duplicate ID No.: 216LM0201D

Signature(s): Eyg. Hamm

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: CNC21
Project No.:

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

Sample ID No.: 216LM0301
Sample Location: MW-3
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8-22-99 / Time: 1150	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA
Method:								

PURGE DATA:

Date: 8-21-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Slow Purge	Initial	6.81	0.99	28.6	15	1.76		
Monitor Reading (ppm): 0	1	6.82	.756	29.2	3	1.38		
Well Casing Diameter & Material	2	6.84	.754	29.9	6	1.81		
Type: 2" P.V.C.	3	6.79	.758	29.8	5	1.41		
Total Well Depth (TD):	13.94							
Static Water Level (WL):	4.27							
One Casing Volume(gal/L):	1.8 gal							
Start Purge (hrs):	1042							
End Purge (hrs):	1152							
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, MTBE, EDB, Napth.	HCl	3x40 ml vials	8-21-99

OBSERVATIONS / NOTES:

Circle if Applicable:
MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: 21
Project No.:

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

Sample ID No.: 21GLMW501
Sample Location: CNC21MW5
Sampled By: JA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/16/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1240	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 8/16/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	6.83	.274	28.3	1	2.25		
Monitor Reading (ppm):	1	7.00	.879	30.0	0	~~1.4~~ 1.79		
Well Casing Diameter & Material	2	6.85	.776	28.6	0	1.21		
Type:	3	6.96	.817	27.9	0	2.74		
Total Well Depth (TD): 12.95								
Static Water Level (WL): 2.78								
One Casing Volume(gal/L): 1.64								
Start Purge (hrs): 1155								
End Purge (hrs): 1240								
Total Purge Time (min):								
Total Vol. Purged (gal/L): ~5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX/EDB	HCl	3 x 40ml	
PAH	—	2 x 1 Ltr.	

OBSERVATIONS / NOTES:

24
10.17
.16
6242
10170
16412

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC - Charleston
Project No.:

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

Sample ID No.: 216MW07D01
Sample Location: MW-07D
Sampled By: RH/EH
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/22/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1430	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: low flow		7.11	23.0	28.1	64	6.87		

PURGE DATA:

Date: 8/22/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: slow purge	Initial	6.37	23.5	24.1	B	1.31		
Monitor Reading (ppm):	1	6.95	21.6	24.4	4	1.88		
Well Casing Diameter & Material	2	7.11	23.0	28.1	64	6.87		
Type: 2" PVC	3							
Total Well Depth (TD):	53.52							
Static Water Level (WL):	5.84							
One Casing Volume(gal/L):	4.7 gal							
Start Purge (hrs):	0840							
End Purge (hrs):	1350							
Total Purge Time (min):	310							
Total Vol. Purged (gal/L):	11.4							

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, MTBE, EDB, naph	HCl	3x 40mL vial	8/22/99
PAH	—	2x 1L amber	8/22/99

OBSERVATIONS / NOTES:

* Note: well was not producing water, so purging was stopped @ approximately 2.5 casing volumes. Well was allowed to recharge, and sample was taken. Only 2 reading from Horiba were taken.

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): Emily J. Harrison

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC-Charleston
Project No.:

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

Sample ID No.: 01GLM0801
Sample Location: MW-08
Sampled By: RH/EH
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/22/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1500	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: slow flow								

PURGE DATA:

Date: 8/22/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: slow purge	Initial	6.77	21.0	25.9	90	1.01		
Monitor Reading (ppm):	1							
Well Casing Diameter & Material	2							
Type: 1.25" PVC	3							
Total Well Depth (TD):	11.62							
Static Water Level (WL):	5.77							
One Casing Volume(gal/L):	0.4							
Start Purge (hrs):	1410							
End Purge (hrs):	1450							
Total Purge Time (min):	40							
Total Vol. Purged (gal/L):	0.5 gal							

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX, MTBE, EDB, naph	HCl	3 x 40 mL vial	8/22/99
PAH	—	2 x 1L amber	

OBSERVATIONS / NOTES:

- Well went dry after initial reading @ 1430. Stopped pump and allowed to recharge. Restarted @ 1445, dry again at 1450

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): Eg J Harrison

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: CNC Zone F
Project No.:
Location: Site 21/Building 241
Personnel: Paul Calligan
Weather Conditions: Overcast, 86 Degrees
Measuring Device: Keck Water Level Indicator
Tidally Influenced: Yes _X_ No ___
Remarks:

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)* TOC	Total Well Depth (feet)*	Depth to Free Product (feet)*	Depth to Water (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
CNC21M01	10/13/1999	1544				5.12			
CNC21M02	10/13/1999	1524				5.17			
CNC21M03	10/13/1999	1532				4.14			
CNC21M04	10/13/1999	1520				5.19			
CNC21M05	10/13/1999	1527				2.69			
CNC21M06	10/13/1999	1536				4.71			
CNC21M7D	10/13/1999	1540				6.02			

* All measurements to the nearest 0.01 foot

GROUNDWATER LEVEL MEASUREMENT SHEET

Page ___ of ___

PROJECT NAME: CNC - Chas. SC
PROJECT NUMBER: Zone F - 0219
PERSONNEL: Roger Franklin / M. Darrington
DATE: 8/8/99
WEATHER CONDITIONS: Sunny / Hot / Humid

LOCATION: Site 21 / Zone F
MEASURING DEVICE: Keck
ADJUSTMENT FACTOR: None
REMARKS: None

Well or Piezometer Number	Time	Elevation of Reference Point (Feet)*	Water Level Indicator Reading (Feet)*	Groundwater Elevation (Feet)*	Comments
CNC21-MO1	1124		5.65		
CNC21-MO2	1024		5.56		
CNC21-MO3	0920		4.52		
CNC21-MO4	1325		5.19		
CNC21-MO5	0828		2.98		
CNC21-MO6	0815		4.71		
CNC21-MO7D	1322		6.77		
CNC21-MO8	1358		3.95		
① Water levels taken prior to sampling. This was not a synoptic measuring event.					

*Measurements to nearest 0.01 foot.

Signature(s): _____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

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Project Site Name: site 21
Project No.: ϕ219
Sampled By: JK/RH
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 219LMϕ101
Sample Location: MW-1
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 9 9 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time: 1040	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method: Geopump	oily	6.62	1.10	26.9	1	1.2ϕ		

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: _____

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
_____	x 0.01 =	mg/L
_____	x 0.02 =	mg/L

CHEMetrics: 1.0 mg/L

Notes:

Alkalinity:

Analysis Time: _____

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & _____	x 0.1 =	mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4 =	mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	_____ & _____	x 1.0 =	mg/L
☒	200-800 mg/L	50 ml	1.600 N	2.0	_____ & 277	x 2.0 =	554 mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0 =	mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0 =	mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:			

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: _____

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☒	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
_____	x 0.1 =	mg/L
_____	x 0.2 =	mg/L
548	x 1.0 =	548 mg/L
_____	x 2.0 =	mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

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Project Site Name: Site 21 | Sample ID No.: 21GLM01 01

Project No.: 02219 | Sample Location: MW-1

Sampled By: JK/RN | Duplicate: ☐

Field Analyst: RN | Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: (DR-700) DR-8__ HACH MN-5 Other: _____ Analysis Time: _____

Program/Module: 525nm 41

Concentration: 4.4 mg/L Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: (DR-700) DR-8__ IR-18C Color Wheel Other: _____ Analysis Time: _____

Program/Module: 500nm 33

Concentration: 5.10 mg/L Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: (HS-C) Other: _____ Analysis Time: _____

Concentration: 2.0 mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Ckecklist: ☐

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

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Project Site Name: Site 21
Project No.: 0219
Sampled By: JK / BH
Field Analyst: BH
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 21GLM0101
Sample Location: MW-1
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: (DR-700) DR-8__ HS-C Color Chart HS-WR Color Wheel Analysis Time: _____
Program/Module: 610nm 93 Other: _____

Concentration: 0.087 mg/L Filtered: ☐
Notes:

Sulfate (SO_4^{2-}):

Equipment: DR-700 DR-8__ Other: _____ Analysis Time: _____
Program/Module: 91
Concentration: _____ mg/L Filtered: ☐

Standard Solution: ☐ Results: _____
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Nitrite (NO_2^--N):

Analysis Time: _____
Equipment: DR-700 DR-8__ Other: _____ Filtered: ☐
Program/Module: 60
Concentration: _____ mg/L Reagent Blank Correction: ☐
Standard Solution: ☐ Results: ☐
Notes:

Nitrate (NO_3^--N):

Analysis Time: _____
Equipment: DR-700 DR-8__ Other: _____ Filtered: ☐
Program/Module: 55
Concentration: _____ mg/L
Nitrite Interference Treatment: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc. Page __ of __

Project Site Name: Site 21 Sample ID No.: 21GLMO4Ø1

Project No.: 0219 Sample Location: MW-4

Sampled By: RH / JK Duplicate: ☐

Field Analyst: Blank: ☐

Field Form Checked as per QA/QC Checklist (initials):

SAMPLING DATA:

Date: 9-8-99	Color	~~ORP (Eh)~~ pH	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time: 1210	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method: Grab	Or.	6.60	8.50	26.3	0	1.48		

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: _____

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	~~2-10 mg/L~~ 1-12	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
_____	x 0.01 =	mg/L
_____	x 0.02 =	mg/L

CHEMetrics: 1.0 mg/L

Notes:

Alkalinity:

Analysis Time: _____

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & _____	x 0.1 =	mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4 =	mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	_____ & _____	x 1.0 =	mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & _____	x 2.0 =	mg/L
☒	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & 267	x 5.0 =	1335 mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0 =	mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:			

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: _____

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☐	100-400 mg/L	200 ml	3.636 N	1.0
☒	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
_____	x 0.1 =	mg/L
_____	x 0.2 =	mg/L
_____	x 1.0 =	mg/L
360	x 2.0 =	720 mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

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Project Site Name: Site 21
Project No.: 0219
Sampled By: RH/JK
Field Analyst: RH
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 21GLM0401
Sample Location: MW-4
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: (DR-700) DR-8__ HACH MN-5 Other: _____ Analysis Time: _____
Program/Module: 525nm 41
Concentration: ~0.2 mg/L
Filtered: ☐
Digestion: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Ferrous Iron (Fe^{2+}):

Equipment: (DR-700) DR-8__ IR-18C Color Wheel Other: _____ Analysis Time: _____
Program/Module: 500nm 33
Concentration: 5.10 mg/L
Filtered: ☐
Notes:

Hydrogen Sulfide (H_2S):

Equipment: (HS-C) Other: _____ Analysis Time: _____
Concentration: 1.0 mg/L Exceeded 5.0 mg/L range on color chart: ☐
Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐
Correct measurement units are cited in the SAMPLING DATA block: ☐
Mulitplication is correct for each *Multiplier* table: ☐
Final calulated concentration is within the appropriate *Range Used* block: ☐
Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐
QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐
Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐
Title block is initialized by person who performed the QA/QC Ckecklist: ☐

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

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Project Site Name: Site 21 CNC
Project No.: 0219
Sampled By: RW/JK
Field Analyst: RW
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 21GLM0401
Sample Location: MW4
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: (DR-700) DR-8__ HS-C Color Chart HS-WR Color Wheel Analysis Time: _____
Program/Module: 610nm 93 Other: _____

Concentration: 0.084 mg/L Filtered: ☐
Notes:

Sulfate (SO_4^{2-}):

Equipment: DR-700 DR-8__ Other: _____ Analysis Time: _____
Program/Module: 91
Concentration: _____ mg/L Filtered: ☐

Standard Solution: ☐ Results: _____
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Nitrite (NO_2^--N):

Analysis Time: _____
Equipment: DR-700 DR-8__ Other: _____ Filtered: ☐
Program/Module: 60
Concentration: _____ mg/L Reagent Blank Correction: ☐
Standard Solution: ☐ Results: ☐
Notes:

Nitrate (NO_3^--N):

Analysis Time: _____
Equipment: DR-700 DR-8__ Other: _____ Filtered: ☐
Program/Module: 55
Concentration: _____ mg/L
Nitrite Interference Treatment: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

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Project Site Name: Site 21

Project No.: 0219

Sampled By:

Field Analyst:

Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 21GMW01

Sample Location: MW-6

Duplicate: ☐

Blank: ☐

SAMPLING DATA:

	Color	~~ORP (Eh)~~ pH	S.C.	Temp.	Turbidity	DO	Sal.	pH
Date: 9 8 99								
Time: 1120	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method: geo pump	Or.	6.64	5.35	27.4	11	0.49		

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: _____mg/L) Analysis Time: _____

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier		Concentration
_____	x 0.01	=	mg/L
_____	x 0.02	=	mg/L

CHEMetrics: 1.5 mg/L

Notes:

Alkalinity:

Analysis Time: _____

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: _____mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier		Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & _____	x 0.1	=	mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	=	mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	_____ & _____	x 1.0	=	~~1060~~ mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	_____ & 530	x 2.0	=	1060 mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	_____ & _____	x 5.0	=	mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	_____ & _____	x 10.0	=	mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:			

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: _____

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☐	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count			Concentration
_____	x 0.1	=	mg/L
_____	x 0.2	=	mg/L
670	x 1.0	=	670 mg/L
_____	x 2.0	=	mg/L

CHEMetrics: _____mg/L

Notes:

Standard Additions: ☐ Titrant Molarity:_____ Digits Required: 1st.:_____ 2nd.:_____ 3rd.:_____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: Site 21
Project No.: 0219
Sampled By: RH/UK
Field Analyst: RH
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 21GLM06G1
Sample Location: MW-6
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: (DR-700) DR-8__ HACH MN-5 Other: _____ Analysis Time: 3 min
Program/Module: 525nm 41
Concentration: 0.5 mg/L
Filtered: ☐
Digestion: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Ferrous Iron (Fe^{2+}):

Equipment: (DR-700) DR-8__ IR-18C Color Wheel Other: _____ Analysis Time: _____
Program/Module: 500nm 33
Concentration: 3.36 mg/L
Filtered: ☐
Notes:

Hydrogen Sulfide (H_2S):

Equipment: (HS-C) Other: _____ Analysis Time: _____
Concentration: 0.1 mg/L Exceeded 5.0 mg/L range on color chart: ☐
Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐
Correct measurement units are cited in the SAMPLING DATA block: ☐
Mulitplication is correct for each *Multiplier* table: ☐
Final calulated concentration is within the appropriate *Range Used* block: ☐
Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐
QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐
Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐
Title block is initialized by person who performed the QA/QC Ckecklist: ☐

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: Site 21 CMC
Project No.: 0219
Sampled By: RH / JK
Field Analyst: RH
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 21GLM0601
Sample Location: MW-6
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: (DR-700) DR-8__ HS-C Color Chart HS-WR Color Wheel Analysis Time: 5 min
Program/Module: 610nm 93 Other: _____

Concentration: 0.080 mg/L Filtered: ☐
Notes:

Sulfate (SO_4^{2-}):

Equipment: DR-700 DR-8__ Other: _____ Analysis Time: _____
Program/Module: 91
Concentration: _____ mg/L Filtered: ☐

Standard Solution: ☐ Results: _____
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Nitrite (NO_2^--N):

Analysis Time: _____
Equipment: DR-700 DR-8__ Other: _____ Filtered: ☐
Program/Module: 60
Concentration: _____ mg/L Reagent Blank Correction: ☐
Standard Solution: ☐ Results: ☐
Notes:

