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CORRECTIVE ACTION PLAN FOR SITE 2 BUILDING NS 53 ZONE H SITE IDENTIFICATION NUMBER 00957 CNC CHARLESTON SC

11/1/2000

J A JONES ENVIRONMENTAL SERVICES

CORRECTIVE ACTION PLAN
FOR
SITE 2, BUILDING NS 53, ZONE H

Site Identification # 00957

Charleston Naval Complex
Charleston, South Carolina

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

Contract Number N62467-99-C-0960

November 2000

JA Jones Environmental Services

TRANSMITTAL FORM

Project:	**Charleston Naval Shipyard**
DO Title:	Delivery Order '007
DO Project Location:	Charleston Naval Complex

Date:	30-Nov-00
Contract Number :	
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007	
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Other		

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CORRECTIVE ACTION PLAN
FOR
SITE 2, BUILDING NS 53, ZONE H

Site Identification # 00957

Charleston Naval Complex
Charleston, South Carolina

Submitted to:
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CH2MHILL

Contract Number: N62467-99-C-0960

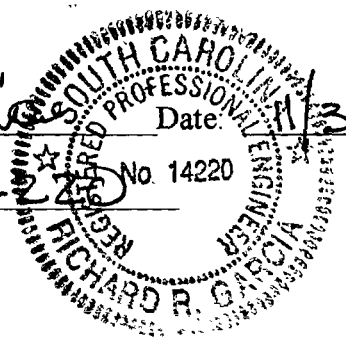
November 2000

CERTIFICATION

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

Approved By: R. Garcia Date: 11/30/00

South Carolina Registration No. 14220



ACRONYMS

AFVR	Aggressive Fluid - Vapor Recovery
bls	below land surface
BTEX	benzene, toluene, ethylbenzene and xylenes
BRAC	Defense Base Realignment and Closure Act
CAP	Corrective Action Plan
CNC	Charleston Naval Complex
CoC	Chemical of Concern
CSAP	Comprehensive Sampling and Analysis Plan
DOT	Department of Transportation
EISOPQAM	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual
EPA	Environmental Protection Agency
ft bls	feet below land surface
mg/kg	microgram per kilogram
mg/L	microgram per liter
OVA	Organic Vapor Analyzer
PAHs	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PVC	polyvinyl chloride
QA	Quality Assurance
QC	Quality Control
RA	Rapid Assessment
RAR	Rapid Assessment Report
RBSL	Risk-Based Screening Level
RCRA	Resource Conservation Recovery Act
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSTL	Site-Specific Target Level
SWMU	Solid Waste Management Unit
TTNUS	Tetra Tech NUS
UST	Underground Storage Tank

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1.0 INTRODUCTION

This Corrective Action Plan (CAP) has been prepared by CH2M-JONES, LLC. The plan is designed for Site 2, Building NS 53, Zone H; located at the Charleston Naval Complex (CNC), Charleston, South Carolina. Site 2 contains the locations of two former petroleum Underground Storage Tank (UST) systems used to supply fuel oil to the building. The South Carolina Department of Health and Environmental Control (SCDHEC) has designated this site as Identification Number: 00957.

This CAP provides a method for active remediation of the site by removing free petroleum product identified in the vicinity of the former UST basins; conducting groundwater sampling to evaluate the active remediation of the site; and implementing intrinsic remediation and monitoring well abandonment as a corrective action in accordance with SCDHEC Corrective Action Guidance, June 1997. The CAP was developed using the information provided in the Rapid Assessment Report (RAR) for Site 2 prepared by Tetra Tech NUS, Inc. (TTNUS), dated September 1999. The applicable tables and figures from the RAR have been incorporated into this CAP.

1.1 General Site Description

The CNC is located in the city of North Charleston, on the west bank of the Cooper River in Charleston County, South Carolina (**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 bounded 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 (**Figure 2**).

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**.

1.2 Site Background

The CNC began operations in 1901, when the Navy acquired the property. In 1993, the CNC was added to the list of bases schedule for closure under the Defense Base Realignment and Closure Act (BRAC). BRAC regulates the closure of the base and transition of the property back to the community. With the scheduled closure of the base, environmental cleanup has proceeded to make the property available for redevelopment after closure.

Building NS 53 is a former barber shop and maintenance shop at CNC. Two USTs were utilized to store used oil. UST NS 53A was a 3,000-gallon steel tank installed in 1935 and used to supply fuel oil to the building's boiler, and UST NS 53B was a 800-gallon steel tank

installed in 1935 and used to supply fuel oil to a hot water heater. The USTs were located on the eastern side of the building between Building NS 53 and Sarsi Street (**Figure 3**).

Between December 2, 1996 and February 18, 1997, UST NS 53A and B, and their distribution lines were removed from the site. No petroleum-contaminated soil was identified during the removal activities based upon soil sampling results. Excavated soil was returned to the original tank basins. A SCDHEC UST Assessment Report was completed by SPORTENVDETCHASN in 1997. Mild petroleum odors were observed in the excavations. Minimal groundwater (insufficient for sampling) was encountered in the excavations.

The site lies within the Resource Conservation Recovery Act (RCRA) designated Solid Waste Management Unit (SWMU) 178, which has been identified because of Polychlorinated Biphenyls (PCBs). No PCBs were detected in soil samples in the tank closure activities (SPORTENVDETCHASN, 1997).

From December 1998 through March 1999, TTNUS completed a Rapid Assessment (RA) for Site 2. The information from the Rapid Assessment Report (RAR), prepared by TTNUS, dated September 1999, is summarized in **Section 2.0** of this report. The RAR was approved by SCDHEC on November 12, 1999.

2.0 RAPID ASSESSMENT SUMMARY

TTNUS completed a Rapid Assessment Report (RAR), dated September 1999, for Site 2, Building NS 53, Zone H. The assessment information was used to develop this CAP. The information from the RAR is summarized in this section.

2.1 Receptor Survey

A receptor survey of the site vicinity was conducted by TTNUS personnel to identify potential receptors for petroleum hydrocarbon contamination. **Figure 2** depicts the public utilities located within 250 feet of the former UST study area. The receptor utilities located on or near the site include sanitary sewer, potable water, natural gas, storm sewer, and electrical. Specific information concerning the depth of utilities below land surface is currently unavailable, however, utilities at this site generally are between 2 to 6 feet below land surface (ft bls).

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 shallow potable water wells or irrigation wells 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 NS 53 is Cooper River located approximately 500 feet to the north and northeast.

There are no city, county or state-zoning ordinances, the property (CNC) is currently owned by the federal government. Information concerning zoning ordinances was obtained from the SOUTHDIV Remedial Project Manager located at 2155 Eagle Drive, North Charleston, South Carolina 29406.

2.2 Assessment Information

From December 1998 through March 1999, TTNUS conducted field activities for the RA, which included the installation and sampling of eighteen (18) soil borings, four (4) shallow monitoring wells, one (1) deep monitoring well, two (2) permanent piezometers, and two (2) temporary piezometers. Two additional wells, NBCH178-001 and NBCH178-002, were previously installed onsite. Sample locations are shown on **Figure 3**. The soil and groundwater field and laboratory sampling data from the RA is summarized in **Tables 1** through **9**.

As reported in the RAR, the site lithology consists of silty and clayey sands from ground surface to approximately 4 to 5 feet below land surface (ft bls), underlain by clay and sandy clay to approximately 10 ft bls, and underlain by sand and silty sand to approximately 26 ft bls. Two geologic cross sections of the site are depicted in **Figures 4** and **5**. Groundwater levels ranged from 3 to 7 ft bls (**Table 1**). Based upon groundwater level measurements collected on March 7, 1999, surficial groundwater flow is to the east-southeast; a groundwater potentiometric map for this date is presented in **Figure 6**.

During the RA, no soil contaminant concentrations exceeded Risk-Based Screening Levels (RBSLs) established by SCDHEC (Risk-Based Corrective Action For Petroleum Release, January 5, 1998) (**Table 7**).

During two groundwater measurement events on December 19, 1998 and March 7, 1999, free product was detected in four well locations with measurements ranging from sheen to 0.07 feet thickness (**Table 1**). The areal extent of free product is depicted on **Figure 7**. For concentrations of wells containing free product, the maximum solubility in equilibrium with fuel oil was calculated using Raoult's Law. Calculated concentrations for benzene, toluene and naphthalene in equilibrium with free product exceeded their respective RBSLs (Appendix G, TTNUS, September 1999).

In addition to the presence of free product and based upon groundwater sampling conducted during the RA, no groundwater contaminant concentrations exceeded RBSLs (**Table 8**). The distribution of Chemicals of Concern (CoC) in groundwater is presented in **Figure 7**.

2.3 Fate and Transport Modeling

The aquifer characterization calculated by TTNUS and the fate and transport parameters determined by TTNUS during the RA are summarized in **Table 9**. As illustrated in **Figures 8** and **9**, the Domenico model was used to predict the distance at which the tip of the contaminant plume is attenuated to SCDHEC RBSLs in 10 and 20 years, respectively.

2.4 Exposure Pathway Analysis

In the RA, TTNUS evaluated the receptor characterizations of the potentially exposed populations in the vicinity of the site and identified the potentially complete exposure pathways for those receptors. Exposure pathway analysis for current land use and future land is summarized in **Tables 10** and **11**.

2.5 Site-Specific Target Levels (SSTLs)

No SSTLs were calculated for soils, because no soil contaminant concentration exceeded RBSLs. In the RA, TTNUS, considered only one scenario for the calculations of SSTLs: on-site construction worker exposure to groundwater. No other exposure routes pathways were considered likely threats (**Tables 10** and **11**). The minimum SSTLs for this scenario were selected at this site for each CoC. **Table 12** compares the soil and groundwater contaminant concentrations to the soil RBSLs and calculated groundwater SSTLs.

Contaminant concentrations of benzene and naphthalene in groundwater exceeded the minimum calculated SSTLs protective of a construction worker in a utility trench. Therefore; the petroleum contamination detected at Site 2 may pose a threat to construction workers in nearby utilities.

3.0 PROPOSED CORRECTIVE ACTION

This CAP provides a method for active remediation of the site by removing free petroleum product identified in the vicinity of the former UST NS 53 basins; conducting groundwater sampling to evaluate the active remediation of the site; and implementing intrinsic remediation and monitoring well abandonment as a corrective action in accordance with SCDHEC Corrective Action Guidance, June 1997. Based on the results of the RA, source removal of free petroleum product will be performed at this site to remove CoCs from groundwater and to reduce contaminant concentrations below SSTLs. At which time, intrinsic remediation will be implemented until contaminant concentrations decrease below RBSLs or action levels approved by SCHDEC. The proposed active remediation plan is described in **Section 4.0**, and the proposed intrinsic remediation plan is described in **Section 5.0**.

