N61165.AR.004032
CNC CHARLESTON
5090.3a

CORRECTIVE ACTION PLAN FOR ZONE C SITE 32 BUILDING 54 SITE IDENTIFICATION NUMBER 17789 CNC CHARLESTON SC

9/1/2000

J A JONES ENVIRONMENTAL SERVICES

CORRECTIVE ACTION PLAN
FOR
ZONE C/ SITE 32 BUILDING 54

SITE IDENTIFICATION # 17789

Charleston Naval Complex
Charleston, South Carolina

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

Contract Number N62467-99-C-0960

September 2000

JA Jones Environmental Services

TRANSMITTAL FORM

Project:	Charleston Naval Shipyard		
DO Title:	Delivery Order 001	**DO Project Location:**	Charleston Naval Complex

Date: 21-Sep-00	**To:** Paul Bristol SCDHEC 2600 Bull Street Columbia , SC 29201-1708 803-898-3559	**From:** Brian R. Crawford J.A. Jones Environmental Services 2470 Mall Dr. Charleston, South Carolina 29406 (843) 746-8882
Contract Number :		
Delivery Order Number		
001		
File Number		
0		

JAJ Subcontract Number	**Subcontractor/Supplier/Manufacturer:**	**Transmitted for:**	
na		Approval/Comment	
JAJ P.O. Number		Final document	
na		Information	X
Change Order Number		As requested	X
na		Fabrication	
Transmittal Number		Field Use	
001-C001		Other	

Specification Section Number or Drawing	Qty	Description of Submittal	Date	Comments	Number of Copies
	1	Corrective Action Plan Site 32 Building 54	09/21/00		1

SENT		**GENERAL COMMENTS**
Enclosed	X	Original
Separate		
Fed Ex	X	
Mail		
Other		
Other		

CC: Project File Gary Foster Gabe Magwood Tony Hunt	**Signed:** BRC Brian R. Crawford, Engineer II

CORRECTIVE ACTION PLAN
FOR
ZONE C/ SITE 32-BUILDING 54

SITE IDENTIFICATION # 17789

Charleston Naval Complex
Charleston, South Carolina

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
Charleston, South Carolina 29406

Submitted by:
CH2M-JONES, LLC.
115 Perimeter Center Place NE
Suite 700
Atlanta, Georgia 30346-1278

J.A. JONES
ENVIRONMENTAL SERVICES

CH2MHILL

Contract Number: N62467-99-C-0960

September 2000

PREPARED BY:

9-19-00
Brian R. Crawford
Engineer II
CH2M-JONES, LLC.

APPROVED BY:

9-19-00
Jed A. Heames
Site Superintendent
CH2M-JONES, LLC.

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 7/21/00

South Carolina Registration No. 14,220

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER RICHARD R. GARCIA

SOUTH CAROLINA
J A. JONES
MANAGEMENT
SERVICES, INC.
No. C02036
CERTIFICATE OF AUTHORIZATION

TABLE OF CONTENTS

Section **Page**

ACRONYMS ..... **iii**

1.0 INTRODUCTION **1-1**
1.1 GENRAL SITE DESCRIPTION 1-1
1.2 OBJECTIVE 1-1
2.0 RECEPTOR SURVEY **2-1**
2.1 FATE AND TRANSPORT MODELING 2-1
2.2 SOIL LEACHABILITY SSTL 2-2
3.0 PROPOSED CORRECTIVE ACTION **3-1**
4.0 MONITORING WELL INSTALLATON AND ABANDONMENT **4-1**
4-1 MONITORING WELL INSTALLATION 4-1
4-2 MONITORING WELL ABANDONMENT 4-1
4-3 SURVEYING 4-1
4-4 EQUIPMENT DECONTAMINATION 4-1
5.0 PROPOSED PROGRAM **5-1**
5-1 SOIL BORING SCHEDULE 5-1
5-2 ANALYTICAL PARAMETERS 5-2
5-3 FIELD MEASUREMENTS 5-2
5-4 GROUNDWATER LEVEL MEASUREMENTS 5-2
5-5 SAMPLE HANDLING 5-2
5-6 SAMPLE PACKING AND SHIPPING 5-2
5-7 QUALITY CHECK 5-3
5-8 FIELD QA/QC 5-3
5-9 CONTROL LIMITS 5-3
5-10 RECORDKEEPING 5-4
5-11 SITE MANAGEMENT AND BASE SUPPORT 5-4