Nitrate (NO_3^--N):

Analysis Time: _____
Equipment: DR-700 DR-8__ Other: _____ Filtered: ☐
Program/Module: 55
Concentration: _____ mg/L
Nitrite Interference Treatment: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

APPENDIX D

SOIL AND GROUNDWATER LABORATORY ANALYTICAL DATA

S. W. COLE ENGINEERING, INC.

R E P O R T O F G R A D A T I O N
ASTM C-117, C-136

Project No. 99008
Date 06/30/1999

Project MISCELLANEOUS

Client KATAHDIN ANALYTICAL

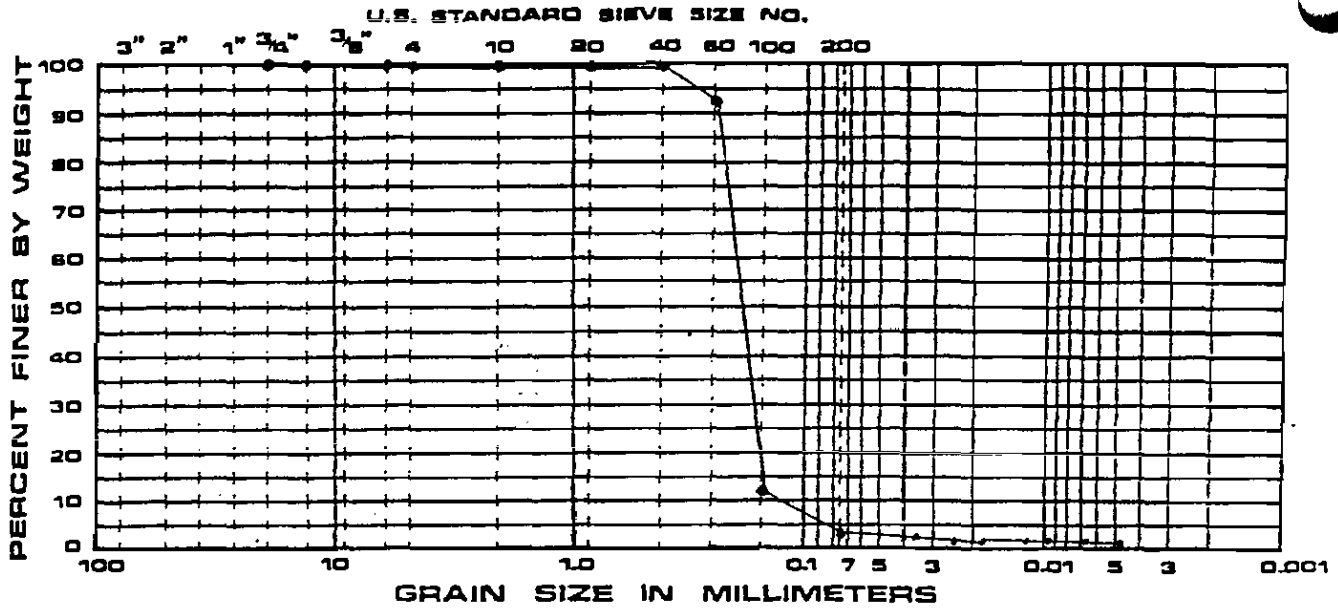
Sample No. 31, CLAY, WP3035-5 (21 ~~ENE~~ SLB 080607)

Sieve Size	Percent Passing	PROJECT Specifications %
# 10	100.0	
# 20	99.9	
# 40	99.8	
# 60	99.3	
# 100	96.7	
# 200	92.2	

JOB NO: 99-008

GRAIN SIZE ANALYSIS

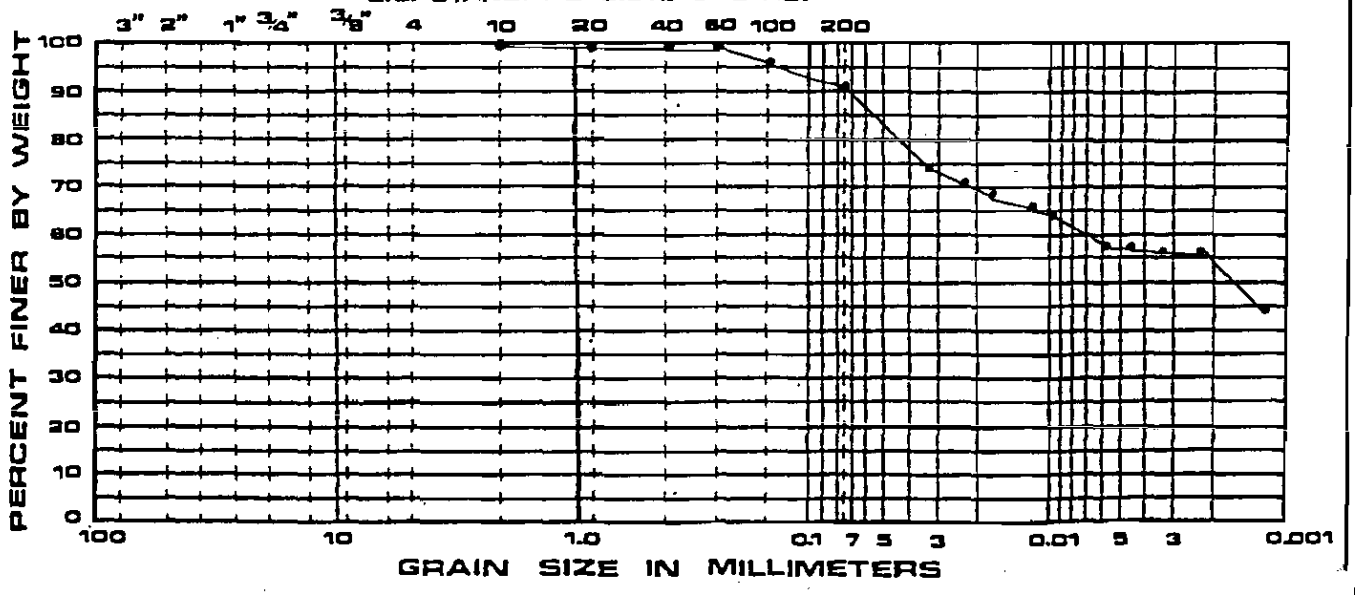
COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W
•	WB1035-4	S10				

GRAIN SIZE ANALYSIS

COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W
•	WB1035-5	S31				
(21	LB080607)					

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308
Proj. ID: CNC CHARLESTON

Lab Number:	WP3672-4
SDG:	WP3672
Report Date:	9/23/99
PO No. :	N7912-P99264
Project:	CTO #68
% Solids:	61
Method:	SW8260
Date Analyzed:	8/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB030304	SL	8/18/99	8/19/99	8/25/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<7	ug/Kg	1.5	7	5
TOLUENE	J4	ug/Kg	1.5	7	5
1,2-DIBROMOETHANE	<7	ug/Kg	1.5	7	5
ETHYLBENZENE	<7	ug/Kg	1.5	7	5
NAPHTHALENE	<7	ug/Kg	1.5	7	5
MTBE	<7	ug/Kg	1.5	7	5
TOTAL XYLENES	<7	ug/Kg	1.5	7	5
DIBROMOFLUOROMETHANE	100	%	1.5		
2-DICHLOROETHANE-D4	90	%	1.5		
OLUENE-D8	109	%	1.5		
P-BROMOFLUOROBENZENE	83	%	1.5		

Report Notes: J

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3672-4
SDG: WP3672
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 61
Method: EPA 8270
Date Analyzed: 9/1/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB030304	SL	8/18/99	8/19/99	8/20/99	LAP	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<530	ug/Kg	1.6	530	330
2-METHYLNAPHTHALENE	2500	ug/Kg	1.6	530	330
ACENAPHTHYLENE	<530	ug/Kg	1.6	530	330
ACENAPHTHENE	J340	ug/Kg	1.6	530	330
FLUORENE	J500	ug/Kg	1.6	530	330
PHENANTHRENE	1100	ug/Kg	1.6	530	330
ANTHRACENE	<530	ug/Kg	1.6	530	330
FLUORANTHENE	<530	ug/Kg	1.6	530	330
PYRENE	<530	ug/Kg	1.6	530	330
BENZO[A]ANTHRACENE	<530	ug/Kg	1.6	530	330
CHRYSENE	<530	ug/Kg	1.6	530	330
BENZO[B]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[K]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[A]PYRENE	<530	ug/Kg	1.6	530	330
INDENO[1,2,3-CD]PYRENE	<530	ug/Kg	1.6	530	330
DIBENZ[A,H]ANTHRACENE	<530	ug/Kg	1.6	530	330
BENZO[G,H,I]PERYLENE	<530	ug/Kg	1.6	530	330
NITROBENZENE-D5	45	%	1.6		
2-FLUOROBIPHENYL	71	%	1.6		
TERPHENYL-D14	74	%	1.6		

Report Notes: J

Katahdin
ANALYTICAL SERVICES

CLIENT: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3672-4
Report Date: 09/24/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB030304	Solid	JR HILL	08/18/99	08/19/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	61.	wt %	1.0	0.10	CLP/CIP SOW	08/24/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 08/23/99 by JF

09/24/99

LJO/baeajc(dw)/msm
PH23TSS4
CC: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-6
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 93
Method: SW8260
Date Analyzed: 6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB040405	SL	6/23/99	6/24/99	6/25/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.3	6	5
TOLUENE	<6	ug/Kg	1.3	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.3	6	5
ETHYLBENZENE	<6	ug/Kg	1.3	6	5
NAPHTHALENE	J4	ug/Kg	1.3	6	5
MTBE	<6	ug/Kg	1.3	6	5
TOTAL XYLENES	<6	ug/Kg	1.3	6	5
DIBROMOFLUOROMETHANE	91	%	1.3		
1,2-DICHLOROETHANE-D4	96	%	1.3		
TOLUENE-D8	87	%	1.3		
P-BROMOFLUOROBENZENE	74	%	1.3		

Report Notes: J

0000027

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

ent: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308
Proj. ID: CNC CHARLESTON

Lab Number: WP3035-6
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 93
Method: EPA 8270
Date Analyzed: 7/28/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB040405	SL	6/23/99	6/24/99	6/28/99	PMM	SW3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<360	ug/Kg	1.1	360	330
2-METHYLNAPHTHALENE	E9900	ug/Kg	1.1	360	330
ACENAPHTHYLENE	<360	ug/Kg	1.1	360	330
ACENAPHTHENE	1400	ug/Kg	1.1	360	330
FLUORENE	2200	ug/Kg	1.1	360	330
PHENANTHRENE	5400	ug/Kg	1.1	360	330
ANTHRACENE	760	ug/Kg	1.1	360	330
FLUORANTHENE	1300	ug/Kg	1.1	360	330
RENE	980	ug/Kg	1.1	360	330
BENZO[A]ANTHRACENE	440	ug/Kg	1.1	360	330
CHRYSENE	400	ug/Kg	1.1	360	330
BENZO[B]FLUORANTHENE	370	ug/Kg	1.1	360	330
BENZO[K]FLUORANTHENE	J200	ug/Kg	1.1	360	330
BENZO[A]PYRENE	J340	ug/Kg	1.1	360	330
INDENO[1,2,3-CD]PYRENE	J230	ug/Kg	1.1	360	330
DIBENZ[A,H]ANTHRACENE	<360	ug/Kg	1.1	360	330
BENZO[G,H,I]PERYLENE	J200	ug/Kg	1.1	360	330
NITROBENZENE-D5	67	%	1.1		
2-FLUOROBIPHENYL	59	%	1.1		
TERPHENYL-D14	55	%	1.1		

Report Notes: J, E, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-6DL
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 93
Method: EPA 8270
Date Analyzed: 7/29/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB040405	SL	6/23/99	6/24/99	6/28/99	PMM	SW3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<1400	ug/Kg	4.3	1400	330
2-METHYLNAPHTHALENE	11000	ug/Kg	4.3	1400	330
ACENAPHTHYLENE	<1400	ug/Kg	4.3	1400	330
ACENAPHTHENE	1400	ug/Kg	4.3	1400	330
FLUORENE	2200	ug/Kg	4.3	1400	330
PHENANTHRENE	5700	ug/Kg	4.3	1400	330
ANTHRACENE	J780	ug/Kg	4.3	1400	330
FLUORANTHENE	J1300	ug/Kg	4.3	1400	330
PYRENE	J1100	ug/Kg	4.3	1400	330
BENZO[A]ANTHRACENE	<1400	ug/Kg	4.3	1400	330
CHRYSENE	<1400	ug/Kg	4.3	1400	330
BENZO[B]FLUORANTHENE	<1400	ug/Kg	4.3	1400	330
BENZO[K]FLUORANTHENE	<1400	ug/Kg	4.3	1400	330
BENZO[A]PYRENE	<1400	ug/Kg	4.3	1400	330
INDENO[1,2,3-CD]PYRENE	<1400	ug/Kg	4.3	1400	330
DIBENZ[A,H]ANTHRACENE	<1400	ug/Kg	4.3	1400	330
BENZO[G,H,I]PERYLENE	<1400	ug/Kg	4.3	1400	330
NITROBENZENE-D5	86	%	4.3		
2-FLUOROBIPHENYL	59	%	4.3		
TERPHENYL-D14	62	%	4.3		

Report Notes: J, O-2

0000026

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3035-6
Report Date: 08/19/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB040405	Solid	R. FRANKLIN	06/23/99	06/23/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	93.	wt %	1.0	0.10	CLP/CIP SOW	06/28/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/25/99 by JF

08/19/99

LJO/baeajc(dw)/msm
PF25TSS2
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Client:	Katahdin Analytical
	340 County Road
	Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: July 19, 1999

Sample ID	: 21SLB040405
Lab ID	: 9906802-05
Matrix	: Soil
Date Collected	: 06/23/99
Date Received	: 06/23/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		229	104	208	mg/kg	1.0	AAT	07/13/99	1300	152814	1
Evaporative Loss @ 105 C		4.00	1.00	1.00	wt%	1.0	TSM2	07/19/99	0920	153640	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

Client:	Katahdin Analytical
	340 County Road
	Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: July 19, 1999

Sample ID	: 21SLB040405D
Lab ID	: 9906802-06
Matrix	: Soil
Date Collected	: 06/23/99
Date Received	: 06/23/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		359	104	208	mg/kg	1.0	AAT	07/13/99	1300	152814	1
Evaporative Loss @ 105 C		4.00	1.00	1.00	wt%	1.0	TSM2	07/19/99	0920	153640	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-7
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 98
Method: SW8260
Date Analyzed: 6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB050506	SL	6/23/99	6/24/99	6/25/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<7	ug/Kg	1.4	7	5
TOLUENE	<7	ug/Kg	1.4	7	5
1,2-DIBROMOETHANE	<7	ug/Kg	1.4	7	5
ETHYLBENZENE	<7	ug/Kg	1.4	7	5
NAPHTHALENE	<7	ug/Kg	1.4	7	5
MTBE	<7	ug/Kg	1.4	7	5
TOTAL XYLENES	<7	ug/Kg	1.4	7	5
DIBROMOFLUOROMETHANE	92	%	1.4		
1,2-DICHLOROETHANE-D4	96	%	1.4		
TOLUENE-D8	81	%	1.4		
P-BROMOFLUOROBENZENE	64	%	1.4		