3.1 Soil Remediation

Because no soil contaminant concentration exceeded RBSLs in the RA, active soil remediation as a part of this CAP is not warranted at this time.

3.2 Groundwater Remediation

Free product and groundwater contamination was identified in the vicinity of the former UST NS 53 basins. Contaminant concentrations in groundwater exceeded the minimum calculated SSTLs protective of a construction worker in a utility trench. The maximum source concentrations for groundwater were calculated based upon the presence of free product using Raoult's Law. Therefore, the active groundwater remediation of the site will include the removal free product identified in the vicinity of the former UST NS 53 basins and groundwater sampling to evaluate the active remediation of the site.

The following document was used as a source for remedial design: United States Environmental Protection Agency (EPA), 1996, EPA How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites. Three approaches were considered for free product recovery: passive removal/skimmer system, bioremediation (injection), and dual-phase vapor and groundwater recovery.

The volume of free product at this site is estimated at 2.47 cubic feet or 18.30 gallons using the following data obtained from the RAR: area of free product is approximately 520.5 square feet (**Figure 7**), average thickness of free product over the affected area is 0.01 feet (**Table 1**), and porosity (n) = 0.47 (**Table 9**). Due to the limited affected area of free product, thin thickness of free product, and low volume of free product estimated at the site, the following remedial strategy was designed for the Site 2.

Step 1: A passive removal/skimmer system will be implemented at the site to remove free product. A passive, floating skimmer with a product recovery filter canister is designed to remove free product down to a sheen or thickness of 0.01 feet thickness. Typically, the skimmer is lowered into the well until the midpoint of the skimmer is located at the

fluid level in the well. Floating hydrocarbons (free product) enters the skimmer through the floating intake outer debris screen and then through an inner oileophilic hydrophobic screen, and down into a clear canister for storage. To empty the skimmer, the device is brought to the surface, and the canister is drained using the discharge valve at the skimmer base. A dedicated, free product bailer will be utilized to remove free product from the top of the wells in the target area if free product thickness is near or less than 0.01 feet.

Step 2: In addition, if contaminate concentrations continue to remain above the minimum calculated SSTLs, enhanced bioremediation may be used to target specific locations to enhance the natural degradation of contaminants at the site. Bioremediation consist of the injection of naturally occurring microbes with an affinity towards digesting specific contaminants and the injection of nutrients to support the microbes. Typically, the bioremediation mixture of microbes and nutrients is injected through well points that are installed into the contaminated zone using direct push technology.

Step 3: Other active removal methods may be employed if free product persist at the site, an 8-hour Aggressive Fluid – Vapor Recovery (AFVR) event or multiple events will be conducted to remove free product from the source area. The AFVR will consist of a vacuum truck utilized to extract fluid and vapor from target well points. The AFVR assembly will connect the vacuum hose to the top of the wellhead with the design such that liquid and vapor will be extracted from the top of the water column in the target well point. .

4.0 PROPOSED ACTIVE REMEDIATION

Active remediation of the site will include removing free product identified in the vicinity of the former UST NS 53 basin, and conducting groundwater sampling to evaluate the active remediation of the site. A passive removal/skimmer system will be implemented at the site to remove free product. If free product persist at the site, an 8-hour Aggressive Fluid – Vapor Recovery (AFVR) event or multiple events will be conducted to remove free product from the source area. In addition, if free product continues to persist at the site and/or groundwater contaminant concentrations do not decrease, bioremediation may be used to target specific locations to enhance the natural degradation of the contamination at the site.

4.1 Free Product Recovery System

Free product will be removed using a passive removal/skimmer system. A passive, floating skimmer with a product recovery filter canister will be used for the removal of free product in recovery wells with free product thickness greater than 0.01 feet. A Product Recovery Canister (Model PRC-94) or an equivalent device for a 2-inch diameter well with a capacity of 0.25 liter or greater should be adequate for the conditions at the site assuming that product levels are greater than 0.01 feet in recovery wells (**Appendix A**). A minimum thickness of 0.01 feet is required for the Model PRC-94 and most passive skimmer devices. A dedicated, free product bailer will be utilized to remove free product from the top of the wells if free product thickness is near or less than 0.01 feet.

The proposed free product recovery well diagram is included as **Figure 10**. Existing monitoring well NBCH178-001 and two proposed monitoring wells (CNC02-M06 and CNC02-M07) will be utilized as the free product recovery wells, assuming free product is present in these wells. The locations of the proposed recovery wells are shown on **Figure 7**. Any free product and contaminated groundwater removed from the wells will be containerized in DOT-approved (Specification 7H) 55-gallon drums and disposed of at a later date pending fluid contents analysis. The drums will be secured in a location coordinated with site management and base support (see **Section 6.0**).

Monitoring well (NBCH178-001), and two proposed monitoring wells (CNC02-M06 and CNC02-M07) may also be used as the target well points if AFVR is warranted for this site. Any free product and contaminated groundwater from the AFVR event will be containerized in a tanker vehicle and disposed at an appropriate facility based upon fluid contents.

The former UST basins and their associated contaminant plume will be the target area if bioremediation is warranted at the site. An SCDHEC-approved bioremediation product will be utilized at the site. The bioremediation product will be delivered into the contaminated zone through injection points typically installed using direct push technology in a grid pattern over the target area.

SCDHEC will be contacted prior to the implementation of the different remedial approaches at the site, if AFVR and bioremediation is warranted at the site.

4.2 Monitoring Well Installation

Two proposed monitoring wells (CNC02-M06 and CNC02-M07) will be installed at the site. The locations of the proposed wells are shown on **Figure 7**. These wells will be installed to the same specifications as existing shallow monitoring wells. The wells will consist of 2-inch diameter polyvinyl chloride (PVC) well casing installed to a depth of 12 ft bls with a 0.01-inch slotted screened interval from 2 to 12 ft bls.

If any wells are unusable or new wells are warranted for any other reason, the wells will be installed to the same specification as existing monitoring wells unless site conditions change and warrant otherwise. The wells will be installed in accordance with South Carolina Well Standards and Regulations R.61-71. A utility locate will be completed prior to any well installation activities. Any necessary permits will be acquired prior to well installation activities.

4.3 Surveying

Surveying of any new well locations will be conducted as a part of this CAP.

4.4 Soil Boring Schedule

Because no soil contaminant concentration exceeded RBSLs in the RA, no soil borings are scheduled to be installed in this CAP unless site conditions change and warrant otherwise.

4.5 System Operation and Maintenance

System operation and maintenance will conducted every week for the first month, and a minimum of once per month thereafter. The actual frequency of sites visit will depend on the free product removal rates. During scheduled site visits, free product will be removed by hand bailing. System operation and maintenance will include the measurement of free product levels in the recovery wells (CNC02-P02, NBCH178-001, CNC02-M06 and CNC02-M07), the estimate of free product amount removed from each recovery well, and the examination of the downgradient and nearby monitoring wells (CNC02-P01D, CNC02-M03, CNC02-M04 and CNC02-M05D) for free product.

4.6 Sampling and Analysis Plan

During system operation and maintenance, groundwater samples will be collected at system start-up and semi-annually from monitoring wells CNC02-M04, CNC02-M05D, CNC02-M06, CNC02-M07, CNC02-P02, and NBCH178-001. Once free product has been removed from the site, groundwater samples will collected from all monitoring wells. The groundwater samples will be submitted to a certified laboratory for analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and naphthalene by EPA Method 8260, and Polyaromatics Hydrocarbons (PAHs) by EPA Method 8270.

Groundwater level measurements will be collected from all monitoring wells prior to all groundwater sampling events. Measurements will be taken with an electrical water level indicator or interface probe if floating product is present. No groundwater samples will be collected if free product is measurable.

From three to six well volumes will be purged from each well prior to groundwater sampling. Field measurements of pH, groundwater temperature, specific conductance, dissolved oxygen, and turbidity will be taken during groundwater sampling events.

All sampling procedures will be conducted in accordance with EPA Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), 1996. Any contaminated groundwater collected during the well sampling events will be containerized in DOT-approved (Specification 7H) 55-gallon drums and disposed of at a later date pending fluid contents analysis.

4.7 Reporting

Semi-annual monitoring reports will be submitted to SCDHEC. The reports will summarize and include copies of field and laboratory analytical data. Upon completion of active remediation, a Performance Evaluation Report will also be submitted to SCDHEC to summarizes the remediation activities, evaluate the soil and water quality data, and provide recommendations for the site.

4.8 Equipment Decontamination

All drilling equipment, augers, well casing and screens, and soil and groundwater sampling equipment involved in field sampling activities will be decontaminated according to the EPA EISOPQAM.

4.9 Sample Handling

Sample handling will be conducted in accordance to the following references: EPA EISOPQAM, Code of Federal Regulations 136, 1990, and EPA Users Guide to Contract Laboratory Program, 1988. The following forms will be completed for packing/shipping process: sample labels, chain-of-custody labels, appropriate labels applied to shipping coolers, and chain-of-custody forms.

4.10 Quality Control

In addition to periodic calibration of field equipment and the completions of the appropriate documentation, quality control (QC) samples will be collected during sampling events. QC samples may include field blanks, field duplicates, and trip blanks. Definitions of each can be found below as described by the EPA EISOPQAM:

- **Field Blank:** A sample collected using organic-free water, which has been run over/through sample collection equipment. These samples are used to determine if

contaminants have been introduced by contact of the sample medium with sampling equipment. Equipment field blanks are often associated with collecting rinse blanks of equipment that has been field cleaned.

- **Field Duplicates:** Two or more samples collected from a common source. The purpose of a duplicate sample is to estimate the variability of a given characteristic or contamination associated with a population.

- **Trip Blank:** A sample, which is prepared prior to the sampling event in the actual container and is stored with the investigative samples throughout the sampling event. They are often packaged for shipment with the other samples and submitted for analysis. At no time after their preparation are trip blanks to be opened before they reach the laboratory. Trip blanks are used to determine if samples were contaminated during storage and/or transportation back to the laboratory (a measure of sample handling variability resulting in positive bias in contaminant concentration). If samples are to be shipped, trip blanks are to be provided with each shipment but not for each cooler.