REFERENCES R-1

6.0 APPENDICES

APPENDIX A.....FIELD FORMS

APPENDIX B.....UNDERGROUND STORAGE TANK ASSESSMENT REPORT

APPENDIX C.....GEOLOGIC BORING LOGS

7.0 TABLES

TABLE 1.....GROUNDWATER ELEVATIONS

TABLE 2.....GROUNDWATER FIELD MEASUREMENTS

TABLE 3.....GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS

TABLE 4.....OVA SOIL SCREENING

TABLE 5.....MOBILE LAB SCREENING RESULTS FOR SOIL

TABLE 6.....MOBILE LAB SCREENING RESULTS FOR GROUNDWATER

TABLE 7.....FIX-BASE LAB RESULTS FOR COCs IN SOIL

TABLE 8.....FIX-BASED LAB RESULTS FOR COCs IN GROUNDWATER

TABLE 9.....COMPARISON OF MAXIMUM CONCENTRATIONS TO RBSLs

TABLE 10.....EXPOSURE PATHWAY ASSESSMENT-CURRENT LAND USE

TABLE 11.....EXPOSURE PATHWAYASSESSMENT-FUTURE LAND USE

8.0 FIGURES

FIG 1.....SITE LOCATION MAPS

FIG 2.....SITE VICINITY MAP

FIG 3.....SITE MAP AND SAMPLING LOCATIONS OF UST S

FIG 4.....CROSS SECTION A-A MAP

FIG 5.....CROSS SECTION B-B MAP

FIG 6.....GROUNDWATER POTENTIOMETERIC MAP

FIG 7.....ETHYLBENZENE SOIL CONCENTRATION MAP

FIG 8.....TOTAL XYLENES SOIL CONCENTRATION MAP

FIG 9.....NAPHTHALENE SOIL CONCENTRATION MAP

FIG 10.....PROPOSED EXCAVATION AREA MAP

ACRONYMS

bls	below land surface
CAP	Corrective Action Plan
CNC	Charleston Naval Complex
COC	Chemical of Concern
EISOPQAM	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual
EPA	Environmental Protection Agency
mg/kg	microgram per kilogram
mg/L	microgram per liter
OVA	Organic Vapor Analyzer
QA	Quality Assurance
QC	Quality Control
RBSL	Risk-Based Screening Level
RDA	Redevelopment Authority
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSTL	Site-Specific Target Level
TTNUS	Tetra Tech NUS
UST	Underground Storage Tank

1.0 INTRODUCTION

This Corrective Action Plan (CAP) has been prepared by CH2M-JONES, LLC. The plan is designed for Zone C/ Site 32-Building 54; located at the Charleston Naval Complex (CNC), Charleston, South Carolina.

The South Carolina Department of Health and Environmental Control (SCDHEC) has designated this site as Identification Number: 17789. This CAP provides methods to further evaluate the applicability of active remediation by removing contaminated soils around the former Underground Storage Tank (UST), and continuing intrinsic remediation and monitoring well abandonment as a corrective action in accordance with SCDHEC Corrective Action Guidance, June 1997.

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 as shown in 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 as shown in Figure 1. (Tetra Tech, NUS [TTNUS], Rapid Assessment [RA] Report for Site 32, Building 54, January 2000).

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.

Tetra Tech NUS, Inc. (TTNUS) completed a Rapid Assessment (RA) for Site 32, which contained an UST system. The UST system supplied diesel fuel to a generator, which powered water pumps at the former pump house (Building 54) at Charleston Naval Complex Zone C, in North Charleston, South Carolina.

1.2 Objective

This CAP presents a plan to actively excavate or (dig and haul) Site 32. Details for the abandonment of monitoring wells at this site are also included in this plan.

2.0 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. Specific information concerning the depth of utilities bls is currently unavailable, however, utilities at this site generally are between 2 to 6 feet (ft) below land surface (bls). The following utility receptors were located:

Utility	On-Site or Distance/ Direction from Site	Depth to Utility
Sanitary Sewer	15 ft west and 20 ft south of the former UST Building 54	2-6 ft bls
Water	South side of Building 54	2-6 ft bls
Electrical	Entering all sides of the former Building 54.	2-6 ft bls

According to the RA report completed by TTNUS, 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 are 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 Building 54 is Noisette Creek located approximately 2,000 feet to the north (TTNUS 2000).

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 (TTNUS, 2000).