Report Notes:

0000039

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

ent: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-7
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 98
Method: EPA 8270
Date Analyzed: 7/28/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB050506	SL	6/23/99	6/24/99	6/28/99	PMM	SW3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<330	ug/Kg	1.0	330	330
2-METHYLNAPHTHALENE	<330	ug/Kg	1.0	330	330
ACENAPHTHYLENE	<330	ug/Kg	1.0	330	330
ACENAPHTHENE	<330	ug/Kg	1.0	330	330
FLUORENE	<330	ug/Kg	1.0	330	330
PHENANTHRENE	<330	ug/Kg	1.0	330	330
ANTHRACENE	<330	ug/Kg	1.0	330	330
FLUORANTHENE	<330	ug/Kg	1.0	330	330
RENE	<330	ug/Kg	1.0	330	330
BENZO[A]ANTHRACENE	<330	ug/Kg	1.0	330	330
CHRYSENE	<330	ug/Kg	1.0	330	330
BENZO[B]FLUORANTHENE	<330	ug/Kg	1.0	330	330
BENZO[K]FLUORANTHENE	<330	ug/Kg	1.0	330	330
BENZO[A]PYRENE	<330	ug/Kg	1.0	330	330
INDENO[1,2,3-CD]PYRENE	<330	ug/Kg	1.0	330	330
DIBENZ[A,H]ANTHRACENE	<330	ug/Kg	1.0	330	330
BENZO[G,H,I]PERYLENE	<330	ug/Kg	1.0	330	330
NITROBENZENE-D5	42	%	1.0		
2-FLUOROBIPHENYL	53	%	1.0		
TERPHENYL-D14	70	%	1.0		

Report Notes:

0000039

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3035-7
Report Date: 08/19/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
21SLB050506	Solid	R. FRANKLIN	06/23/99	06/24/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	98.	wt %	1.0	0.10	CLP/CIP SOW	06/28/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/25/99 by JF

08/19/99

LJO/baeajc(dw)/msm
PF25TSS2
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308
Proj. ID: CNC CHARLESTON

Lab Number:	WP3672-1
SDG:	WP3672
Report Date:	9/23/99
PO No.:	N7912-P99264
Project:	CTO #68
% Solids:	54
Method:	SW8260
Date Analyzed:	8/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB070506	SL	8/18/99	8/19/99	8/25/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<11	ug/Kg	2.2	11	5
TOLUENE	<11	ug/Kg	2.2	11	5
1,2-DIBROMOETHANE	<11	ug/Kg	2.2	11	5
ETHYLBENZENE	<11	ug/Kg	2.2	11	5
NAPHTHALENE	24	ug/Kg	2.2	11	5
MTBE	<11	ug/Kg	2.2	11	5
TOTAL XYLENES	<11	ug/Kg	2.2	11	5
DIBROMOFLUOROMETHANE	103	%	2.2		
1,2-DICHLOROETHANE-D4	99	%	2.2		
TOLUENE-D8	103	%	2.2		
P-BROMOFLUOROBENZENE	118	%	2.2		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3672-1
SDG: WP3672
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 54
Method: EPA 8270
Date Analyzed: 8/31/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB070506	SL	8/18/99	8/19/99	8/20/99	LAP	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<630	ug/Kg	1.9	630	330
2-METHYLNAPHTHALENE	7000	ug/Kg	1.9	630	330
ACENAPHTHYLENE	<630	ug/Kg	1.9	630	330
ACENAPHTHENE	860	ug/Kg	1.9	630	330
FLUORENE	1400	ug/Kg	1.9	630	330
PHENANTHRENE	3000	ug/Kg	1.9	630	330
ANTHRACENE	<630	ug/Kg	1.9	630	330
FLUORANTHENE	<630	ug/Kg	1.9	630	330
PYRENE	<630	ug/Kg	1.9	630	330
BENZO[A]ANTHRACENE	<630	ug/Kg	1.9	630	330
CHRYSENE	<630	ug/Kg	1.9	630	330
BENZO[B]FLUORANTHENE	<630	ug/Kg	1.9	630	330
BENZO[K]FLUORANTHENE	<630	ug/Kg	1.9	630	330
BENZO[A]PYRENE	<630	ug/Kg	1.9	630	330
INDENO[1,2,3-CD]PYRENE	<630	ug/Kg	1.9	630	330
DIBENZ[A,H]ANTHRACENE	<630	ug/Kg	1.9	630	330
BENZO[G,H,I]PERYLENE	<630	ug/Kg	1.9	630	330
NITROBENZENE-D5	70	%	1.9		
2-FLUOROBIPHENYL	98	%	1.9		
TERPHENYL-D14	94	%	1.9		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3672-1
Report Date: 09/24/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB070506	Solid	JR HILL	08/18/99	08/19/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	54.	wt %	1.0	0.10	CLP/CIP SOW	08/24/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 08/23/99 by JF

09/24/99

LJO/baeajc(dw)/msm
PH23TSS4
CC: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR

340 County Road No. 5
P.O. Box 691, Gorham, ME 04038
Tel: (207) 874-2400 Fax: (207) 775-4029
http://katahdinlab.com
210 West Road No. 5, Portsmouth, NH 03801
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KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-5
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 52
Method: SW8260
Date Analyzed: 6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB080607	SL	6/23/99	6/24/99	6/25/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<10	ug/Kg	2.0	10	5
TOLUENE	<10	ug/Kg	2.0	10	5
1,2-DIBROMOETHANE	<10	ug/Kg	2.0	10	5
ETHYLBENZENE	<10	ug/Kg	2.0	10	5
NAPHTHALENE	<10	ug/Kg	2.0	10	5
MTBE	<10	ug/Kg	2.0	10	5
TOTAL XYLENES	<10	ug/Kg	2.0	10	5
DIBROMOFLUOROMETHANE	95	%	2.0		
1,2-DICHLOROETHANE-D4	97	%	2.0		
TOLUENE-D8	92	%	2.0		
P-BROMOFLUOROBENZENE	74	%	2.0		

Report Notes:

0000023

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

ent: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-5
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 52
Method: EPA 8270
Date Analyzed: 7/28/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB080607	SL	6/23/99	6/24/99	6/28/99	PMM	SW3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<630	ug/Kg	1.9	630	330
2-METHYLNAPHTHALENE	<630	ug/Kg	1.9	630	330
ACENAPHTHYLENE	<630	ug/Kg	1.9	630	330
ACENAPHTHENE	<630	ug/Kg	1.9	630	330
FLUORENE	<630	ug/Kg	1.9	630	330
PHENANTHRENE	<630	ug/Kg	1.9	630	330
ANTHRACENE	<630	ug/Kg	1.9	630	330
FLUORANTHENE	<630	ug/Kg	1.9	630	330
RENE	<630	ug/Kg	1.9	630	330
ENZO[A]ANTHRACENE	<630	ug/Kg	1.9	630	330
CHRYSENE	<630	ug/Kg	1.9	630	330
BENZO[B]FLUORANTHENE	<630	ug/Kg	1.9	630	330
BENZO[K]FLUORANTHENE	<630	ug/Kg	1.9	630	330
BENZO[A]PYRENE	<630	ug/Kg	1.9	630	330
INDENO[1,2,3-CD]PYRENE	<630	ug/Kg	1.9	630	330
DIBENZ[A,H]ANTHRACENE	<630	ug/Kg	1.9	630	330
BENZO[G,H,I]PERYLENE	<630	ug/Kg	1.9	630	330
NITROBENZENE-D5	43	%	1.9		
2-FLUOROBIPHENYL	48	%	1.9		
TERPHENYL-D14	59	%	1.9		

Report Notes:

0000022

Katahdin
ANALYTICAL SERVICES

Lab Number : WP-3035-5
Report Date: 08/19/99
PO No. : N7912-P99264
Project : CTO #68

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB080607	Solid	R. FRANKLIN	06/23/99	06/24/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	52.	wt %	1.0	0.10	CLP/CIP SOW	06/28/99	JF	1
Total Combustible Organics	11.	wt %	1.0	0.1	ASTM D2974-8	06/28/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/25/99 by JF

08/19/99

LJO/baeajc(dw)/msm
PF25VSS4
CC: MS. LEE LECK
TEIRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Client:	Katahdin Analytical
	340 County Road
	Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: July 19, 1999

Sample ID	: 21SLB080607
Lab ID	: 9906802-03
Matrix	: Soil
Date Collected	: 06/23/99
Date Received	: 06/23/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Evaporative Loss @ 105 C		55.0	1.00	1.00	wt%	1.0	TSM2	07/19/99	0920	153640	1
Total Organic Carbon		15900	0.906	4.12	mg/l	1.0	LIB	07/02/99	1439	152320	2

M = Method	Method-Description
M 1	EPA 3550
M 2	SW846 9060 Modified

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-3RE
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 49
Method: SW8260
Date Analyzed: 6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB080607D	SL	6/23/99	6/24/99	6/25/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<11	ug/Kg	2.2	11	5
TOLUENE	<11	ug/Kg	2.2	11	5
1,2-DIBROMOETHANE	<11	ug/Kg	2.2	11	5
ETHYLBENZENE	<11	ug/Kg	2.2	11	5
NAPHTHALENE	J7	ug/Kg	2.2	11	5
MTBE	<11	ug/Kg	2.2	11	5
TOTAL XYLENES	<11	ug/Kg	2.2	11	5
DIBROMOFLUOROMETHANE	99	%	2.2		
1,2-DICHLOROETHANE-D4	111	%	2.2		
TOLUENE-D8	91	%	2.2		
P-BROMOFLUOROBENZENE	81	%	2.2		

Report Notes: J, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

ent: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-3
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 49
Method: EPA 8270
Date Analyzed: 7/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB080607D	SL	6/23/99	6/24/99	6/28/99	PMM	SW3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<660	ug/Kg	2.0	660	330
2-METHYLNAPHTHALENE	<660	ug/Kg	2.0	660	330
ACENAPHTHYLENE	<660	ug/Kg	2.0	660	330
ACENAPHTHENE	<660	ug/Kg	2.0	660	330
FLUORENE	<660	ug/Kg	2.0	660	330
PHENANTHRENE	<660	ug/Kg	2.0	660	330
ANTHRACENE	<660	ug/Kg	2.0	660	330
FLUORANTHENE	<660	ug/Kg	2.0	660	330
'RENE	<660	ug/Kg	2.0	660	330
BENZO[A]ANTHRACENE	<660	ug/Kg	2.0	660	330
CHRYSENE	<660	ug/Kg	2.0	660	330
BENZO[B]FLUORANTHENE	<660	ug/Kg	2.0	660	330
BENZO[K]FLUORANTHENE	<660	ug/Kg	2.0	660	330
BENZO[A]PYRENE	<660	ug/Kg	2.0	660	330
INDENO[1,2,3-CD]PYRENE	<660	ug/Kg	2.0	660	330
DIBENZ[A,H]ANTHRACENE	<660	ug/Kg	2.0	660	330
BENZO[G,H,I]PERYLENE	<660	ug/Kg	2.0	660	330
NITROBENZENE-D5	56	%	2.0		
2-FLUOROBIPHENYL	58	%	2.0		
TERPHENYL-D14	88	%	2.0		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3035-3
Report Date: 08/19/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB080607D	Solid	R. FRANKLIN	06/23/99	06/24/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	49.	wt %	1.0	0.10	CLP/CIP SOW	06/28/99	JF	1
Total Combustible Organics	11.	wt %	1.0	0.1	ASTM D2974-8	06/28/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/25/99 by JF

08/19/99

LJO/baeajc(dw)/msm
PF25VSS4
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Client:	Katahdin Analytical
	340 County Road
	Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: July 19, 1999

Sample ID	: 21SLB080607D
Lab ID	: 9906802-04
Matrix	: Soil
Date Collected	: 06/23/99
Date Received	: 06/23/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Evaporative Loss @ 105 C		43.0	1.00	1.00	wt%	1.0	TSM2	07/19/99	0920	153640	1
Total Organic Carbon		5990	0.110	0.500	mg/l	1.0	LIB	07/02/99	1455	152320	2

M = Method	Method-Description
M 1	EPA 3550
M 2	SW846 9060 Modified

Notes:
The qualifiers in this report are defined as follows:
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U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-8
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 90
Method: SW8260
Date Analyzed: 6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB090708	SL	6/23/99	6/24/99	6/25/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kg	1.0	5	5
TOLUENE	<5	ug/Kg	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kg	1.0	5	5
ETHYLBENZENE	<5	ug/Kg	1.0	5	5
NAPHTHALENE	55	ug/Kg	1.0	5	5
MTBE	<5	ug/Kg	1.0	5	5
TOTAL XYLENES	<5	ug/Kg	1.0	5	5
DIBROMOFLUOROMETHANE	94	%	1.0		
1,2-DICHLOROETHANE-D4	95	%	1.0		
TOLUENE-D8	77	%	1.0		
P-BROMOFLUOROBENZENE	84	%	1.0		

Report Notes:

0000033

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

ient: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-8
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 90
Method: EPA 8270
Date Analyzed: 7/28/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB090708	SL	6/23/99	6/24/99	6/28/99	PMM	SW3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<3600	ug/Kg	11	3600	330
2-METHYLNAPHTHALENE	25000	ug/Kg	11	3600	330
ACENAPHTHYLENE	<3600	ug/Kg	11	3600	330
ACENAPHTHENE	3600	ug/Kg	11	3600	330
FLUORENE	5200	ug/Kg	11	3600	330
PHENANTHRENE	15000	ug/Kg	11	3600	330
ANTHRACENE	J2600	ug/Kg	11	3600	330
FLUORANTHENE	7900	ug/Kg	11	3600	330
'RENE	6200	ug/Kg	11	3600	330
BENZO[A]ANTHRACENE	4100	ug/Kg	11	3600	330
CHRYSENE	4100	ug/Kg	11	3600	330
BENZO[B]FLUORANTHENE	4300	ug/Kg	11	3600	330
BENZO[K]FLUORANTHENE	J1800	ug/Kg	11	3600	330
BENZO[A]PYRENE	3800	ug/Kg	11	3600	330
INDENO[1,2,3-CD]PYRENE	J2800	ug/Kg	11	3600	330
DIBENZ[A,H]ANTHRACENE	<3600	ug/Kg	11	3600	330
BENZO[G,H,I]PERYLENE	J2500	ug/Kg	11	3600	330
NITROBENZENE-D5	97	%	11		
2-FLUOROBIPHENYL	80	%	11		
TERPHENYL-D14	69	%	11		

Report Notes: J, O-1

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3035-8
Report Date: 08/19/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB090708	Solid	R. FRANKLIN	06/23/99	06/24/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	90.	wt %	1.0	0.10	CLP/CIP SOW	06/28/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/25/99 by JF