4.11 Field Quality Assurance / Quality Control (QA/QC)

All sampling procedures will be conducted in accordance with EPA EISOPQAM. More information on field QC can be found in **Sections 4.8** through **4.10**.

QA/QC specifications for selected field measurements are summarized below.

Analysis	Control Parameter	Control Limit	Corrective Action
Air Monitoring	Check Calibration of OVA daily	Calibrate to manufactures specifications	Recalibrate. If unable to calibrate, replace.
pH of water	Continuing calibration check of pH 7.0 buffer	pH = 7.0	Recalibrate. If unable to calibrate, replace electrode.
Specific Conductance of water	Continuing calibration check of standard solution	> 1% of standard	Recalibrate.

4.12 Record keeping

In addition to required sampling documentation (see **Section 4.9**), standardized forms, log sheets and logbooks will be completed during all field activities.

5.0 PROPOSED INTRINSIC REMEDIATION

Upon completion of active remediation, if warranted, intrinsic remediation will be implemented until contaminant concentrations decrease below RBSLs or other action levels approved by SCHDEC. This CAP provides a method for implementing intrinsic remediation and monitoring well abandonment as a corrective action in accordance with SCDHEC Corrective Action Guidance, June 1997. The intrinsic remediation method may be modified based upon the results of active remediation.

5.1 Monitoring Well Installation

Assuming the wells from the active remediation method are in good condition, no monitoring wells will be installed for the CAP. If any wells are unusable or new wells are warranted for any other reason, the wells will be installed to the same specification as existing monitoring wells unless site conditions change and warrant otherwise.

5.2 Surveying

No new monitoring wells are scheduled to be installed as a part of the intrinsic CAP. Surveying of any new well locations will be conducted if warranted.

5.3 Soil Boring Schedule

No other soils borings are scheduled for the CAP unless site conditions change and warrant otherwise.

5.4 Monitoring Well Abandonment

All monitoring wells will be abandoned upon receiving approval by SCDHEC. The wells will be abandoned following the South Carolina Well Standards and Regulations R.61-71. The well abandonment will include grouting wells, removing stick-ups and removing all guard posts. Any well casing and screen removed will be decontaminated and disposed of as general refuse.

5.5 Sampling and Analysis Plan

Groundwater samples will be collected semi-annually for a period of 18 months from monitoring wells CNC02-M04, CNC02-M05D, CNC02-M06, CNC02-M07, CNC02-P02, and NBCH178-001. The groundwater samples will be submitted to a certified laboratory for analysis of BTEX and naphthalene by EPA Method 8260, and PAHs by EPA Method 8270. The following parameters will also be considered for analysis in order to evaluate the effectiveness of intrinsic remediation: nitrate (NO^{-3}), sulfate (SO^{-4}), total dissolved iron, methane (CH_4), and alkalinity.

Groundwater level measurements will be collected from all monitoring wells prior to all groundwater sampling events. Measurements will be taken with an electrical water level

indicator or interface probe if floating product is present. No groundwater samples will be collected if free product is measurable.

From three to six well volumes will be purged from each well prior to groundwater sampling. Field measurements of pH, groundwater temperature, specific conductance, dissolved oxygen, and turbidity will be taken during groundwater sampling events.

All sampling procedures will be conducted in accordance with EPA EISOPQAM. Any contaminated groundwater collected during the well sampling events will be containerized in DOT-approved (Specification 7H) 55-gallon drums and disposed of at a later date pending fluid contents analysis.

5.6 Reporting

Semi-annual monitoring reports will be submitted to SCDHEC. The reports will summarize and include copies of field and laboratory analytical data. Upon completion of 18 months of sampling, a Performance Evaluation Report will also be submitted to SCDHEC to summarizes the sampling activities, evaluate the soil and water quality data, and provide recommendations for the site.

6.0 SITE MANAGEMENT AND BASE SUPPORT

Throughout the investigation activities, work on the CNC will be coordinated through SOUTHDIV and SCDHEC.

The primary contacts for each are as follows:

1. SOUTHDIV point of contact
   Gabe Magwood
   Southern Division Engineering Command
   2155 Eagle Drive
   North Charleston, SC 29406
   (843) 820-7307

2. SOUTHDIV point of contact
   Tony Hunt
   Southern Division Engineering Command
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   North Charleston, SC 29406
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3. SCDHEC point of contact
   Paul Bristol
   South Carolina Department of Health and Environmental Control
   2600 Bull Street
   Columbia, SC 29201
   (843) 898-3559

7.0 REFERENCES

Comprehensive Sampling and Analysis Plan (Ensafe/ Allen & Hoshall. July 1996).

South Carolina Department of Health and Environmental Control. 1997. Corrective Action Guidance.

SPORTENVDETCHASN. 1997. UST Assessment Report.

Tetra Tech NUS, Inc. September 1999. Rapid Assessment Report for Site 2, Building NS 53, Zone H, Charleston, South Carolina.

United States Environmental Protection Agency. 1990. Code of Federal Regulations 136.

United States Environmental Protection Agency. 1996. EPA Environmental Investigations Standard Operating Procedures for Quality Assurance Manual.

United States Environmental Protection Agency. 1996. EPA Environmental Investigations Standard Operating Procedures for Quality Assurance Manual.

United States Environmental Protection Agency. 1988. EPA How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites.

TABLE 1

GROUNDWATER ELEVATIONS
SITE 2, BUILDING NS 53
ZONE H, CHARLESTON NAVAL COMPLEX
SOUTH CHARLESTON, SOUTH CAROLINA

Monitoring Well No.	Total Depth of Well (ft)	Top of Casing Elevation (ft MSL / ft local elevation)	Date Measured	Depth to free product (BTOC)	Depth to Water (BTOC)	Groundwater Elevation (MSL)
CNC02-P04	12	NS / 11.57	12/19/99	[1]	6.25	NA
			2/21/99	NM	NM	NM
			3/7/99	[1]	6.17	NA
NBCH178-001	27	12.23 / 12.20*	12/19/99	[1]	4.49	7.74
			2/21/99	NM	NM	NM
			3/7/99	[1]	7.08	5.15
NBCH178-002	12	9.16	2/21/99	NM	NM	NM
			2/21/99	NM	NM	NM
			3/7/99	NP	4.02	5.14

Notes:
MSL - Mean Sea Level
BTOC - Below Top of Casing
NS - Not surveyed
ft - feet
NM - Not measured
NA - Not applicable
[1] - Visable trace amounts; not measurable
NP - Not present

TABLE 2

GROUNDWATER FIELD MEASUREMENTS
SITE 2, BUILDING NS 53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Purge method	Volume (gallons	Temp. (°C)	pH	Conductivity (uMHOS/cm)
CNC02-M01	3/8/99	PP	6.5	16.4	7.33	0.540
CNC02-M02	3/8/99	PP	4.0	18.5	7.19	2.77
CNC02-M03	3/8/99	PP	5.5	20.2	6.81	17.20
CNC02-M04	3/8/99	PP	6.5	17.8	6.98	3.36
CNC02-M05	3/8/99	PP	4.0	20.3	7.05	16.50
CNC02-P01	3/8/99	PP	5.0	16.5	6.75	1.82
NBCH178-002	3/8/99	PP	6.5	17.6	7.64	1.52

Notes:
(°C) - Degrees Celcius
PP - Peristaltic pump, low flow technique
uMHOS/cm - micro HOS per centimeter
NTU - Nephelometric turbidity units

TABLE 3

GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS
SITE 2, BUILDING NS 53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Dissolved Oxygen (mg/L)	Akalinity (mg/L)	Carbon Dioxide (mg/L)	Sulfide (mg/L)	Ferrous Iron (mg/L)	Nitrite (mg/L)	Manganese (mg/L)	Nitrogen/ Nitrate (mg/L)*	Sulfate (mg/L)*	Methane (mg/L)*
CNC02-M02	3/8/99	3.65	250	76	0.01	0.02	0.029	0.1	0.150	145.0	12
CNC02-P01	3/8/99	0.00	500	NA	0.01	3.30	0.018	15.7	ND	386.0	850
NBCH178-002	3/8/99	2.91	220	52	0.01	0.20	0.013	0.0	0.015 J	86.4	190

Notes:
* - Fixed base laboratory analysis
mg/L - milligrams per liter

TABLE 4

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 2, BUILDING NS 53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (PPM)
CNC02-B01	02SSB0101	1	10
	02SSB0102	2	1
	02SSB0103	3	18
CNC02-B02	02SSB0201	1	9
	02SSB0202	2	15
	02SSB0203	3	20
CNC02-B03	02SSB0301	1	ND
	02SSB0302	2	ND
	02SSB0303	3	1
CNC02-B04	02SSB0401	1	ND
	02SSB0402	2	ND
	02SSB0403	3	ND
CNC02-B05	02SSB0501	1	ND
	02SSB0502	2	1
	02SSB0503	3	1
CNC02-B06	02SSB0601	1	ND
	02SSB0602	2	ND
CNC02-B07	02SSB0701	1	ND
	02SSB0702	2	ND
CNC02-B08	02SSB0801	1	ND
	02SSB0802	2	ND
CNC02-B09	02SSB0901	1	ND
	02SSB0902	2	1
CNC02-B10	02SSB1001	1	ND
	02SSB1002	2	ND
CNC02-B11	02SSB1101	1	ND
	02SSB1102	2	ND
CNC02-B12	02SSB1201	1	2
	02SSB1202	2	2
CNC02-B13	02SSB1301	1	ND
	02SSB1302	2	ND
CNC02-B14	02SSB1401	1	2
	02SSB1402	2	2
CNC02-B15	02SSB1501	1	5
	02SSB1502	2	3
CNC02-B16	02SSB1601	1	ND
	02SSB1602	2	ND
CNC02-B17	02SSB1701	1	ND
	02SSB1702	2	ND
	02SSB1703	3	ND
CNC02-B18	02SSB1801	1	ND
	02SSB1802	2	ND
	02SSB1803	3	ND

Notes:
OVA - organic vapor analyzer equipped with a flame ionization detector
PPM - parts per million
ND- not detected