Exposure pathway analysis for current land use and future land use can be found in Tables 10 and 11 in Section 7.0.

2.1 Fate and Transport Modeling

TTNUS did not complete Fate and Transport modeling because the analytical results for groundwater never exceeded the SCDHEC Risk Based Screening Levels (RBSLs).

2.2 Soil Leaching Site Specific Target Level

SSTLs were calculated for ethylbenzene and naphthalene concentrations leaching from subsurface soil to groundwater using SCDHEC Soil Leachability Model and Selected Minimum RBSLs. Leachability modeling for the Polynuclear Aeromatic hydrocarbons (PAH) was considered, but not performed. Instead, naphthalene was used for modeling purposes because of its similarity to PAHs (TTNUS 2000).

Chemical of Concern	Concentration in CNC32-B03/32SLB020506 (mg/kg)	Soil Leaching SSTL (mg/kg)
Ethylbenzene	1.8	25
Naphthalene	42	12

The soil SSTL for ethylbenzene is 25 mg/kg, which is well above the maximum ethylbenzene concentration detected (1.8 mg/kg). The soil leaching SSTL calculated for naphthalene is 12 mg/kg. This is less than the maximum naphthalene concentration detected in subsurface soil sample at 42 mg/kg, which indicates naphthalene will leach into the groundwater at concentrations above the RBSL for a construction worker. Since the naphthalene was detected at concentrations where calculations indicate it will leach to the groundwater, it is assumed the PAH constituents have the potential to leach into the groundwater. (TTNUS 2000).

3.0 PROPOSED CORRECTIVE ACTION

Based on the results of the RA modeling, a dig and haul approach will be performed at this site to remove the COCs. Because no contaminates have been detected in groundwater sampling, no additional groundwater sampling will be conducted at this time. Additional soil samples will be collected prior to excavation in order to establish the contaminated area. After defining the clean boundaries, soils from approximately 2 to 8 ft bls at the former UST pit will be excavated as recommended in the TTNUS RA report. The proposed active measures and monitoring program is described in detail in Sections 4.0 and 5.0 of this plan.

4.0 MONITORING WELL INSTALLATION AND ABANDONMENT

4.1 Monitoring Well Installation

Because no CoCs were found in any of the monitoring wells, no additional monitoring wells will be added to this site at this time.

4.2 Monitoring Well Abandonment

A total of six monitoring wells are located at Site 32. Two of the six monitoring wells are in the proposed excavation area. The two monitoring wells will be abandoned prior to excavation. The remaining four monitoring wells will be abandoned upon receiving approval for no further action. All six monitoring 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.

4.3 Surveying

Although no new monitoring wells will be installed at this site, additional surveying of any new boring locations will be conducted.

4.4 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 Environmental Protection Agencies (EPA) " Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM).

5.0 PROPOSED PROGRAM

5.1 Soil Boring Schedule

Because no COCs were found in any of the monitoring wells at the former Building 54 site, it has been determined that the COCs have not reached the groundwater, therefore, no groundwater monitoring plan will be used at this site. For groundwater flow see Figure 6, Section 8.0.

Soil borings will be used in able to define the boundaries of the excavation area. The analytical data acquired by TTNUS for soil borings, CNC32-B01, CNC32-B04, and CNC32-B03 as shown in Table 7, Section 7.0, will be used as an excavation line of establishment on the southern end of the proposed excavation (see figure 9 in Section 8.0 for boring locations). The northern end boundaries will be established by adding additional borings to the area. Initially a total of two soil borings with two-foot intervals will be collected prior to any excavation. The soil samples will be collected using hand-auguring methods. The intent of the soil samples will be to establish the extent of the COC contaminated area. The first soil boring samples will be taken from 2-4 ft bls, 4-6 ft bls, and 6-8 ft bls from boring CNC-32 SB010 which, will be located approximately 10 ft north-northwest of boring SB-02 and the second soil boring samples will be taken from 2-4 ft bls, 4-6 ft bls, and 6-8 ft bls from boring CNC32-SB011 which, will be located approximately 10 ft to the west of soil boring SB-02 (Figure 10, Section 8.0 will be submitted to this plan after establishing the area to be excavated). In the event that the first two soil borings analytical data are above the RBSLs, two additional soil boring samples will be acquired approximately 5 additional feet beyond the first set of northern borings. This process will be used until soil borings with analytical data indicating no contamination are found.