08/19/99

LJO/baeajc(dw)/msm
PF25TSS2
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3672-2
SDG: WP3672
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 58
Method: SW8260
Date Analyzed: 8/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB110506	SL	8/18/99	8/19/99	8/25/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<10	ug/Kg	2.0	10	5
TOLUENE	<10	ug/Kg	2.0	10	5
1,2-DIBROMOETHANE	<10	ug/Kg	2.0	10	5
ETHYLBENZENE	<10	ug/Kg	2.0	10	5
NAPHTHALENE	24	ug/Kg	2.0	10	5
MTBE	<10	ug/Kg	2.0	10	5
TOTAL XYLENES	<10	ug/Kg	2.0	10	5
DIBROMOFLUOROMETHANE	100	%	2.0		
1,2-DICHLOROETHANE-D4	92	%	2.0		
TOLUENE-D8	102	%	2.0		
P-BROMOFLUOROBENZENE	96	%	2.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308
Proj. ID: CNC CHARLESTON

Lab Number: WP3672-2
SDG: WP3672
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 58
Method: EPA 8270
Date Analyzed: 8/31/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB110506	SL	8/18/99	8/19/99	8/20/99	LAP	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<560	ug/Kg	1.7	560	330
2-METHYLNAPHTHALENE	3700	ug/Kg	1.7	560	330
ACENAPHTHYLENE	<560	ug/Kg	1.7	560	330
ACENAPHTHENE	1100	ug/Kg	1.7	560	330
FLUORENE	2300	ug/Kg	1.7	560	330
PHENANTHRENE	4800	ug/Kg	1.7	560	330
ANTHRACENE	<560	ug/Kg	1.7	560	330
FLUORANTHENE	<560	ug/Kg	1.7	560	330
PYRENE	<560	ug/Kg	1.7	560	330
BENZO[A]ANTHRACENE	<560	ug/Kg	1.7	560	330
CHRYSENE	<560	ug/Kg	1.7	560	330
BENZO[B]FLUORANTHENE	<560	ug/Kg	1.7	560	330
BENZO[K]FLUORANTHENE	<560	ug/Kg	1.7	560	330
BENZO[A]PYRENE	<560	ug/Kg	1.7	560	330
INDENO[1,2,3-CD]PYRENE	<560	ug/Kg	1.7	560	330
DIBENZ[A,H]ANTHRACENE	<560	ug/Kg	1.7	560	330
BENZO[G,H,I]PERYLENE	<560	ug/Kg	1.7	560	330
NITROBENZENE-D5	58	%	1.7		
2-FLUOROBIPHENYL	80	%	1.7		
TERPHENYL-D14	81	%	1.7		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3672-2
Report Date: 09/24/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB110506	Solid	JR HILL	08/18/99	08/19/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	59.	wt %	1.0	0.10	CLP/CIP SOW	08/24/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 08/23/99 by JF

09/24/99

LJO/baeajc(dw)/msm
PH23TSS4
CC: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3672-3
SDG: WP3672
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 54
Method: SW8260
Date Analyzed: 8/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB120708	SL	8/18/99	8/19/99	8/25/99	DJP	5030	DJP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<11	ug/Kg	2.2	11	5
TOLUENE	<11	ug/Kg	2.2	11	5
1,2-DIBROMOETHANE	<11	ug/Kg	2.2	11	5
ETHYLBENZENE	<11	ug/Kg	2.2	11	5
NAPHTHALENE	<11	ug/Kg	2.2	11	5
MTBE	<11	ug/Kg	2.2	11	5
TOTAL XYLENES	<11	ug/Kg	2.2	11	5
DIBROMOFLUOROMETHANE	89	%	2.2		
1,2-DICHLOROETHANE-D4	78	%	2.2		
TOLUENE-D8	100	%	2.2		
P-BROMOFLUOROBENZENE	81	%	2.2		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3672-3
SDG: WP3672
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 54
Method: EPA 8270
Date Analyzed: 8/31/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21SLB120708	SL	8/18/99	8/19/99	8/20/99	LAP	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<590	ug/Kg	1.8	590	330
2-METHYLNAPHTHALENE	6800	ug/Kg	1.8	590	330
ACENAPHTHYLENE	<590	ug/Kg	1.8	590	330
ACENAPHTHENE	1000	ug/Kg	1.8	590	330
FLUORENE	1900	ug/Kg	1.8	590	330
PHENANTHRENE	4300	ug/Kg	1.8	590	330
ANTHRACENE	<590	ug/Kg	1.8	590	330
FLUORANTHENE	<590	ug/Kg	1.8	590	330
PYRENE	<590	ug/Kg	1.8	590	330
BENZO[A]ANTHRACENE	<590	ug/Kg	1.8	590	330
CHRYSENE	<590	ug/Kg	1.8	590	330
BENZO[B]FLUORANTHENE	<590	ug/Kg	1.8	590	330
BENZO[K]FLUORANTHENE	<590	ug/Kg	1.8	590	330
BENZO[A]PYRENE	<590	ug/Kg	1.8	590	330
INDENO[1,2,3-CD]PYRENE	<590	ug/Kg	1.8	590	330
DIBENZ[A,H]ANTHRACENE	<590	ug/Kg	1.8	590	330
BENZO[G,H,I]PERYLENE	<590	ug/Kg	1.8	590	330
NITROBENZENE-D5	44	%	1.8		
2-FLUOROBIPHENYL	72	%	1.8		
TERPHENYL-D14	71	%	1.8		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3672-3
Report Date: 09/24/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21SLB120708	Solid	JR HILL	08/18/99	08/19/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	55.	wt %	1.0	0.10	CLP/CIP SOW	08/24/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 08/23/99 by JF

09/24/99

LJO/baeajc(dw)/msm
PH23TSS4
CC: MS LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3035-9
SDG: WP3035
Report Date: 8/17/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: -
Method: SW8260
Date Analyzed: 6/24/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21TL00201	SL	6/23/99	6/24/99	6/24/99	KMC	5035	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kgdrywt	1.0	5	5
TOLUENE	<5	ug/Kgdrywt	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kgdrywt	1.0	5	5
ETHYLBENZENE	<5	ug/Kgdrywt	1.0	5	5
NAPHTHALENE	<5	ug/Kgdrywt	1.0	5	5
MTBE	<5	ug/Kgdrywt	1.0	5	5
TOTAL XYLENES	<5	ug/Kgdrywt	1.0	5	5
DIBROMOFLUOROMETHANE	99	%	1.0		
1,2-DICHLOROETHANE-D4	94	%	1.0		
TOLUENE-D8	106	%	1.0		
P-BROMOFLUOROBENZENE	114	%	1.0		

Report Notes:

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN Page ____ of ____

Client	Contact	Phone #	Fax #
Tetra Tech NUS	Roger Franklin	(843) 554-4925 ( )	

Address	City	State	Zip Code
NH-21 Aud H	N. Charleston	SC	29405

Purchase Order #	Proj. Name / No.	Katahdin Quote #

Bill (if different than above) ____ Address ____

Sampler (Print / Sign) Roger Franklin / Roger Franklin Copies To: ____

LAB USE ONLY WORK ORDER #: WP3035

KATAHDIN PROJECT MANAGER ____

REMARKS: ____

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO: ____

TEMP°C ____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

*	Sample Description	Date / Time collected	Matrix	No. of Cntrs.	ANALYSIS AND CONTAINER TYPE / PRESERVATIVES: BTEX / EDB	PAH Naphthalene	FOC	Grain Size						FID Results
					Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N
	21TLΦΦ201	6/23/—	H_2O	2	X									—
	35SLBΦ2Φ3Φ4	6/23/1030	Soil	5	X	X	X							0
	35SLBΦ2Φ3Φ4D	6/23/1030	Soil	5	X	X	X							0
	35SLBΦ1Φ3Φ4	6/23/1015	Soil	6	X	X		X						
	21SLBΦ8Φ6Φ7	6/23/0850	Soil	6	X	X	X	X						130
	21SLBΦ8Φ6Φ7D	6/23/0850	Soil	5	X	X	X							130 20
	21SLBΦ4Φ4Φ5	6/23/0755	Soil	5	X	X								20
	21SLBΦ5Φ5Φ6	6/23/0815	Soil	5	X	X								10
	21SLBΦ9Φ7Φ8	6/23/0930	Soil	5	X	X								2
		/												
		/												
		/												
		/												
		/												
		/												
		/												

COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	6/23/99 1600	[signature]		06245 0925	[signature]
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

FORMSOURCE INC. ☎ (207) 782-3311
FORM # CHN-OF-CSTDY

ORIGINAL

General Engineering Laboratories, Inc.
2040 Savage Road
Charleston, South Carolina 29407
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

Page 1 of 1

CHAIN OF CUSTODY RECORD

9906802/L

Client Name/Facility Name: Kiawah Isl

Collected by/Company: Tetra Tech NUS

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type	TPH	Remarks
01	3SSL13Ø124304	6/23	1630				Y	2		X														X	.1
02	3SSL13Ø2Ø3Ø4Ø	6/23	1030				Y	2		X														X	.1
03	21SL13Ø4Ø4Ø7	6/23	0450				X	1		X															.2
04	21SL13Ø4Ø6Ø7D	6/23	0450				X	1		X															.2
05	21SL13Ø4Ø4Ø5	6/23	0755				X	1																X	.3
06	21SL13Ø4Ø4Ø5D	6/23	0755				Y	1																X	.3

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods

41016

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
[signature]	6/23/94	1138	[signature]				
Relinquished by:	**Date:**	**Time:**	**Received by lab by:**	**Date:**	**Time:**	**Remarks:**	
			[signature]	6/23/94	1138		

White = sample collector Yellow = file Pink = with report

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3850-12
SDG: WP3850
Report Date: 10/1/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 9/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0101	AQ	9/8/99	9/9/99	9/10/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	20	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	98	%	1.0		
1,2-DICHLOROETHANE-D4	94	%	1.0		
TOLUENE-D8	88	%	1.0		
P-BROMOFLUOROBENZENE	90	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number:	WP3850-12
SDG:	WP3850
Report Date:	10/5/99
PO No. :	N7912-P99264
Project:	CTO #68
% Solids:	N/A
Method:	EPA 8270
Date Analyzed:	9/23/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0101	AQ	9/8/99	9/9/99	9/10/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	12	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	140	ug/L	1.0	10	10
ACENAPHTHYLENE	J8	ug/L	1.0	10	10
ACENAPHTHENE	17	ug/L	1.0	10	10
FLUORENE	18	ug/L	1.0	10	10
PHENANTHRENE	21	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	81	%	1.0		
2-FLUOROBIPHENYL	69	%	1.0		
TERPHENYL-D14	36	%	1.0		

Report Notes: J

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3850-12
Report Date: 10/06/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21GLM0101	Aqueous	P.HALVERSON,JR HEBL,J.KRIEGER,T .THOMPSON	09/08/99	09/09/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Nitrate as N	<0.050	mg/L	1.0	0.050	353.2	09/10/99	KW	
Sulfate	5.2	mg/L	1.0	1.0	375.4	09/18/99	VN	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' valu

10/06/99

LJO/baeajc(dw)/msm
PI10NOW1
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ ENSR _____ Contract: _____ WP3850-12

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990170-3

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___CFI_011_____

Level: (low/med) _____ low _____ Date Received:__9/10/99 _____

% Moisture: _____ NA _____ Date Analyzed:___9/14/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____ 1_____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	6800	E

(21GLM0101)

4A

VOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKF10A

Lab Name: Katahdin Analytical Services SDG No.: WP3850

Lab File ID: F1805 Lab Sample ID: VBLKF10A

Date Analyzed: 09/10/99 Time Analyzed: 9:39

GC Column: RTX-624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: 5972-F

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S :

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCSF10A	LCSF10A	F1804	9/10/99	8:45:00 AM
24TL00201	WP3850-8	F1806	9/10/99	10:32:00 AM
15LGM0201	WP3850-9	F1808	9/10/99	11:45:00 AM
15GLM0301	WP3850-10	F1809	9/10/99	12:22:00 PM
24GLM0301	WP3850-11	F1810	9/10/99	12:58:00 PM
21GLM0101	WP3850-12	F1811	9/10/99	1:35:00 PM
21GLM0601	WP3850-13	F1812	9/10/99	2:11:00 PM
21GLM0401	WP3850-14	F1813	9/10/99	2:48:00 PM
24GLM0101	WP3850-15	F1814	9/10/99	3:24:00 PM
24GLM0201	WP3850-16	F1815	9/10/99	4:01:00 PM

[For Information Only]

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-11
SDG: WP3703
Report Date: 9/24/99
PO No.: N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0201	AQ	8/22/99	8/24/99	8/26/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	94	%	1.0		
1,2-DICHLOROETHANE-D4	87	%	1.0		
TOLUENE-D8	98	%	1.0		
P-BROMOFLUOROBENZENE	101	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-11
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0201	AQ	8/22/99	8/24/99	8/25/99	DS	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	72	%	1.0		
2-FLUOROBIPHENYL	74	%	1.0		
TERPHENYL-D14	87	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-12
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0201D	AQ	8/22/99	8/24/99	8/26/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	93	%	1.0		
1,2-DICHLOROETHANE-D4	89	%	1.0		
TOLUENE-D8	101	%	1.0		
P-BROMOFLUOROBENZENE	95	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-12
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/8/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0201D	AQ	8/22/99	8/24/99	8/25/99	DS	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	75	%	1.0		
2-FLUOROBIPHENYL	79	%	1.0		
TERPHENYL-D14	87	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-10
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0301	AQ	8/22/99	8/24/99	8/26/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	91	%	1.0		
1,2-DICHLOROETHANE-D4	88	%	1.0		
TOLUENE-D8	100	%	1.0		
P-BROMOFLUOROBENZENE	100	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-10
SDG: WP3703
Report Date: 9/24/99
PO No.: N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/8/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0301	AQ	8/22/99	8/24/99	8/25/99	DS	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	72	%	1.0		
2-FLUOROBIPHENYL	79	%	1.0		
TERPHENYL-D14	108	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308
Proj. ID: CNC CHARLESTON

Lab Number:	WP3850-14
SDG:	WP3850
Report Date:	10/1/99
PO No. :	N7912-P99264
Project:	CTO #68
% Solids:	N/A
Method:	SW8260
Date Analyzed:	9/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0401	AQ	9/8/99	9/9/99	9/10/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	96	%	1.0		
1,2-DICHLOROETHANE-D4	91	%	1.0		
TOLUENE-D8	88	%	1.0		
P-BROMOFLUOROBENZENE	87	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3850-14
SDG: WP3850
Report Date: 10/5/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/16/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0401	AQ	9/8/99	9/9/99	9/10/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	57	%	1.0		
2-FLUOROBIPHENYL	54	%	1.0		
TERPHENYL-D14	41	%	1.0		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3850-14
Report Date: 10/06/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED	DATE RECEIVED
21GLM0401	Aqueous	P.HALVERSON,JR HEBL,J.KRIEGER,T .THOMPSON	09/08/99	09/09/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Nitrate as N	<0.050	mg/L	1.0	0.050	353.2	09/10/99	KW	
Sulfate	53.	mg/L	4.0	1.0	375.4	09/18/99	VN	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

10/06/99

LJO/baeajc(dw)/msm
PI10NOW1
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ ENSR _____ Contract: _____ WP3850-14

Lab Code: _____ Case No.: _____ SAS NO.: _____ SDG NO.: _____

Matrix: (soil/water) _____ water _____ Lab Sample ID: 990170-6

Sample wt / vol: ____ 32.5 ml _____ (g/ml) Lab File ID: ___CFI_017_____

Level: (low/med) _____ low _____ Date Received:__9/10/99 _____

% Moisture: _____ NA _____ Date Analyzed:___9/14/99 _____

GC Column: _ Carboxen 1004 __ OD: ___ 1/16" ___ Dilution Factor:_____1_____

Soil Extract Volume: _____ NA ____ (µl) Soil Aliquot Volume: ____ NA ____ (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) __ µg/L __	Q
74-82-8	Methane	2700	E