TABLE 5

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
SITE 2, BUILDING NS53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Mobile Laboratory Screening Data (PPB)[1]				
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Diesel Range Organics
CNC02-B01	02SFB0103	3	<0.5	<0.5	<0.5	<1.0	24,261.98
CNC02-B02	02SFB0203	3	<0.5	<0.5	<0.5	<1.0	15,038.73
CNC02-B03	02SFB0303	3	<0.5	<0.5	<0.5	<1.0	2,788.91
CNC02-B04	02SFB0403	3	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B05	02SFB0503	3	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B06	02SFB0602	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B07	02SFB0702	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B08	02SFB0802	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B09	02SFB0902	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B10	02SFB1002	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B11	02SFB1102	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B12	02SFB1202	2	<0.5	<0.5	<0.5	<1.0	105.99
CNC02-B13	02SFB1302	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B14	02SFB1402	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B15	02SFB1501	1	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B16	02SFB1602	2	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B17	02SFB1703	3	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B18	02SFB1803	3	<0.5	<0.5	<0.5	<1.0	<100

NOTES:
[1] Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.
PPB - parts per billion

TABLE 6

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
SITE 2, BUILDING NS53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Mobile Laboratory Screening Data (PPB)[1]				
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Diesel Range Organics
CNC02-P01	02GFP0101	<0.5	<0.5	<0.5	<1.0	1,752.39
CNC02-P02	NS					
CNC02-P03	NS					
CNC02-P04	NS					
NBCH178-001	NS					
NBCH178-002	NBCH178-002	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B04	02GFB04	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B07	02GFB07	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B09	02GFB09	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B10	02GFB10	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B11	02GFB11	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B12	02GFB12	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B13	02GFB13	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B14	02GFB14	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B15	02GFB15	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B16	02GFB16	<0.5	<0.5	<0.5	<1.0	1.61
CNC02-B17	02GFB17	<0.5	<0.5	<0.5	<1.0	<100
CNC02-B18	02GFB18	<0.5	<0.5	<0.5	<1.0	<100

NOTES:
[1] Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.
PPB - parts per billion
NS – Free product present, no sample collected.

TABLE 7

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 2, BUILDING NS 53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Soil Boring / Sample No.	Sample Date	Benzene	Ethyl-benzene	Naphthalene	Toluene	Xylenes (total)	Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Dibenzo(a,h) anthracene	Chrysene	TRPH (mg/kg)
RBSL[1]		5	384	52	478	11119	17687	7042	5593	21265	3146	
CNC02-B01/ 02SLB0103	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	271
CNC02-B03/ 02SLB0303	20-Jan-99	2.61[J]	ND	ND	1.26[J]	ND	ND	ND	ND	ND	ND	NA
CNC02-B04/ 02SLB0403	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC02-B05/ 02SLB0503	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC02-B08/ 07SLB0802	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC07-B08/ 07SLB0802D[2]	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
CNC02-B10/ 02SLB1002	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
ZHTL0701[3]	20-Jan-99	ND	ND	0.676	ND	ND	NA	NA	NA	ND	NA	NA
ZHRL00201[4]	20-Jan-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA

All concentrations are in micrograms per kilograms (ug/kg) unlsee noted

NA - Compound not analyzed

ND - Compound not detected

* Concentration in milligrams per kilograms

J - Estimated concentration

TRPH - total recoverable petroleum hydrocarbons

Sample 02SLB1902 was analyzed for total organic carbon and contained 2,730 milligrams/kilograms

[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] duplicate sample

[3] trip blank sample

[4] equipment blank sample

TABLE 8

SUMMARY OF FIXED - BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE --, BUILDING NS53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/Sample No.	Sample Date	Benzene	Ethyl-benzene	Toluene	Xylenes (total)	Naphthalene	Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	MTBE
RBSL[1]		5	700	1000	10000	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	40
CHC02-M01 / 02GLM0101	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M02 / 02GLM0201	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M03 / 02GLM0301	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M03 / 02GLM0301D	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M04 / 02GLM0401	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-M05 / 02GLM0501	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHC02-P01 / 02GLP0101	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NBCH 178-002 / NBCH 178-002	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.83
ZHTL01501[3]	09-Mar-99	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	ND
ZHRL00501[4]	09-Mar-99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

All concentrations are in ug/L. ND = Compound not detected. NA = Compound 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) The Risk Based Screening Level for individual PAH CoC is 10 ug/l or 25 ug/l for total PAHs.

(3) trip blank sample.

(4) equipment blank sample

TABLE 9

FATE AND TRANSPORT INPUT PARAMETERS

ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Parameter	Domenico Dilution/Attenuation Model[1]
Hydraulic Conductivity [m/sec]	1.0795E-06
Hydraulic Gradient	0.02725
Porosity	0.47
Estimated Plume Length [ft]	NA
Soil Bulk Density [kg/L]	1.5
Partition Coefficient [L/kg]	chemical specific[1]
Fractional Organic Carbon[a]	2.73E-03
First Order Decay Rate[a] [sec^{-1}]	0
Modeled Plume Length [ft]	NA
Modeled Plume Width [ft]	NA
Source Width[a] [m]	15
Source Thickness[a] [m]	2
Soluble Mass [kg]	Infinite[b]

(1) - *South Carolina Risk-Based Corrective Action for Petroleum Releases,* South Carolina Department of Health and Environmental Control, 1998.

(a) - Stated values are default values.

(b) - Assumption of the Domenico Model

TABLE 10

EXPOSURE PATHWAY ASSESSMENT - CURRENT USE
SITE 2, BUILDING NS 53
ZONE H, CHARLESTÓN 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.	
	Dermal contact	No		
	Inhalation	No	No basements	
Surface Water	Ingestion	No	No downgradient surface water	
	Dermal contact	No		
	Inhalation	No		
Surficial Soil	Ingestion	No	No surface soil with BTEX, MTBE, or PAHs above RBSLs	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	No	No impacted subsurface soil	
	Dermal contact	No		
	Inhalation	No		

TABLE 11

EXPOSURE PATHWAY ASSESSMENT - FUTURE USE
SITE 2, BUILDING NS 53
ZONE H, 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	Potential future utility worker may have dermal, inhalation, and incidental ingestion exposure	
	Dermal contact	Yes		
	Inhalation	Yes		
Surface Water	Ingestion	No	No downgradient surface water	
	Dermal contact	No		
	Inhalation	No		
Surficial Soil	Ingestion	No	No surface soil with BTEX, MTBE, or PAHs above RBSLs	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	No	No impacted subsurface soil	
	Dermal contact	No		
	Inhalation	No		

TABLE 12

COMPARISON OF MAXIMUM CONCENTRATIONS TO RBSLs
SITE 2, BUILDING NS 53
ZONE H, 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)	RBSLs (GW) (mg/L)[b]
Benzene	0.00261 J	0 005	**0.31**	0.152
Toluene	0.00126 J	0.478	4.64	5.376
Ethybenzene	ND	0.364	0.104	6.05
Xylenes	ND	11.119	0.794	102.33
Naphthalene	0.000676	0.052	**23.35**	1.630

(a) - From Risk-Based Corrective Action for Petroleum Releases, Table B4, Depth to GW - 0-5 ft, SCDHEC RBCA Guidelines, 1998.
(b) - Minimum RBSL calculated for Construction /Utility worker exposure to Groundwater, see Appendix H
J = Estimated Concentration
GW - Groundwater
RBSLs - Risk Based Screening Levels
Shaded cell indicates the concentration exceeded the RBSL

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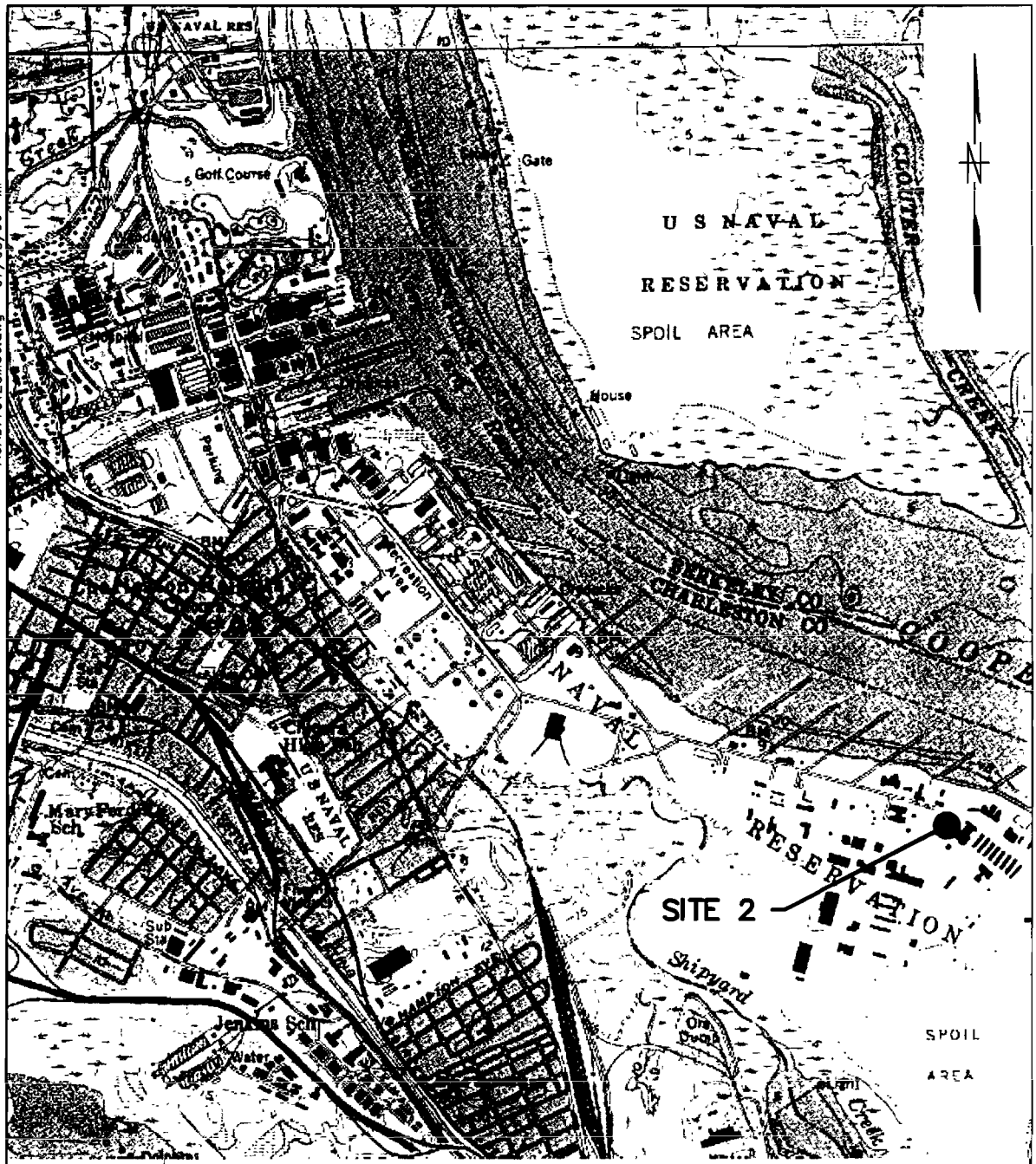