(21GLM0401)

4A

VOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKF10A

Lab Name: Katahdin Analytical Services SDG No.: WP3850

Lab File ID: F1805 Lab Sample ID: VBLKF10A

Date Analyzed: 09/10/99 Time Analyzed: 9:39

GC Column: RTX-624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: 5972-F

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S :

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCSF10A	LCSF10A	F1804	9/10/99	8:45:00 AM
24TL00201	WP3850-8	F1806	9/10/99	10:32:00 AM
15LGM0201	WP3850-9	F1808	9/10/99	11:45:00 AM
15GLM0301	WP3850-10	F1809	9/10/99	12:22:00 PM
24GLM0301	WP3850-11	F1810	9/10/99	12:58:00 PM
21GLM0101	WP3850-12	F1811	9/10/99	1:35:00 PM
21GLM0601	WP3850-13	F1812	9/10/99	2:11:00 PM
21GLM0401	WP3850-14	F1813	9/10/99	2:48:00 PM
24GLM0101	WP3850-15	F1814	9/10/99	3:24:00 PM
24GLM0201	WP3850-16	F1815	9/10/99	4:01:00 PM

[For Information Only]

KATAHDIN ANALYTICAL SERVICES

REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3647-7
SDG: WP3647
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/21/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0501	AQ	8/16/99	8/17/99	8/21/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	96	%	1.0		
1,2-DICHLOROETHANE-D4	86	%	1.0		
TOLUENE-D8	103	%	1.0		
P-BROMOFLUOROBENZENE	98	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3647-7
SDG: WP3647
Report Date: 9/23/99
PO No.: N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/2/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0501	AQ	8/16/99	8/17/99	8/20/99	DS	SW3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	60	%	1.0		
2-FLUOROBIPHENYL	70	%	1.0		
TERPHENYL-D14	76	%	1.0		

Report Notes:

Katahdin
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN Page ____ of ____

Client: Tetra Tech NUS	Contact: Bryan Howze	Phone #: (843) 554 4925	Fax #: ( )
Address: NH21 Ave H	City: N. Charleston	State: SC	Zip Code: 29405
Purchase Order #	Proj. Name / No.		Katahdin Quote #
Bill (if different than above)	Address		
Sampler (Print / Sign)		Copies To:	

LAB USE ONLY — WORK ORDER #: WP3647 — KATAHDIN PROJECT MANAGER

REMARKS:

SHIPPING INFO: ☒ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO: 813402904484

TEMP°C ____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	ANALYSIS AND CONTAINER TYPE / PRESERVATIVES: Filt. Y/N	Filt. Y/N	Filt. Y/N	Filt. Y/N	Filt. Y/N	Filt. Y/N	Filt. Y/N	Filt. Y/N	Filt. Y/N	Filt. Y/N
					BTEX/EDB	PAH	TAL Metals							
	24GLMØ1Ø1	8/13/99 1135	W	1			1							
	24GLMØ2Ø1	/1136	W	1			1							
	24GLMØ3Ø1	/1137	W	1			1							
	24GLMØ4Ø1	/1151	W	6	3	2	1							
	36GLMØ1Ø1	/1752	W	5	3	2								
	36GL680-004	/1754	W	5	3	2								
	21GLMØ5Ø1	8/14/99 1240	W	5	3	2								
	24TLØØ2Ø1	/	W	2	2									
		/												
		/												
		/												
		/												
		/												
		/												
		/												
		/												

COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	8/16/99	813402904484		8-17-99 1100	[signature]
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

lient: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3850-13
SDG: WP3850
Report Date: 10/1/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 9/10/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0601	AQ	9/8/99	9/9/99	9/10/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	95	%	1.0		
,2-DICHLOROETHANE-D4	87	%	1.0		
TOLUENE-D8	89	%	1.0		
P-BROMOFLUOROBENZENE	88	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3850-13
SDG: WP3850
Report Date: 10/5/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/27/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0601	AQ	9/8/99	9/9/99	9/10/99	DPD	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	80	%	1.0		
2-FLUOROBIPHENYL	79	%	1.0		
TERPHENYL-D14	37	%	1.0		

Report Notes:

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-3850-13
Report Date: 10/06/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
21GLM0601	Aqueous	P.HALVERSON,JR HEBL,J.KRIEGER,T .THOMPSON	09/08/99	09/09/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Nitrate as N	<0.050	mg/L	1.0	0.050	353.2	09/10/99	KW	
Sulfate	64.	mg/L	4.0	1.0	375.4	09/18/99	VN	

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

10/06/99

LJO/baeajc(dw)/msm
PI10NOW1
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ENSR Contract: WP3850-13

Lab Code: Case No.: SAS NO.: SDG NO.:

Matrix: (soil/water) water

Lab Sample ID: 990170-5

Sample wt / vol: 32.5 ml (g/ml)

Lab File ID: CFI_015

Level: (low/med) low

Date Received: 9/10/99

% Moisture: NA

Date Analyzed: 9/14/99

GC Column: Carboxen 1004 OD: 1/16"

Dilution Factor: 1

Soil Extract Volume: NA (µl)

Soil Aliquot Volume: NA (µl)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or PPMv) µg/L	Q
74-82-8	Methane	310	

(21GLM0601)

4A

VOLATILE ORGANICS METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKF10A

Lab Name: Katahdin Analytical Services SDG No.: WP3850

Lab File ID: F1805 Lab Sample ID: VBLKF10A

Date Analyzed: 09/10/99 Time Analyzed: 9:39

GC Column: RTX-624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: 5972-F

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS'S, MS AND MSD'S :

Client Sample ID	Lab Sample ID	Lab Data File	Date Injected	Time Injected
LCSF10A	LCSF10A	F1804	9/10/99	8:45:00 AM
24TL00201	WP3850-8	F1806	9/10/99	10:32:00 AM
15LGM0201	WP3850-9	F1808	9/10/99	11:45:00 AM
15GLM0301	WP3850-10	F1809	9/10/99	12:22:00 PM
24GLM0301	WP3850-11	F1810	9/10/99	12:58:00 PM
21GLM0101	WP3850-12	F1811	9/10/99	1:35:00 PM
21GLM0601	WP3850-13	F1812	9/10/99	2:11:00 PM
21GLM0401	WP3850-14	F1813	9/10/99	2:48:00 PM
24GLM0101	WP3850-15	F1814	9/10/99	3:24:00 PM
24GLM0201	WP3850-16	F1815	9/10/99	4:01:00 PM

[For Information Only]

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-13
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM07D01	AQ	8/22/99	8/24/99	8/26/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	99	%	1.0		
1,2-DICHLOROETHANE-D4	97	%	1.0		
TOLUENE-D8	98	%	1.0		
P-BROMOFLUOROBENZENE	103	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number:	WP3703-13
SDG:	WP3703
Report Date:	9/24/99
PO No. :	N7912-P99264
Project:	CTO #68
% Solids:	N/A
Method:	EPA 8270
Date Analyzed:	9/8/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM07D01	AQ	8/22/99	8/24/99	8/25/99	DS	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	48	%	1.0		
2-FLUOROBIPHENYL	#45	%	1.0		
TERPHENYL-D14	55	%	1.0		

Report Notes: #

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308
Proj. ID: CNC CHARLESTON

Lab Number: WP3703-13RA
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/9/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM07D01	AQ	8/22/99	8/24/99	8/25/99	DS	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	43	%	1.0		
2-FLUOROBIPHENYL	#42	%	1.0		
TERPHENYL-D14	50	%	1.0		

Report Notes: #

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-13RE
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/13/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM07D01	AQ	8/22/99	8/24/99	9/10/99	DS	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.0	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.0	10	10
ACENAPHTHYLENE	<10	ug/L	1.0	10	10
ACENAPHTHENE	<10	ug/L	1.0	10	10
FLUORENE	<10	ug/L	1.0	10	10
PHENANTHRENE	<10	ug/L	1.0	10	10
ANTHRACENE	<10	ug/L	1.0	10	10
FLUORANTHENE	<10	ug/L	1.0	10	10
PYRENE	<10	ug/L	1.0	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.0	10	10
CHRYSENE	<10	ug/L	1.0	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.0	10	10
BENZO[A]PYRENE	<10	ug/L	1.0	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.0	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.0	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.0	10	10
NITROBENZENE-D5	53	%	1.0		
2-FLUOROBIPHENYL	52	%	1.0		
TERPHENYL-D14	50	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308
Proj. ID: CNC CHARLESTON

Lab Number: WP3703-14
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: SW8260
Date Analyzed: 8/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0801	AQ	8/22/99	8/24/99	8/26/99	HMP	5030	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	95	%	1.0		
1,2-DICHLOROETHANE-D4	91	%	1.0		
TOLUENE-D8	99	%	1.0		
P-BROMOFLUOROBENZENE	100	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3703-14
SDG: WP3703
Report Date: 9/24/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: N/A
Method: EPA 8270
Date Analyzed: 9/9/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21GLM0801	AQ	8/22/99	8/24/99	9/8/99	DS	EPA 3510	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<10	ug/L	1.1	10	10
2-METHYLNAPHTHALENE	<10	ug/L	1.1	10	10
ACENAPHTHYLENE	<10	ug/L	1.1	10	10
ACENAPHTHENE	<10	ug/L	1.1	10	10
FLUORENE	<10	ug/L	1.1	10	10
PHENANTHRENE	<10	ug/L	1.1	10	10
ANTHRACENE	<10	ug/L	1.1	10	10
FLUORANTHENE	<10	ug/L	1.1	10	10
PYRENE	<10	ug/L	1.1	10	10
BENZO[A]ANTHRACENE	<10	ug/L	1.1	10	10
CHRYSENE	<10	ug/L	1.1	10	10
BENZO[B]FLUORANTHENE	<10	ug/L	1.1	10	10
BENZO[K]FLUORANTHENE	<10	ug/L	1.1	10	10
BENZO[A]PYRENE	<10	ug/L	1.1	10	10
INDENO[1,2,3-CD]PYRENE	<10	ug/L	1.1	10	10
DIBENZ[A,H]ANTHRACENE	<10	ug/L	1.1	10	10
BENZO[G,H,I]PERYLENE	<10	ug/L	1.1	10	10
NITROBENZENE-D5	58	%	1.1		
2-FLUOROBIPHENYL	60	%	1.1		
TERPHENYL-D14	59	%	1.1		

Report Notes: ,Extracted outside of holding time

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: PAUL CALLIGAN
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP3672-13
SDG: WP3672
Report Date: 9/23/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: -
Method: SW8260
Date Analyzed: 8/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
21TL00101	SL	8/18/99	8/19/99	8/26/99	HMP	5035	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kgdrywt	1.0	5	5
TOLUENE	<5	ug/Kgdrywt	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kgdrywt	1.0	5	5
ETHYLBENZENE	<5	ug/Kgdrywt	1.0	5	5
NAPHTHALENE	<5	ug/Kgdrywt	1.0	5	5
MTBE	<5	ug/Kgdrywt	1.0	5	5
TOTAL XYLENES	<5	ug/Kgdrywt	1.0	5	5
DIBROMOFLUOROMETHANE	97	%	1.0		
1,2-DICHLOROETHANE-D4	86	%	1.0		
TOLUENE-D8	101	%	1.0		
P-BROMOFLUOROBENZENE	103	%	1.0		

Report Notes:

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Client	Contact	Phone #	Fax #
Ctra Tech NUS	Bryn Howze	(843) 554-4925( )	

Address	City	State	Zip Code
NH-21 Ave. H	N. Charleston	SC	

Purchase Order #	Proj. Name / No.	Katahdin Quote #

Bill (if different than above)	Address

Sampler (Print / Sign)	Copies To:

LAB USE ONLY WORK ORDER #: WP3703

KATAHDIN PROJECT MANAGER

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO:

TEMP°C _____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	ANALYSIS AND CONTAINER TYPE PRESERVATIVES: Filt. ☐Y☐N (BTEX, MTBE, EDB; naph; PAH)	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N	Filt. ☐Y☐N
	26GLMØ8Ø1	8/21/99/1513	~~aq~~	5	3	2								
	26GLM1ØDØ1M	8/21/99/1240	aq	5	3	2				←		MS/MSD		
	26GLM1ØDØ1	8/21/99/1240	aq	5	3	2								
	26GLMØ4Ø1	8/21/99/0945	aq	5	3	2								
	26GLMØ6Ø1	8/21/99/1005	aq	5	3	2								
	26GLMØ5Ø1	8/21/99/0945	aq	5	3	2								
	26GLMØ7Ø1	8/21/99/1155	aq	5	3	2								
	26GLMØ7Ø1D	8/21/99/	aq	5	3	2								
	13GLMØ6Ø1	8/21/99/1140	aq	5	3	2								
	32GLMØ6Ø1	8/21/99/1557	aq	5	3	2								
	21GLMØ3Ø1	8/22/99/1152	aq	5	3	2								
	21GLMØ2Ø1	8/22/99/0955	aq	5	3	2								
	21GLMØ2Ø1D	8/22/99	aq	5	3	2								
	21GLMØ7DØ1	8/22/99/1430	aq	5	3	2								
	21GLMØ8Ø1	8/22/99/1500	aq	5	3	2								
	24SLBØ7Ø4Ø5	8/23/99/0915	soil	5	4	1								4ppm

COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
Eq Haun	8/23/99 1830	8134Ø268172 7		8-24-99 0830	
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN Page ____ of ____

Client	Contact	Phone #	Fax #
[illegible]	[illegible]	( )	( )

Address	City	State	Zip Code
[illegible]			

Purchase Order #	Proj. Name / No.	Katahdin Quote #

Bill (if different than above)	Address

Sampler (Print / Sign)	Copies To:

LAB USE ONLY WORK ORDER #: _ *

KATAHDIN PROJECT MANAGER _____

REMARKS: Bill to ENSR

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO: _____

TEMP°C _____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	ANALYSIS AND CONTAINER TYPE PRESERVATIVES: Dissolved Methane	Filt. Y N	Filt. Y N	Filt. Y N	Filt. Y N	Filt. Y N	Filt. Y N	Filt. Y N	Filt. Y N	Filt. Y N
	WP 3250-9	9/8/99 1001	AQ	3	X									
	WP 3250-10	/ 1050			X									
	WP 3250-11	/ 0752			X									
	WP 3250-12	/ 1040			X									
	WP 3250-13	/ 1120			X									
	WP 3250-14	/ 1210			X									
	WP 3250-15	/ 1707			X									
	WP 3250-16	/ 1705			X									
		/												
		/												
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		/												
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COMMENTS

QC-II + w/Narrative DD(KA5007QC-DED) Results Due: 10-7-99

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[illegible]	9/9/99 1615	[illegible]			
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
		9/10/99 1100			

DUPLICATE

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN Page ____ of ____

Client	Contact	Phone #	Fax #
Tetra Tech NUS Inc.		( )	( )

Address ~~80~~ NH-21 Ave N City N. Charleston State S.C. Zip Code

Purchase Order # Proj. Name / No. Katahdin Quote #

Bill (if different than above) Address

Sampler (Print / Sign) James R. Hall / Jerry Krieger Copies To:

LAB USE ONLY WORK ORDER #: WP3850

KATAHDIN PROJECT MANAGER

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO:

TEMP°C ____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	BTEX, MTBE, EDB, Naph.	PAH's	Anions (Nitrate, Sulfate)	Dissolved Methane						
					Filt. O Y O N	Filt. O Y O N	Filt. O Y O N	Filt. O Y O N	Filt. O Y O N	Filt. O Y O N	Filt. O Y O N	Filt. O Y O N	Filt. O Y O N	Filt. O Y O N
	21GLM0101	9/8/99/1040	GW	9	3	2	1	3						
	21GLM0601	/1120		9	3	2	1	3						
	21GLM0401	/1210		9	3	2	1	3						
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		/												

COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
J Krieger	9/8/99 1900	FEDEX 813451738831			Shelby Wilburn
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

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Page ____ of ____

Client	Contact	Phone #	Fax #
Tetra Tech NUS Inc.	Bryn Howze	(843)554-4925	( )

Address	City	State	Zip Code
NH 21 Ave H	N. Charleston	S.C.	29405

Purchase Order #	Proj. Name / No.	Katahdin Quote #

Bill (if different than above) Address

Sampler (Print / Sign) James R. Hill / James R. Hill

Copies To:

LAB USE ONLY WORK ORDER #: WP3672 - *

KATAHDIN PROJECT MANAGER

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO:

TEMP°C ____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	ANALYSIS AND CONTAINER TYPE / PRESERVATIVES: BTEX, EDB Naph.	PAH / FOC	Grain Size							
					Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N
	215LBØ7Ø5Ø6	8/18/99 0900	Soil	5	4	1								100 ppm
	215LB11Ø5Ø6	/0920		5	4	1								150 ppm
	215LB12Ø7Ø8	/0945		5	4	1								50 ppm
	215LBØ3Ø3Ø4	/1010		5	4	1								N/A
	225LBØ2Ø7Ø8	/1125		5	4	1								0 ppm
	225LBØ5Ø3Ø4	/1145		5	4	1								200 ppm
	225LBØ7Ø91Ø	/1205		5	4	1								150 ppm
	225LB15Ø5Ø6	/1230		5	4	1								67 ppm
	225LB18Ø7Ø8	/1425		5	4	1								170 ppm
	225LB21Ø5Ø6	/1440		5	4	1								25 ppm
	225LB11Ø7Ø8	/1500		6	4	1	1							10 ppm
	225LB11Ø7Ø8D	/1500		5	4	1								
	21JLØØ1Ø1	/												
		/												
		/												
		/												

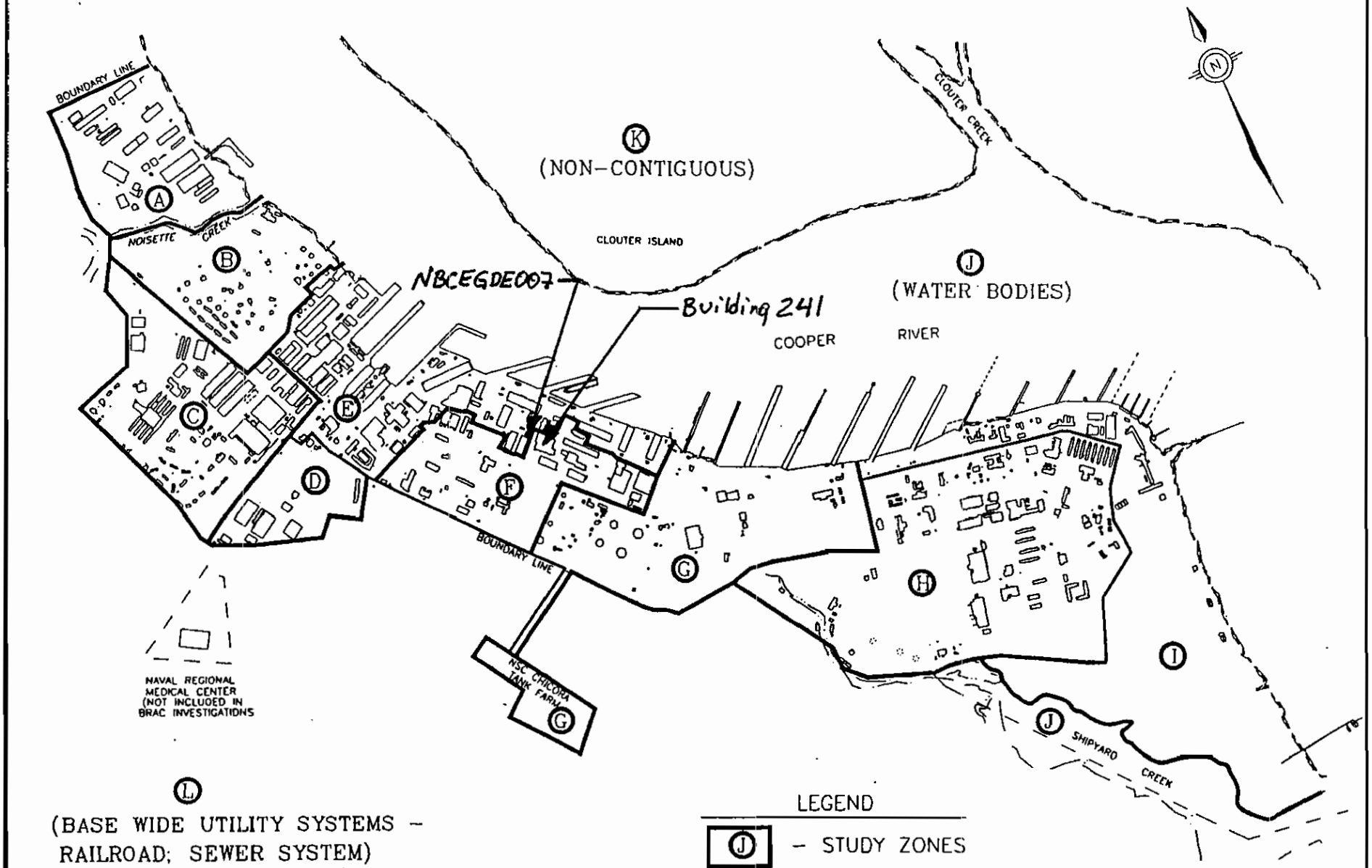
COMMENTS

Note: Did not write FOC on PAH labels / FOC on 225LB11Ø7Ø8 + Dupe only

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
James R. Hill	8/19/99 1820	Shelley Wilkinson	8/19/99 0850		
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

APPENDIX E

AQUIFER CHARACTERIZATION GRAPHS


BOUNDARY LINE
A
NOISETTE CREEK
B
C
D
E
F
G
BOUNDARY LINE
NAVAL REGIONAL MEDICAL CENTER (NOT INCLUDED IN BRAC INVESTIGATIONS
NSC CHICORA TANK FARM
G
K
(NON-CONTIGUOUS)
CLOUTER ISLAND
CLOUTER CREEK
NBCEGDE007
Building 241
J
(WATER BODIES)
COOPER RIVER
H
J
J
SHIPYARD CREEK
N
L
(BASE WIDE UTILITY SYSTEMS - RAILROAD; SEWER SYSTEM)
LEGEND
J - STUDY ZONES
2000 0 2000
SCALE FEET
SOURCES: SOUTHDIV, n.d. ESE, 1981.
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
ZONE E
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 1.1
INVESTIGATIVE
ZONE BOUNDARIES
DWG DATE: 09/29/97
DWG NAME: ZEZMAP

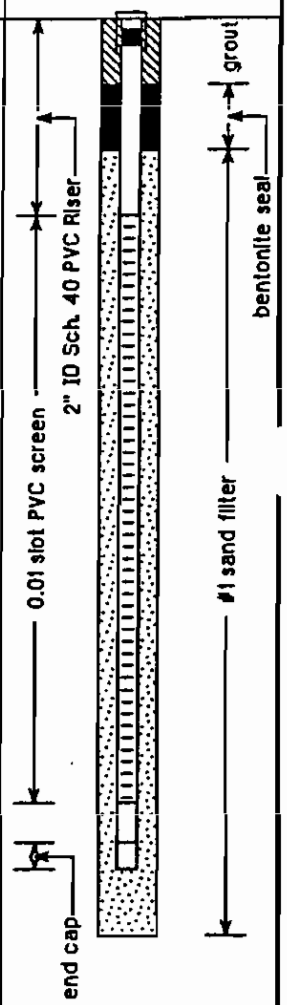
EnSafe/Allen & Hoshall

Monitoring Well NBCEGDE007

Project: *ZONE E - Naval Base Charleston*	Coordinates: *2319030.68 E, 374532.44 N*
Location: *Charleston, SC*	Surface Elevation: *8.1 feet msl*
Started at *1450 on 1-4-96*	TOC Elevation: *7.90 feet msl*
Completed at *1610 on 1-4-96*	Depth to Groundwater: *3.27 feet TOC* Measured: *3/13/96*
Drilling Method: *4.25" ID (7.5" OD) HSA with split spoon*	Groundwater Elevation: *4.63 feet msl*
Drilling Company: *Atlantic Drilling (SC cert #1210)*	Total Well Depth: *13.0 feet bgs*
Geologist: *B. Blythe*	Well Screen: *3.0 to 12.0 feet bgs*

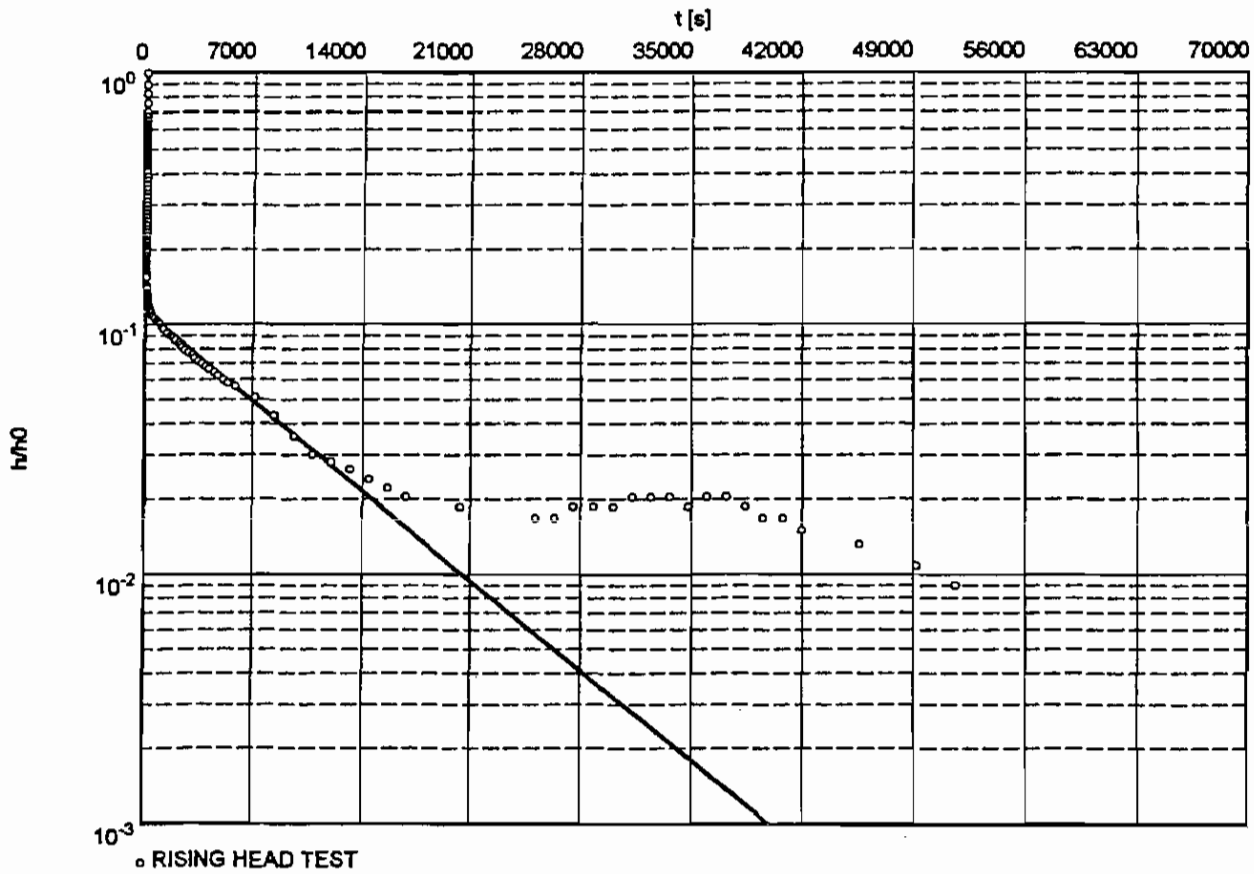
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Surface conditions: asphalt parking lot.	
							OL	Clay: black to dark gray, fat, high organic content, soft, moist.	4.1
							CL		3.8
5							OL	Clay: olive-green, sandy, medium plasticity, soft, wet.	3.6
			1	80	0			Clay: black to gray-green, fat, high organic content, low plasticity, soft, wet--marsh clay.	2.5
							OL	Clay: black to gray-green marsh clay as above.	1
10			2	100	0				1.9
							OL SC	Clay: as above, soft, moist, increasing in sand content at 11.5-12.5' becoming clayey sand.	2.9
			3	75	0				4.4
15									
20									

WELL DIAGRAM



EnSafe/Allen & Hoshall 935 Houston Northcutt Blvd. Suite 113 Mt. Pleasant, SC 29464 (803)-884-0029	slug/bail test analysis BOUWER-RICE's method	Appendix C, Page 1 Project: ZONE E--NAVBASE CHARLESTON Evaluated by: TKK | Date: 13.11.96