SOURCE: QUADRANGLE MAP SOUTH CAROLINA, REVISED 1979
QUADRANGLE MAP NORTH CHARLESTON REVISED, 1979

DRAWN BY DATE: HJP 5/18/99		SITE LOCATION MAP SITE 2, BUILDING NS-53, ZONE H CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SC	CONTRACT NO. 7912
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE: AS NOTED			DRAWING NO. FIGURE 1 / REV. 0

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

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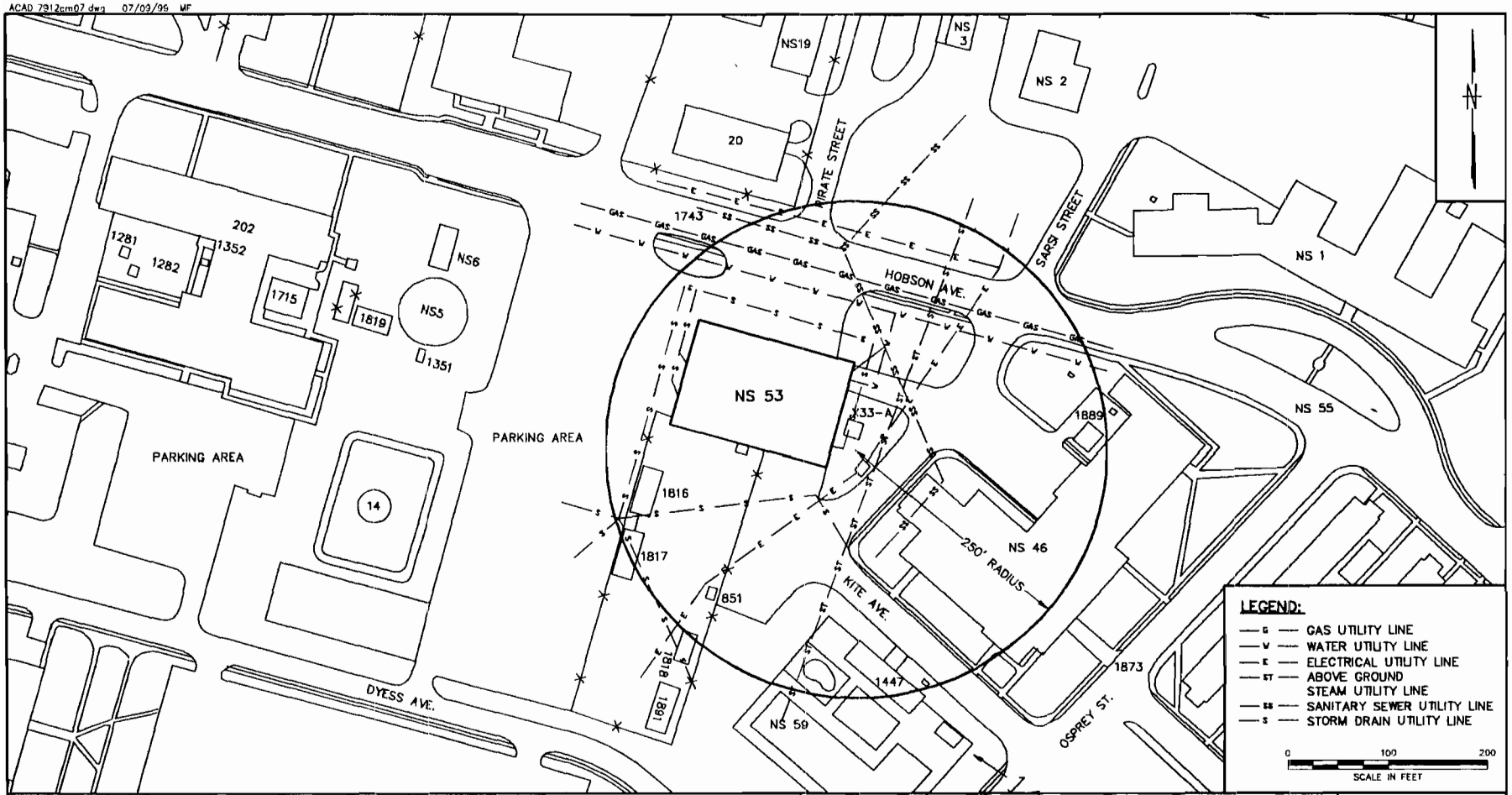

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY KW 5/24/99 DATE
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SITE VICINITY MAP
SITE 2, BUILDING NS 53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912
APPROVED BY DATE
APPROVED BY DATE
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REV. 0

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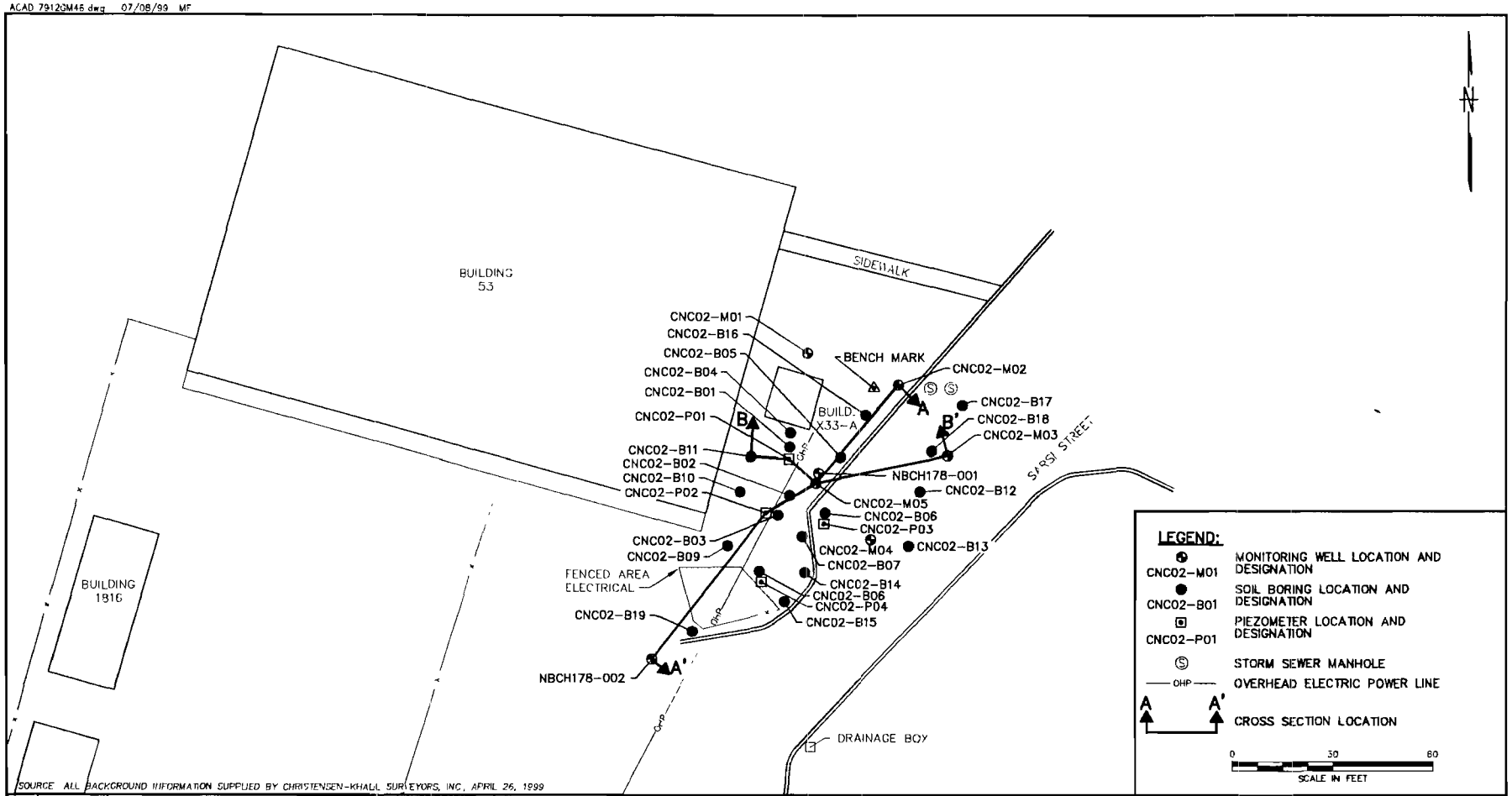

SOURCE ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALL SURVEYORS, INC., APRIL 26, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

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CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SITE AREA AND SAMPLING LOCATIONS
SITE 2 BUILDING NS--53
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 3
REV. 0