Slug Test No. 2	Test conducted on: 21.10.96
NBCE-GDE-007	



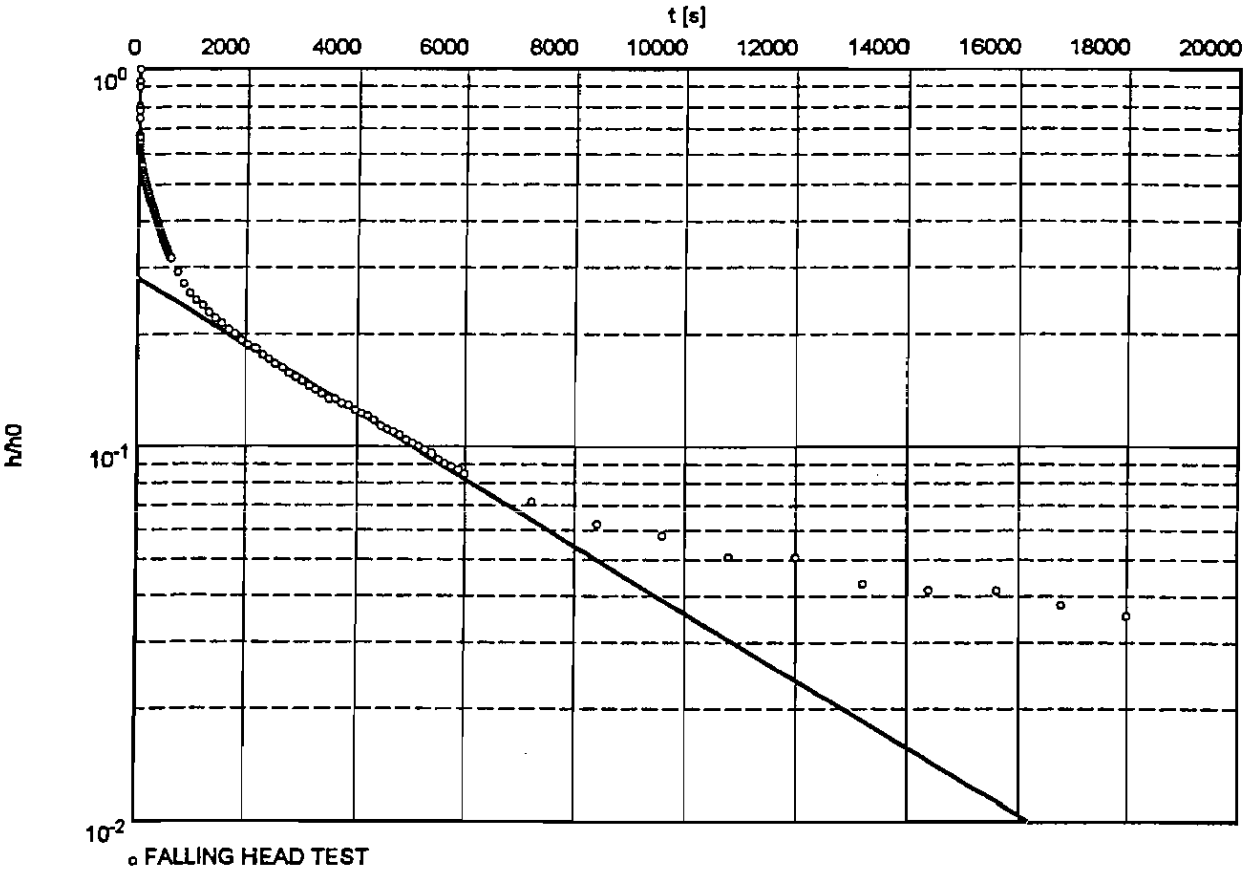
Hydraulic conductivity [ft/s]: 6.52×10^{-7}

Hydraulic conductivity [ft/day]: 5.63 x 10^-2

L = 10.6 ft
b = 10.6 ft
D = 10.6 ft (full penetration)
Reff = 0,195 ft

EnSafe/Allen & Hoshall 935 Houston Northcutt Blvd. Suite 113 Mt. Pleasant, SC 29464 (803)-884-0029	slug/bail test analysis BOUWER-RICE's method	Appendix C, Page 1 Project: ZONE E–NAVBASE CHARLESTON Evaluated by: TKK | Date: 13.11.96

Slug Test No. 1	Test conducted on: 21.10.96
NBCE-GDE-007	



o FALLING HEAD TEST

Hydraulic conductivity [ft/s]: 1.13×10^{-6}

Hydraulic conductivity [ft/day]: 9.76 x 10^-2

L = 10.6 ft
b = 10.6 ft
D = 10.6 ft (full penetration)
Reff = 0.195 ft

APPENDIX F

RBCA CALCULATIONS

Construction Worker Dermal RBSLs

	Kow	MW	Kp	B	τ_{event}	c	b	t*	t_{event}	DAevent
			cm/hr	unitless	hr/event			hr	hr/event	
Benzene	199.5262315	78.1	0.11551543	0.392637855	2.87E-01	6.32E-01	6.03E-01	6.90E-01	1	eq 3.3
Toluene	537.0317964	92.1	0.259561335	0.958068292	3.44E-01	1.13E+00	1.31E+00	1.33E+00	1	eq 3.2
Ethylbenzene	1412.537545	106.2	0.569219802	2.256154884	4.13E-01	2.36E+00	4.39E+00	1.70E+00	1	eq 3.2
Xylene*	1584.893192	106.2	0.638675123	2.531447415	4.13E-01	2.63E+00	5.31E+00	1.72E+00	1	eq 3.2
Naphthalene	1995.262315	128.2	0.605452393	2.636638957	5.48E-01	2.73E+00	5.69E+00	2.29E+00	1	eq 3.2
MTBE	15.136	88.15	0.00769788	0.027797704	3.27E-01	3.52E-01	3.20E-01	7.85E-01	1	eq 3.3
Chrysene	457088	228.3	0.49	2.847578386	1.99E+00	2.93E+00	6.49E+00	8.39E+00	1	eq 3.2

	BW	AT	EV	ED	EF	SA	CSF derm	Rfd derm	Target	RBSL	RBSL
	kg	day	events/day	yrs	days/yr	cm^2	$(mg/kg\text{-}day)^{-1}$	mg/kg-day	Risk or HQ	mg/L	mg/L
Benzene	70	25550	1	1	90	4500	2.99E-02	NA	1.00E-06		8.52E-01
Toluene	70	365	1	1	90	4500	NA	1.60E-01	1.0	2.40E+01	
Ethylbenzene	70	365	1	1	90	4500	NA	9.70E-02	1.0	6.05E+00	
Xylene*	70	365	1	1	90	4500	NA	1.84E+00	1.0	1.02E+02	
Naphthalene	70	365	1	1	90	4500	NA	3.20E-02	1.0	1.63E+00	
MTBE	70	365	1	1	90	4500	NA	5.00E-03	1.0	2.59E+01	
Chrysene	70	25550	1	1	90	4500	1.46E-02	NA	1.00E-06		3.23E-01

* Kow and MW values for xylene, m-

Prepared By: Jessica Sengan 11/3/99

Reviewed By: Albert T. Jenkins 11-4-99

Minimum Construction Worker RBSLs

	Dermal	Incidental Ingestion	Inhalation	Minimum
	RBSL	RBSL	RBSL	RBSL
	mg/L	mg/L	mg/L	mg/L
Benzene	0.85	68.52	0.15	0.15
Toluene	23.98	5677.78	5.38	5.38
Ethylbenzene	6.05	2838.89	14.50	6.05
Xylene	102.33	56777.78	NA*	102.33
Naphthalene	1.63	1135.56	2.63	1.63
MTBE	25.92	141.94	293.44	25.92
Chrysene	3.23E-01	272.22	2.25E+16	3.23E-01

*No inhalation reference dose is available for xylenes; therefore, no inhalation RBSL can be calculated.

Prepared By: _____ 11/4/99

Reviewed By: _____ 11-4-99

Construction Worker Incidental Ingestion RBSLs

	BW	AT	IR	ED	EF	Target	CSF oral	Rfd oral	RBSL
	kg	day	L/day	yrs	days/yr	Risk or HQ			mg/L
Benzene	70	25550	0.01	1	90	1.00E-06	2.90E-02		6.85E+01
Toluene	70	365	0.01	1	90	1.0	NA	2.00E-01	5677.778
Ethylbenzene	70	365	0.01	1	90	1.0	NA	1.00E-01	2838.889
Xylene	70	365	0.01	1	90	1.0	NA	2.00E+00	56777.78
Naphthalene	70	365	0.01	1	90	1.0	NA	4.00E-02	1135.556
MTBE	70	365	0.01	1	90	1.0	NA	5.00E-03	141.9444
Chrysene	70	25550	0.01	1	90	1.00E-06	7.30E-03	NA	2.72E+02

Prepared By: _____ 11/3/99

Reviewed By: _____ 11-4-99

Construction Worker Inhalation RBSLs

Chemical			Dair	Dwater	H	θ_{acap}	θ_{wcap}	θ_{as}	θ_{ws}	θ_T	Deff-cap	Deff-s
			cm^2/s	cm^2/s	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^2/s
Benzene			0.093	1.10E-05	2.26E-01	0.038	0.342	0.33	0.15	0.48	1.35E-05	1.01E-02
Toluene			0.085	9.40E-06	3.01E-01	0.038	0.342	0.33	0.15	0.48	1.07E-05	9.20E-03
Ethylbenzene			0.076	8.50E-06	2.80E-01	0.038	0.342	0.33	0.15	0.48	9.85E-06	8.22E-03
Xylenes			0.072	8.50E-06	2.78E-01	0.038	0.342	0.33	0.15	0.48	9.55E-06	7.79E-03
Naphthalene			0.072	9.40E-06	2.00E-03	0.038	0.342	0.33	0.15	0.48	5.79E-04	7.83E-03
MTBE			0.102	1.05E-05	4.16E-02	0.038	0.342	0.33	0.15	0.48	3.90E-05	1.10E-02
Chrysene			2.48E-02	6.21E-06	3.02E-18	0.038	0.342	0.33	0.15	0.48	2.51E+11	1.61E+10

Chemical			hcap	hv	Deff-ws	Uair	δair	Lgw	W	VFwamb	TR (carc)	HI (nonc)
			cm	cm	cm^3/s	cm/sec	cm	cm	cm	$mg/m^3/mg/L$		
Benzene			5	117	3.18E-04	225	200	122	1500	1.97E-05	1.00E-06	NA
Toluene			5	117	2.54E-04	225	200	122	1500	2.09E-05	NA	1
Ethylbenzene			5	117	2.34E-04	225	200	122	1500	1.79E-05	NA	1
Xylenes			5	117	2.27E-04	225	200	122	1500	1.72E-05	NA	1
Naphthalene			5	117	5.17E-03	225	200	122	1500	2.83E-06	NA	1
MTBE			5	117	8.79E-04	225	200	122	1500	9.99E-06	NA	1
Chrysene			5	117	1.67E+10	225	200	122	1500	3.02E-15	1.00E-06	NA

Chemical	TR (carc)	HI (nonc)	BWadult	AT	Sfi (carc)	RfD (nonc)	IR air	EF	ED	RBSLair	H	RBSLwater
			kg	yr	$[mg/kg\text{-}day]^{-1}$	[mg/kg-day]	m^3/day	day/yr	yr	mg/m^3	cm^3/cm^3	mg/L
Benzene	1.00E-06	NA	70	70	2.90E-02	NA	20	90	1	3.43E-02	2.26E-01	0.15
Toluene	NA	1	70	1	NA	1.14E-01	20	90	1	1.62E+00	3.01E-01	5.38
Ethylbenzene	NA	1	70	1	NA	2.86E-01	20	90	1	4.06E+00	2.80E-01	14.50
Xylenes	NA	1	70	1	NA	NA*	20	90	1	NA*	2.78E-01	NA*
Naphthalene	NA	1	70	1	NA	3.71E-04	20	90	1	5.27E-03	2.00E-03	2.63
MTBE	NA	1	70	1	NA	8.60E-01	20	90	1	1.22E+01	4.16E-02	293.443
Chrysene	1.00E-06	NA	70	70	1.46E-02	NA	20	90	1	6.81E-02	3.02E-18	2.25E+16

*No inhalation reference dose is availeble for xylenes; therefore, no RBSL can be calculated for xylene.

Prepared By: [signature] 11/4/99

Reviewed By: [signature] 11-4-99

SITE 21, BUILDING 241, ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA
SCDHEC UST ID No. 09868

DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT

Site-Speoific Target Lavel Calculations for Groundwater Possibly Impacting the Cooper River

Parameter Descriptions:	Units
POE = Point of Exposure	
SSTL = Site-Specific Target Level	mg/L
$SSTL_{SOURCE}$ = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L
$SSTL_{COMP}$ = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L
X_{POE} = x = Distance from Plume Source to POE (along Centerline)	m
X_{COMP} = x = Distance from POE to Compliance Point (along Centerline)	m
Y = Source Width (Perpendicular to Flow Direction)	m
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m
K_s = Saturated Hydraulic Conductivity	m/sec
I = Groundwater Gradient	cm/cm
θ = Porosity in Saturated Zone	cm^3/cm^3

Parameter Descriptions:	Units
ρ_s = Soil Bulk Density	g/cm^3
f_{OC} = Fraction Organic Carbon in Soil	g-C/g-soil
α_X = Longitudinal Dispersivity = 0.1x	m
α_Y = Transverse Dispersivity = $\alpha_X/3$	m
α_Z = Vertical Dispersivity = $\alpha_X/20$	m
k_{OC} = Organic Carbon Partition Coefficient	cm^3-H_2O/g-C
k_D = Soil-Water Sorption Coefficient	cm^3-H_2O/g-soil
V = Pore Water Velocity	m/sec
R_C = Constituent Retardation Factor	
V/R_C = Maximum Transport Rate of Dissolved Constituent = $(K_s I)/(\theta R_C)$	m/sec
RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

Dilution & Attenuation without Biological Decay

Constituent	X_{POE} ft	X_{POE} m	Y m	Z m	t sec	K_s m/sec	I m/m	θ cm^3/cm^3	ρ_s g/cm^3	α_X m	α_Y m	α_Z m	f_{OC} g-C/g-soil	k_{OC} cm^3-H_2O/g-C	k_D cm^3-H_2O/g-s	V m/sec	R_C	C_{POE}/C_{SOURCE}
Naphthalene	400	121.921	15	2	1.00E+13	2.61E-07	0.0202	0.55	1.4	27.13	9.04	1.36	1.09E-02	1543	16.888135	9.60E-09	43.988	1.111E-02

Constituent	X_{COMP} ft	X_{COMP} m	Y m	Z m	t sec	K_s m/sec	I m/m	θ cm^3/cm^3	ρ_s g/cm^3	α_X m	α_Y m	α_Z m	f_{OC} g-C/g-soil	k_{OC} cm^3-H_2O/g-C	k_D cm^3-H_2O/g-s	V m/sec	R_C	C_{POE}/C_{COMP}
Naphthalene	100	30.4804	15	2	1.00E+13	2.61E-07	0.0202	0.55	1.4	26.37	8.79	1.32	1.09E-02	1543	16.888135	9.60E-09	43.988	4.486E-02

Source: South Caroline Department of Health and Environmental Control (SCDHEC) 1998. *Risk-Based Corrective Action for Petroleum Releases*, Bureau of Underground Storage Tank Management.

DDMENICO DILUTION/ATTENUATION MODEL WITHOUT BIDLOGICAL DECAY

Constituent	POE RBSL mg/L	$SSTL_{SOURCE}$ mg/L	$SSTL_{COMP}$ mg/L
Naphthalene	0.010	0.900	0.223

$$\frac{C_X}{C_{SOURCE}} = \frac{1}{2} erfc\left[\frac{\left(x - \frac{vt}{R_c}\right)}{2\sqrt{\alpha_X \frac{vt}{R_c}}}\right] \times erf\left[\frac{Y}{4\sqrt{\alpha_Y x}}\right] \times erf\left[\frac{Z}{2\sqrt{\alpha_Z x}}\right]$$

Prepared By: Greg Swanson (by M. Daniels)

Reviewed By: 11/12/99

SITE 21, BUILDING 241, ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT

Predicted 10-yeer Migration of Constituents in Groundwater

Parameter Descriptions:	Units
POE = Point of Exposure	
SSTL = Site-Specific Target Level	mg/L
$SSTL_{SOURCE}$ = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L
$SSTL_{COMP}$ = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L
X_{POE} = x = Distance from Plume Source to POE (along Centerline)	m
X_{COMP} = x = Distance from POE to Compliance Point (along Centerline)	m
Y = Source Width (Perpendicular to Flow Direction)	m
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m
K_s = Saturated Hydraulic Conductivity	m/sec
I = Groundwater Gradient	cm/cm
θ = Porosity in Saturated Zone	cm^3/cm^3

Parameter Descriptions:	Units
ρ_s = Soil Bulk Density	g/cm^3
f_{OC} = Fraction Organic Carbon in Soil	g-C/g-soil
α_x = Longitudinal Dispersivity = x/10	m
α_y = Transverse Dispersivity = $\alpha_x/3$	m
α_z = Vertical Dispersivity = $\alpha_x/20$	m
k_{OC} = Organic Carbon Partition Coefficient	cm^3-H_2O/g-C
k_D = Soil-Water Sorption Coefficient	cm^3-H_2O/g-soil
V = Pore Water Velocity	m/sec
R_C = Constituent Retardation Factor	
V/R_C = Maximum Transport Rate of Dissolved Constituent = $(K_i)/(\theta R_C)$	m/sec
RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

Dilution & Attenuation without Biological Decay

Constituent	X_{POE} ft	X_{POE} m	Y m	Z m	t sec	K_s m/sec	i m/m	θ cm^3/cm^3	ρ_s g/cm^3	α_x m	α_y m	α_z m	f_{OC} g-C/g-soil	k_{OC} cm^3-H_2O/g-C	k_D cm^3-H_2O/g-soil	V m/sec	R_C	C_{POE}/C_{SOURCE}
Naphthalene	0.44	0.13411	15	2	3.15E+08	2.61E-07	0.0202	0.55	1.4	0.01	0.00	0.00	1.09E-02	1543	16.888135	8.60E-09	43.986	6.441E-02

Source: South Caroline Department of Health and Environmental Control (SCDHEC) 1998. *Risk-Based Corrective Action for Petroleum Releases*, Bureau of Underground Storage Tank Management.

DOMENICO DILUTION/ATTENUATION MODEL WITHOUT BIOLOGICAL DECAY

$$\frac{C_x}{C_{SOURCE}} = \frac{1}{2} erfc\left[\frac{\left(x - \frac{vt}{R_c}\right)}{2\sqrt{\alpha_x \frac{vt}{R_c}}}\right] \times erf\left[\frac{Y}{4\sqrt{\alpha_y x}}\right] \times erf\left[\frac{Z}{2\sqrt{\alpha_z x}}\right]$$

Constituent	C_{SOURCE} mg/L	C_x mg/L
Naphthalene	0.160	0.010

Prepared By: Greg Swanson
by M Thompson

Reviewed By:

SITE 21, BUILDING 241, ZONE F, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT

Predicted 20-year Migration of Constituents in Groundwater

Parameter Descriptions:	Units
POE = Point of Exposure	
SSTL = Site-Specific Target Level	mg/L
$SSTL_{SOURCE}$ = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L
$SSTL_{COMP}$ = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L
X_{POE} = x = Distance from Plume Source to POE (along Centerline)	m
X_{COMP} = x = Distance from POE to Compliance Point (along Centerline)	m
Y = Source Width (Perpendicular to Flow Direction)	m
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m
K_s = Saturated Hydraulic Conductivity	m/sec
I = Groundwater Gradient	cm/cm
θ = Porosity in Saturated Zone	cm^3/cm^3

Parameter Descriptions:	Units
ρ_s = Soil Bulk Density	g/cm^3
f_{OC} = Fraction Organic Carbon in Soil	g-C/g-soil
α_x = Longitudinal Dispersivity = x/10	m
α_y = Transverse Dispersivity = $\alpha_x/3$	m
α_z = Vertical Dispersivity = $\alpha_x/20$	m
k_{OC} = Organic Carbon Partition Coefficient	cm^3-H_2O/g-C
k_D = Soil-Water Sorption Coefficient	cm^3-H_2O/g-soil
V = Pore Water Velocity	m/sec
R_C = Constituent Retardation Factor	
V/R_C = Maximum Transport Rate of Dissolved Constituent = $(K_s I)/(\theta R_C)$	m/sec
RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

Dilution & Attenuation without Biological Decay

Constituent	X_{POE}	X_{POE}	Y	Z	t	K_s	I	θ	ρ_s	α_x	α_y	α_z	f_{OC}	k_{OC}	k_D	V	R_C	C_{POE}/C_{SOURCE}
	ft	m	m	m	sec	m/sec	m/m	cm^3/cm^3	g/cm^3	m	m	m	g-C/g-soil	cm^3-H_2O/g-C	cm^3-H_2O/g-soil	m/sec		
Naphthalene	0.89	0.27128	15	2	6.31E+08	2.61E-07	0.0202	0.55	1.4	0.03	0.01	0.00	1.09E-02	1543	16.888135	9.60E-09	43.988	6.112E-02

Source: South Carolina Department of Health and Environmental Control (SCDHEC) 1998, *Risk-Based Corrective Action for Petroleum Releases*, Bureau of Underground Storage Tank Management.

DOMENICO DILUTION/ATTENUATION MODEL WITHOUT BIOLOGICAL DECAY

$$\frac{C_x}{C_{SOURCE}} = \frac{1}{2} erfc\left[\frac{\left(x - \frac{vt}{R_c}\right)}{2\sqrt{\alpha_x \frac{vt}{R_c}}}\right] \times erf\left[\frac{Y}{4\sqrt{\alpha_y x}}\right] \times erf\left[\frac{Z}{2\sqrt{\alpha_z x}}\right]$$

Constituent	C_{SOURCE} mg/L	C_x mg/L
Naphthalene	0.160	0.010

Prepared By: Greg Swanson
G. M. Swanson

Reviewed By: [signature]
11/12/99

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID #	17706	COUNTY	Charleston
FACILITY NAME	Site 21, Building 241		
STREET ADDRESS	Charleston Naval Complex, North Charleston, SC		

Soil Risk Evaluation Data

					Figure
TPH		359	mg/kg		
Soil % SAND (Estimated)		10	%		
Soil % CLAY (Estimated)		55	%		
Worst Case	Benzene	0.011	mg/kg	Cs	
Soil Analyses	Toluene		mg/kg	Cs	
	Ethylbenzene		mg/kg	Cs	
	Xylenes		mg/kg	Cs	
	Naphthalene	25.055	mg/kg	Cs	
	MTBE		mg/kg	Cs	
	Chrysene	4.1	mg/kg		
Natural Organic Carbon Content		10945	mg/kg	foc	
Average Annual Recharge		25	cm	Hw	
Distance from highest Soil Impact to water table		46	cm	L	
Bulk Density of Soil		1.4	g/cc	Bd	1
Wetting Front Suction		-150	cm	Hf	2
Soil Hydraulic Conductivity		1.40E-06	cm/sec	Kf	3
Porosity		0.5	decimal %	Φ	4
Residual Water Content		0.08	decimal %	Wr	5

List possible human exposure pathways from surface soil.
Soil leaching to groundwater - construction worker in a utility trench.

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR BENZENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site: Site 21, Building 241

Location: Charleston Naval Complex, North Charleston, SC

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 5.

INPUT:

			BENZENE
COC	Chemical of Concern		
Bd	Soil Bulk Density (1)	g/cm3	1.4
Crsbl	Risk Based Screening Level	mg/L	0.15
Cs	Concentration of COC in soil	mg/kg	0.011
DAF	Dilution/Attenuation Factor (2)	unitless	2
foc	Organic Carbon Content in Soil (3)	mg/kg	10945
H'	Henry's Law Constant (4)	unitless	0.23
Hf	Wetting front suction head (always negative) (5)	cm	-150
Hw	Average Annual Recharge (3)	cm	25.00
Kf	Soil Hydraulic Conductivity (6)	cm/s	1.40E-06
Koc	Soil/Water Partioning Coefficient (2)	ml/g	81
L	Depth between soil sample with greatest COC concentration to groundwater.	cm	46
Φ	Porosity (7)	unitless	0.50
t1/2	Biodegradation "half life" (2)	days	16
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	359
Wr	Residual Water Content (8)	volume fraction	0.08

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc +TPH/1.724)*1E-6 = 0.0112 decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = 0.0113 mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = Ø - Wr = 0.42 decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (I/Kf)*(L-((Hw-Hf)*(ln((Hw+L-Hf)/(Hw-Hf))))) = 1,547,722 seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = 31 ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = 0.886545 ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw/(1+((Bd*Kd)/ø)) = 9 ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = 62.45 days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl)+((Tc/2.3)*(0.693/t1/2))) = 2.2419 mg/l

COC concentration in soil pore water (Cw) is less than concentration necessary to protect groundwater (Cp). Not necessary to calculate SSTL

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Csstl for BENZENE in soil = Cp*DAF*(((Bd*Koc*fcs)+Wr+(F*'H'''))/(Wr*1g/cc+Bd)) = 4.361744 mg/kg

PREPARED BY: Greg Swanson (by M. Dawkins) Date 11/5/99

CHECKED BY: Mark Date 11/9/99

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID # 17706
FACILITY NAME Site 21, Building 241

Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: BENZENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	16	days	t 1/2	1
Soil/water partitioning coefficient	81	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0112	decimal %	f cs	I	1
Leachate Concentration	0.011	mg/l	C w	I	2
Air Filled Porosity	0.42	decimal %	f	II	1
Infiltration Rate Time	1,547,722	seconds	t	II	2
Velocity of Water	31	ft/year	V w	II	3
Soil/Water Distribution Coefficient	0.8865	ml/g	K d	III	1
Contaminant Percolation Rate	9	ft/year	V c	III	2
Time to Reach Groundwater	62.45	days	T c	IV	1
Concentration reaching Groundwater	2.24	mg/l	C p	IV	2
Site Specific Target Level	**4.36**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.

____ YES X NO

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR NAPHTHALENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site:	Site 21, Building 241
Location:	Charleston Naval Complex, North Charleston, SC

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 5.

INPUT:

			NAPHTHALENE
COC	Chemical of Concern		
Bd	Soil Bulk Density (1)	g/cm3	1.4
Crsbl	Risk Based Screening Level	mg/L	1.63
Cs	Concentration of COC in soil	mg/kg	25.055
DAF	Dilution/Attenuation Factor (2)	unitless	2
foc	Organic Carbon Content in Soil (3)	mg/kg	10945
H'	Henry's Law Constant (4)	unitless	0.23
Hf	Wetting front suction head (always negative) (5)	cm	-150
Hw	Average Annual Recharge (3)	cm	25
Kf	Soil Hydraulic Conductivity (6)	cm/s	0.0000
Koc	Soil/Water Partioning Coefficient (2)	ml/g	1543
L	Depth between soil sample with greatest COC concentration to groundwater.	cm	46
Ø	Porosity (7)	unitless	0.50
t1/2	Biodegradation "half life" (2)	days	48
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	359
Wr	Residual Water Content (8)	volume fraction	0.08

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc +TPH/1.724)*1E-6 = 0.0112 decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = 0.12 mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = Ø - Wr = 0.42 decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (f/Kf)*(L-(Hw-Hf))*(ln(Hw+((L-Hf)/(Hw-Hf)))) = 1,547,722 seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = 31 ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = 16.888135 ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw*(1+((Bd*Kd)/ø)) = 1 ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = 865.97 days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl)+((Tc/2.3)*(0.693/t1/2))) = 444671.50 mg/l

COC concentration in soil pore water (Cp) is greater than Crsbl, therefore the SSTL must be calculated.

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Csstl for NAPHTHALENE in soil = Cp*DAF*(((Bd*Koc*fcs)+Wr+(F"H""))/(Wr*1g/cc+Bd)) = 14582906.944492 mg/kg

PREPARED BY: Greg Swanson (By M. Ebenhoeh) Date 11/5/99

CHECKED BY: Date 11/12/99

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID # 17706
FACILITY NAME Site 21, Building 241

Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: NAPHTHALENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	48	days	t 1/2	1
Soil/water partitioning coefficient	1543	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0112	decimal %	f cs	I	1
Leachate Concentration	0.116	mg/l	C w	I	2
Air Filled Porosity	0.42	decimal %	f	II	1
Infiltration Rate Time	1,547,722	seconds	t	II	2
Velocity of Water	31	ft/year	V w	II	3
Soil/Water Distribution Coefficient	16.89	ml/g	K d	III	1
Contaminant Percolation Rate	1	ft/year	V c	III	2
Time to Reach Groundwater	866	days	T c	IV	1
Concentration reaching Groundwater	444,672	mg/l	C p	IV	2
Site Specific Target Level	**1.46E+07**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.

YES	X	NO

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR CHRYSENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site: Site 21, Building 241

Location: Charleston Naval Complex, North Charleston, SC

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 5.

INPUT:

			Chrysene
COC	Chemical of Concern		
Bd	Soil Bulk Density (1)	g/cm3	1.4
Crsbl	Risk Based Screening Level	mg/L	0.32
Cs	Concentration of COC in soil	mg/kg	4.1
DAF	Dilution/Attenuation Factor (2)	unitless	2
foc	Organic Carbon Content in Soil (3)	mg/kg	10945
H'	Henry's Law Constant (4)	unitless	3.02E-18
Hf	Wetting front suction head (always negative) (5)	cm	-150
Hw	Average Annual Recharge (3)	cm	25.00
Kf	Soil Hydraulic Conductivity (6)	cm/s	1.40E-06
Koc	Soil/Water Partioning Coefficient (2)	ml/g	245,471
L	Depth between soil sample with greatest COC concentration to groundwater.	cm	46
Φ	Porosity (7)	unitless	0.50
t1/2	Biodegradation "half life" (2)	days	993
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	359
Wr	Residual Water Content (8)	volume fraction	0.08

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc +TPH/1.724)*1E-6 = 0.0112 decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = 0.0016 mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = ø - Wr = 0.42 decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (t/Kf)*(L-((Hw-Hf)*(ln((Hw+L-Hf)/(Hw-Hf))))) = 1,547,722 seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = 31 ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = 2686.680095 ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw/(1+((Bd*Kd)/ø)) = 0 ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = 134929.51 days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl)+((Tc/2.3)*(0.693/t1/2))) = 2.47E+40 mg/l

COC concentration in soil pore water (Cw) is less than concentration necessary to protect groundwater (Cp). Not necessary to calculate SSTL

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Csstl for CHYRSENE in soil = Cp*DAF*((Bd*Koc*fcs)+Wr+(F"H""))/(Wr*1g/cc+Bd)) = 1.28E+44 mg/kg

PREPARED BY: Greg Swanson (by M. Davidson) Date 11/5/99

CHECKED BY: Date 11/12/99

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID # 17706
FACILITY NAME Site 21, Building 241

Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: CHYRSENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	993	days	t 1/2	1
Soil/water partitioning coefficient	245471	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0112	decimal %	f cs	I	1
Leachate Concentration	0.002	mg/l	C w	I	2
Air Filled Porosity	0.42	decimal %	f	II	1
Infiltration Rate Time	1,547,722	seconds	t	II	2
Velocity of Water	31	ft/year	V w	II	3
Soil/Water Distribution Coefficient	2686.6801	ml/g	K d	III	1
Contaminant Percolation Rate	0	ft/year	V c	III	2
Time to Reach Groundwater	134929.51	days	T c	IV	1
Concentration reaching Groundwater	2.47E+40	mg/l	C p	IV	2
Site Specific Target Level	**1.28E+44**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.

_____ **YES** X **NO**

IN-SITU SOIL RISK EVALUATION