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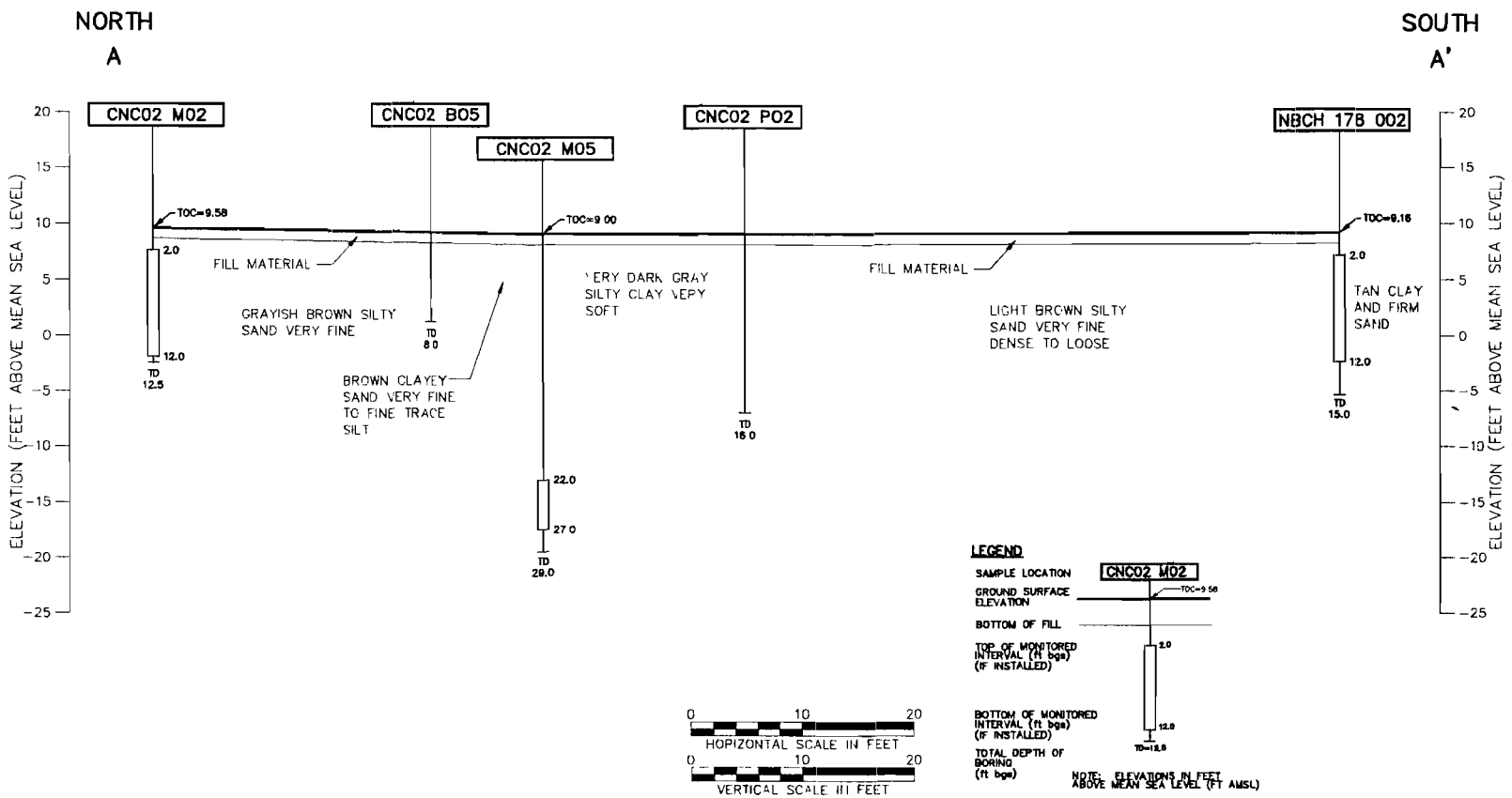

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 7/8/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION
A-A'
SITE 2 BUILDING NS--53
ZONE H CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO 7912
APPROVED BY DATE
APPROVED BY DATE
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REV. 0

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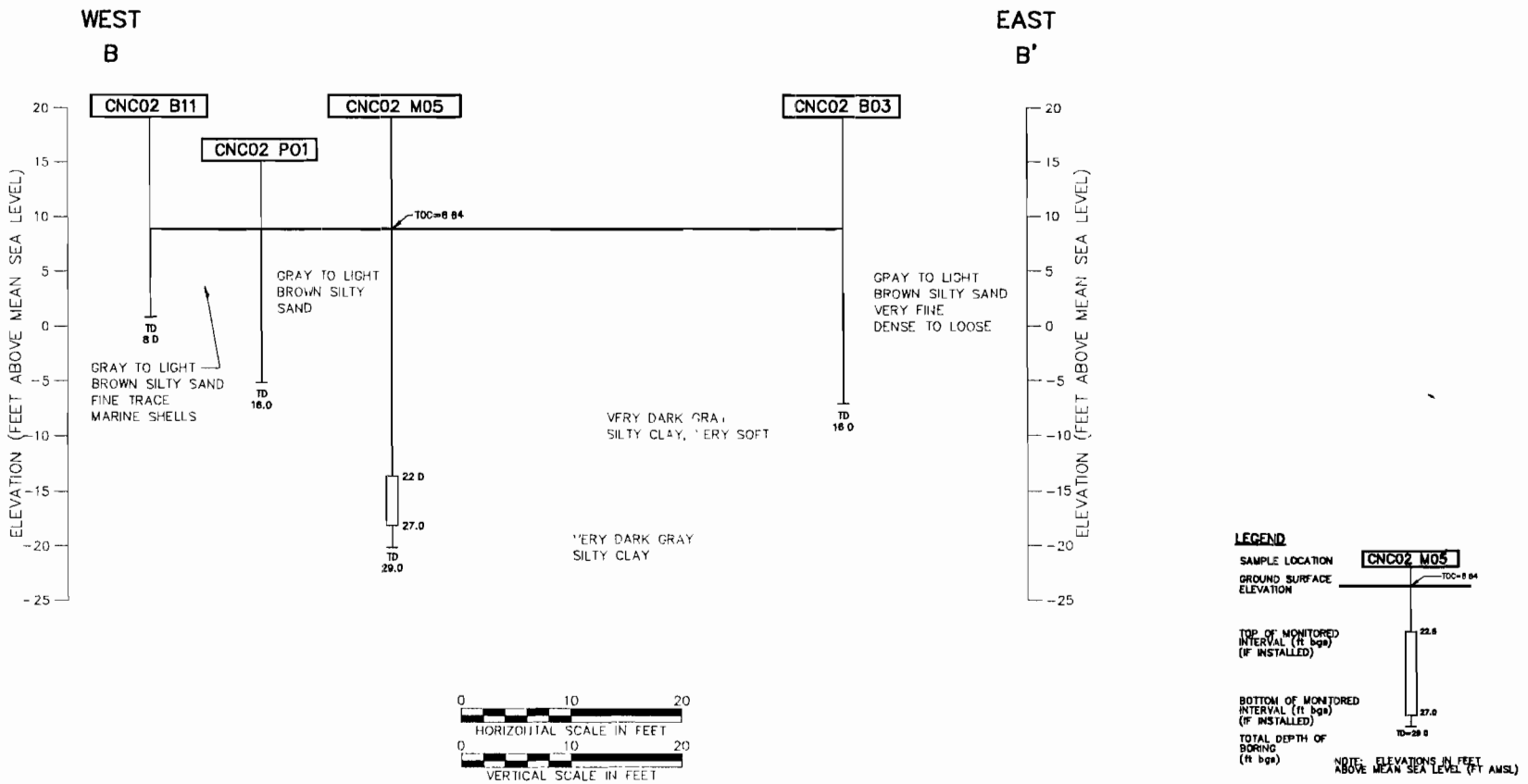

LEGEND

NOTE: ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT AMSL)

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 7/8/99
CHECKED BY DATE
COST/SCHED--AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION
B-B'
SITE 2 BUILDING NS-53
ZONE H CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 5
REV 0

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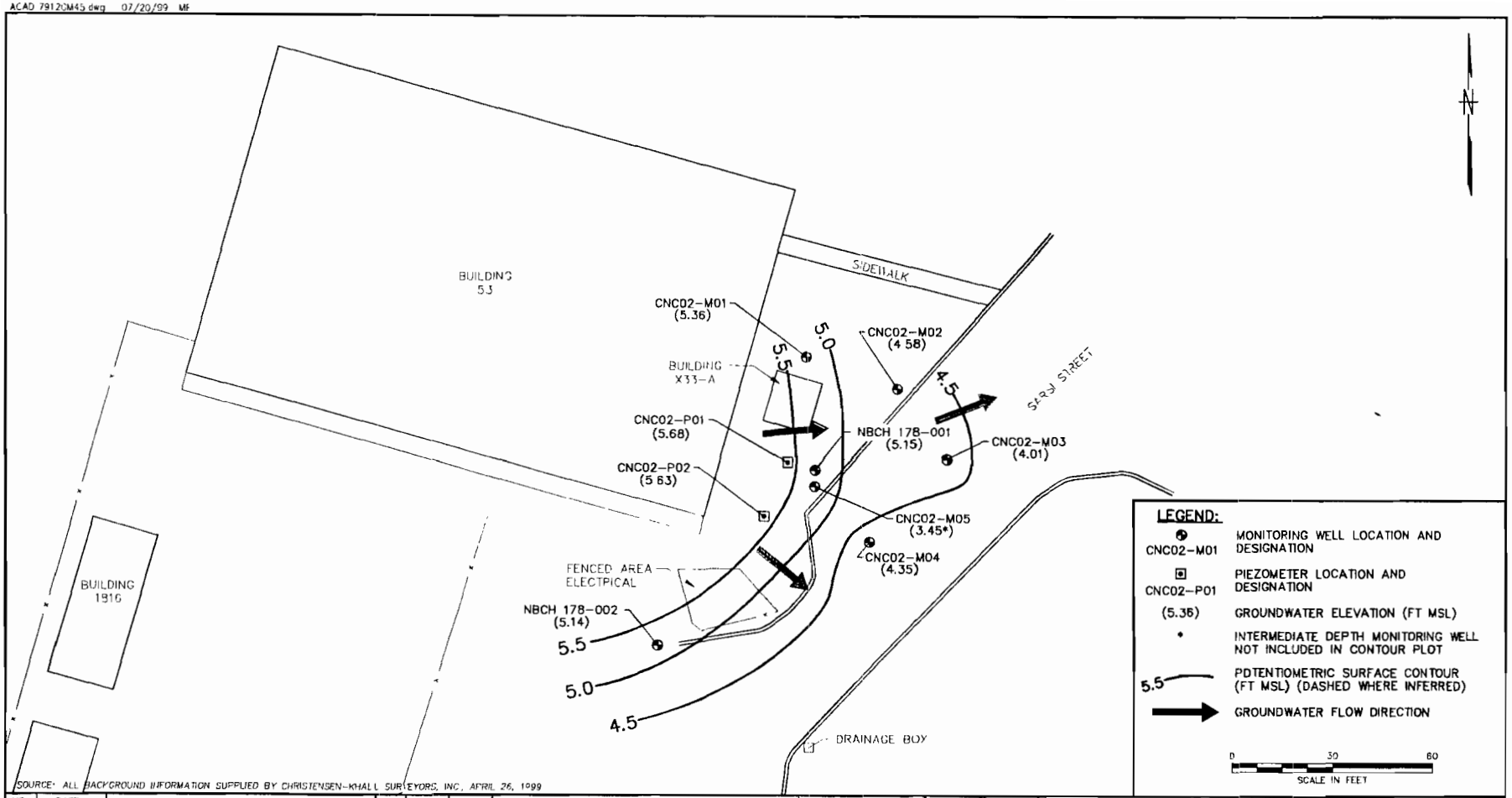

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CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GROUNDWATER POTENTIOMETRIC MAP
MARCH 7, 1999
SITE 2 BUILDING NS-53
ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO 7912
APPROVED BY DATE
APPROVED BY DATE
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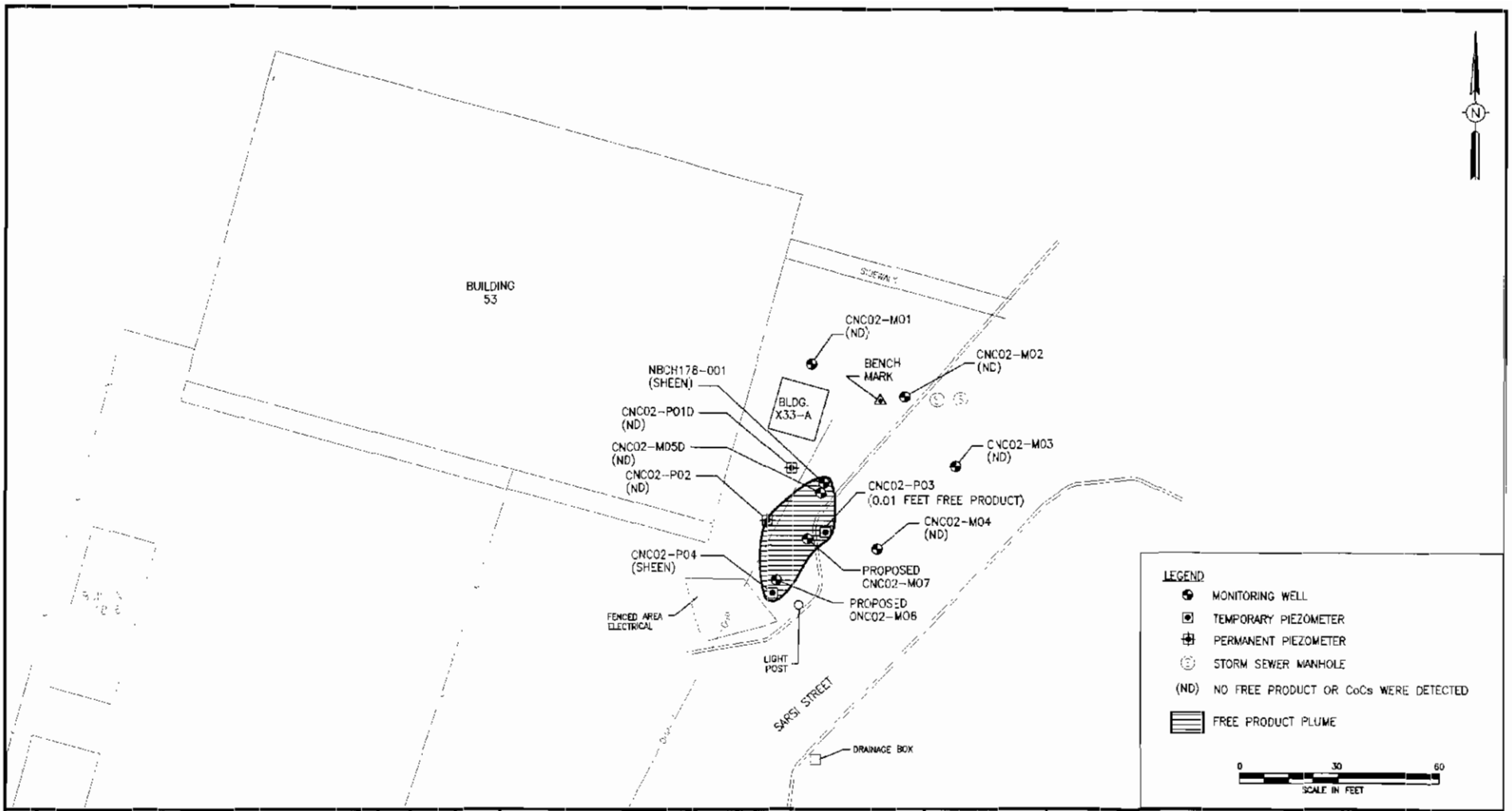

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

J.A. JONES

FREE PRODUCT PLUME, DECEMBER 1998-MARCH 1999
SITE 2, BUILDING NS-53, ZONE H
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

SCALE: AS NOTED
JOB NO. 093
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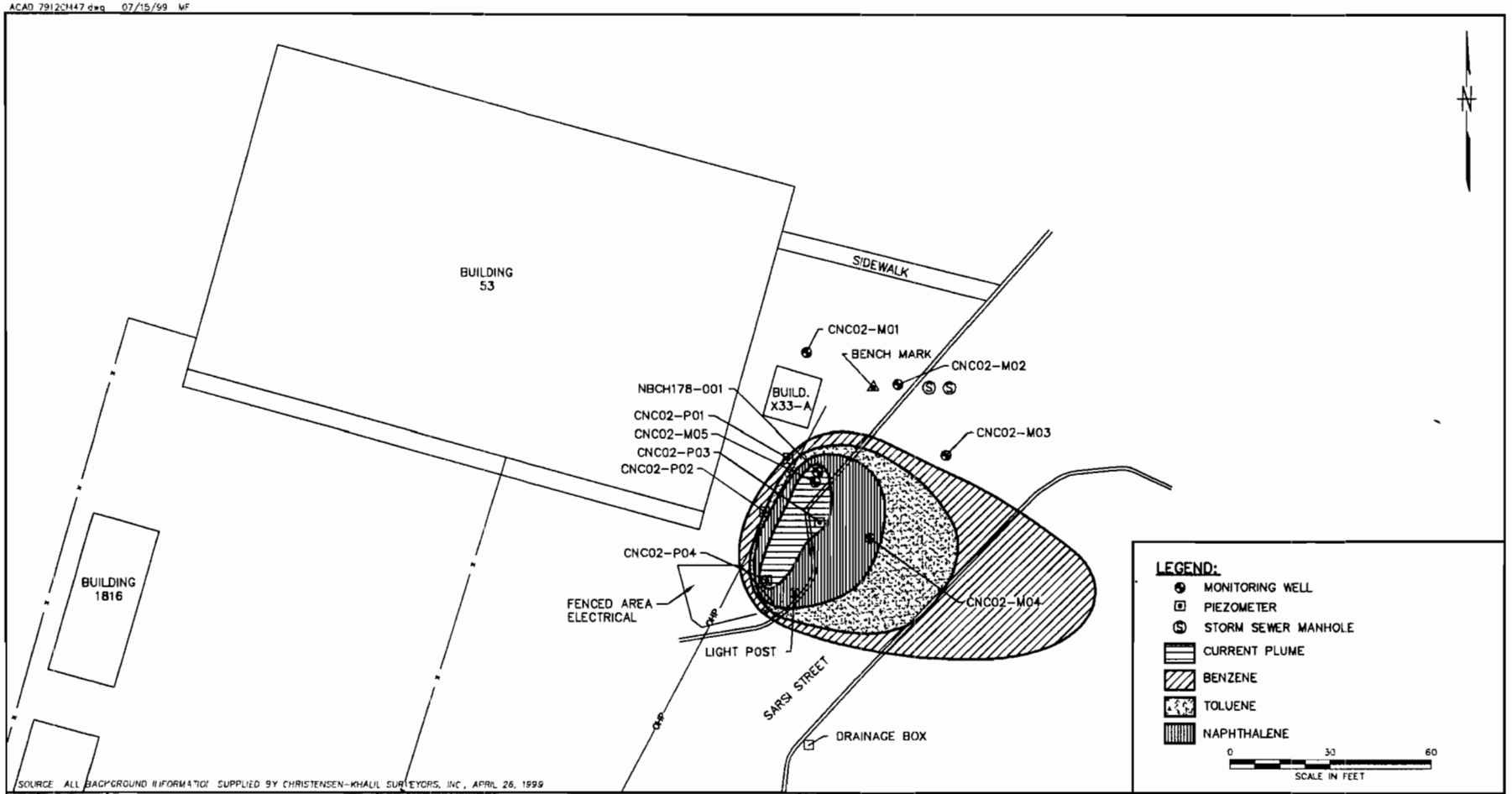

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DRAWN BY MF DATE 7/14/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

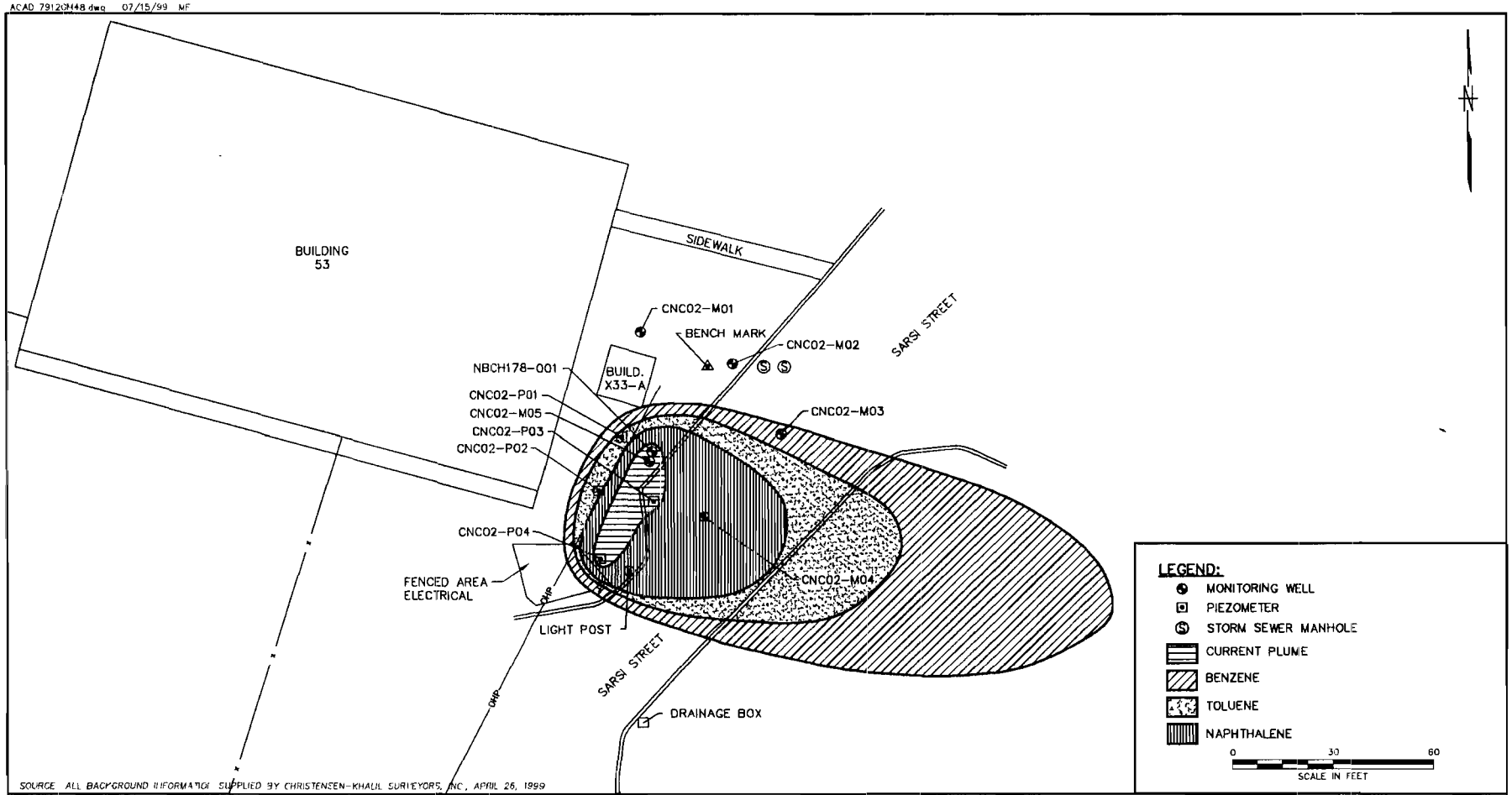
DEPARTMENT OF THE NAVY · NAVAL FACILITIES ENGINEERING COMMAND

PREDICTED 10 YEAR MIGRATION
SITE 2 BUILDING NS-53
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CONTRACT NO 7912
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 8
REV. 0

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

ACAD 7912GM48.dwg 07/15/99 MF



SOURCE ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC., APRIL 26, 1999

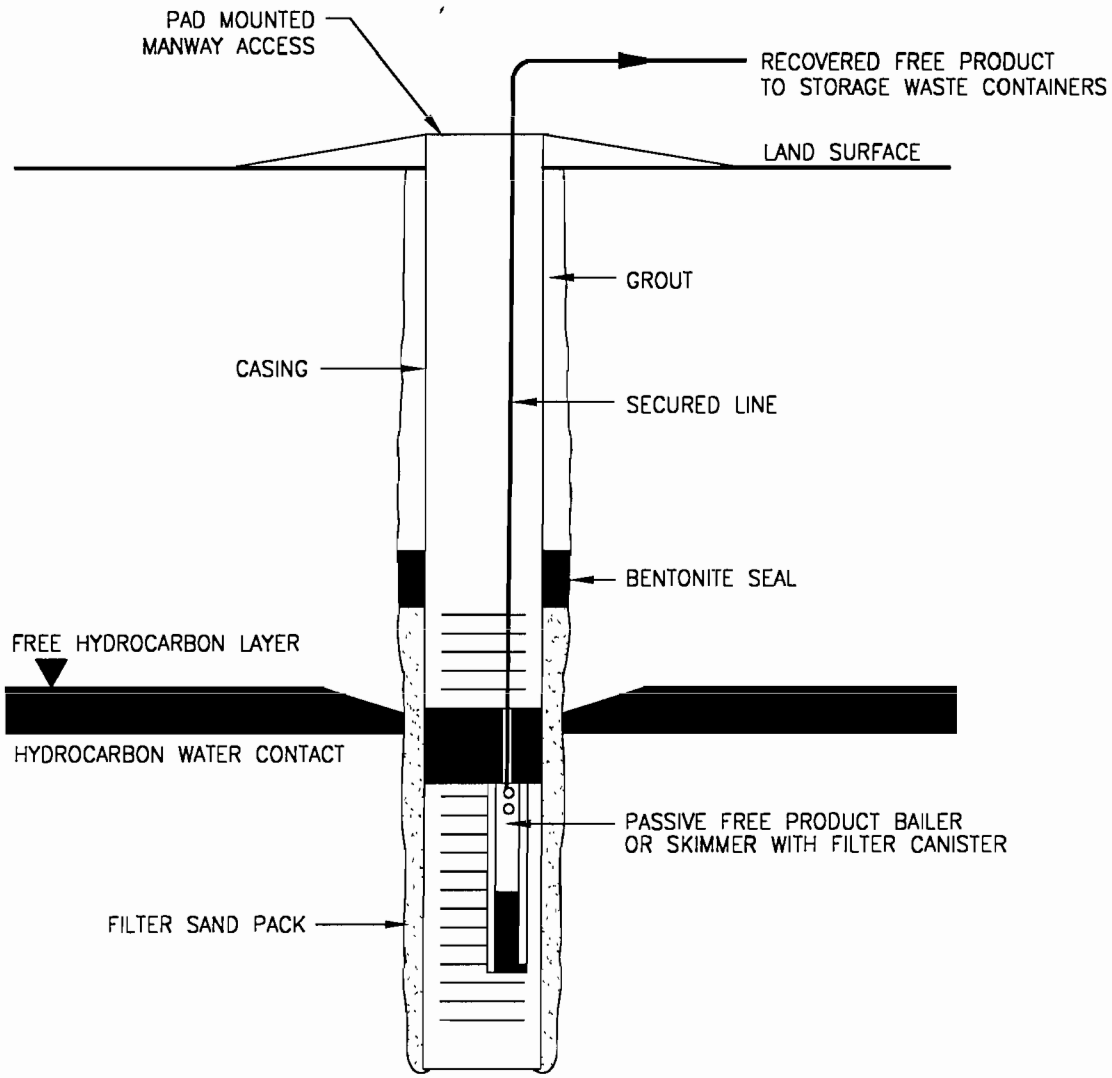
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 7/14/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

PREDICTED 20 YEAR MIGRATION
SITE 2 BUILDING NS-53
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 7912
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 9
REV. 0

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



J.A. JONES

PROPOSED FREE PRODUCT RECOVERY WELL DIAGRAM
SITE 2, BUILDING NS-53, ZONE H
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

SCALE: NONE

JOB NO. 093

DRAWING NO. FIGURE 10

APPENDIX A

REMEDIAL EQUIPMENT – PASSIVE SKIMMER

MAIN MENU

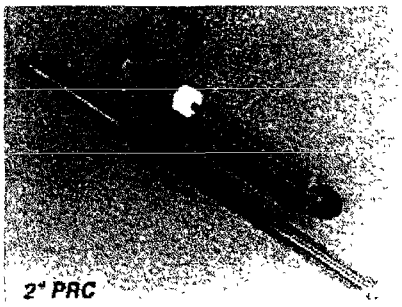
CATALOG INDEX BY ALPHABETICAL ORDER

CATALOG INDEX BY DEPARTMENT

For more info:
enviro@geneq.com

Hydrocarbon Recovery Canister

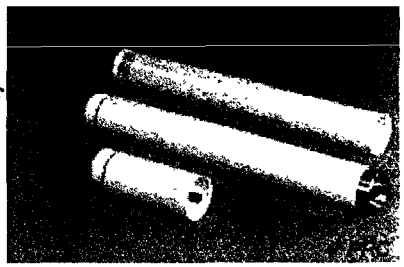
New, Revolutionary, Answer to your Hydrocarbon Recorvery Needs.



The PRC is a passive, floating skimmer device designed to separate and recover light hydrocarbons from the ground water. Incorporating Keck's original skimmer technology with a storage canister, the device will automatically collect floating product is evacuated from the device through a discharge valve at the bottom of the canister.

Featuring a hydrophobic filter buoy for product recovery without water, the PRC skimmer has a travel of 12" to compensate for water table fluctuation and well placement.

The PRC Recovery Canister is available for 2" or larger monitor wells. It requires no external means of power, is easily installed and can be installed at remote sites.



Specifications

- **Dimensions**
  - **Length :** 39"/99cm (4"/100mm canister), 50"/127cm (2"/50mm canister)
  - **O.D. :** 3.5"/90mm or 1.75"/44mm
  - **Weight :** 7 lbs./3.2kg (4"/100mm canister), 4 lbs./1.8kg (2"/50mm canister)
- **Recovery Canister Capacity**
  2"/50mm .5 liter transparent cylinder
  4"/100mm 1 liter standard, other capacities available; easily changed in the field.

KEPRC4-000	**PRC-94 Canister for 4" well**
KEPRC2-000	**PRC-94 Canister for 2" well**

APPENDIX A

REMEDIAL EQUIPMENT – PASSIVE SKIMMER

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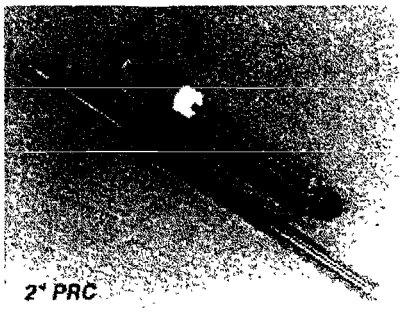

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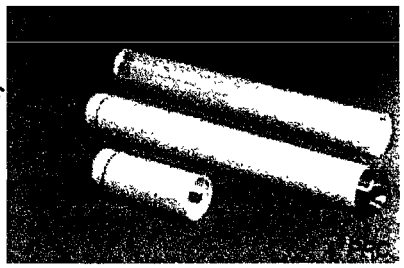

The PRC Recovery Canister is available for 2" or larger monitor wells. It requires no external means of power, is easily installed and can be installed at remote sites.

Specifications

- **Dimensions**
  - **Length :** 39"/99cm (4"/100mm canister), 50"/127cm (2"/50mm canister)
  - **O.D. :** 3.5"/90mm or 1.75"/44mm
  - **Weight :** 7 lbs./3.2kg (4"/100mm canister), 4 lbs./1.8kg (2"/50mm canister)
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CAT. NO.	DESCRIPTION
KEPRC4-000	**PRC-94 Canister for 4" well**
KEPRC2-000	**PRC-94 Canister for 2" well**