Sampling date	Soil Borings Sampled	Laboratory Analytical
Initial sampling event prior to removal of soil	CNC-32: SB-010, SB-011	Naphthalene 8260 PAHs 8270

Schedule:

1. Establish the contaminated soil area by sampling soil borings CNC32-SB010 and CNC32-SB011. Soil borings CNC32-B01, CNC32-B03, and CNC32-B04 have all been sampled and determined not to be contaminated (see Table 7 in Section 7.0).
2. Abandon monitoring wells CNC32-MW01 and CNC32-MW06D.
3. Submit Figure 10 to this plan showing area to be excavated, soil borings, and analytical results.
4. Excavate contaminated soil to a depth of approximately 6-7 ft bls. Unless the additional analytical data indicates contamination in the top intervals of the soil, the soil will be separated and reused for fill material.
5. Transport contaminated soil to a permitted subtitle D landfill.
6. Backfill excavated area with clean fill dirt.

7. Abandon monitoring wells CNC32-MW02, CNC32-MW03, CNC32-MW04, and CNC32-MW05 upon receiving no further action for Site 32.

- **Groundwater Sampling**

No Groundwater sampling proposed.
Prior to any groundwater sampling, each well will be measured for water levels and total depth and each well will be purged in accordance the EPA EISOPQAM.

5.2 Analytical Parameters

The following constituents will be analyzed for each soil sample prior to any excavation:

- Naphthalene using method 8260.
- PAHs using method 8270.

The following parameters will be analyzed in order to evaluate the effectiveness of intrinsic remediation:
N/A

5.3 Field Measurements

The following parameters will be sampled in the field:
N/A

5.4 Groundwater Level Measurements

N/A

5.5 Sample Handling

Sample handling will be conducted in accordance the following references:

EPA EISOPQAM (EPA May, 1996)
Comprehensive Sampling and Analysis Plan, RCRA Facility Investigation, June 30, 1996.

5.6 Sample Packing and Shipping

The following forms will be completed to complete the packing/shipping process:

- Sample labels
  Chain-of-custody labels
- Appropriate labels applied to shipping coolers
  Chain-of-custody forms
  Federal express air bill

5.7 Quality Control

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 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.

5.8 Field QA/QC

More information on field QC can be found in section 5.6.

5.9 Control Limits

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.

5.10 Record keeping

In addition to records kept in logbooks, forms will be kept on log sheets for soil and groundwater. See Appendix A.

5.11 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
   2155 Eagle Drive
   North Charleston, SC 29406
   (843) 820-7307

3. SCDHEC point of contact
   Paul Bristol
   South Carolina Department of Health and Environmental Control
   2600 Bull Street
   Columbia, SC 29201
   (843) 898-3559

REFERENCES

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

Tetra Tech NUS, Inc.; 2000 Standard Limited Assessment for Site 32 (Building 54), Charleston, South Carolina.

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

United States Environmental Protection Agency. 1988. EPA Users Guide to Contract Laboratory Program.

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

Monitoring Well Data
Contract Task Order No.

Well Identification	Date/Time	Total Depth of Well	Depth to Product	Depth to Water	pH	Temperature (°C)	Conductivity (mv/cm)	Dissolved O_2 (mg/l)	Turbidity (NTU)	Sample ID

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

Commissioner: Douglas E. Bryant

Board: John H. Burriss, Chairman
William M. Hull, Jr. MD Vice Chairman
Roger Leaks, Jr. Secretary

Richard E. Jabbour, DDS
Cyndi C. Mosteller
Brian K. Smith
Rodney L. Grandy

Promoting Health Protecting the Environment

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

Re: Assessment Report dated October 17, 1996
Charleston Naval Base Building # 54 (Site Identification # 12094)
Charleston County

Date: December 31, 1996

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 system. The results presented indicate elevated levels of polynuclear aromatic hydrocarbons (PAH) were detected in areas of the tank pit and from groundwater grab samples. The results exceed the levels proposed in the Soil Corrective Action Plan (dated July 18, 1996) and 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

recycled paper

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. #: 12094, Registered but not regulated

Facility Name: Charleston Naval Base Complex, BLDG 54

Street Address: South Hobson Avenue

City: North Charleston, 29405-2413 County: Charleston

III CLOSURE INFORMATION

Closure Started: 10 June 96 Closure Completed: 12 June 96

Number of USTs Closed: 1

[illegible] [illegible]
Consultant UST Removal Contractor

[illegible]

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 immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

[illegible]

Signature

		550 gal
C.	Age.....	
	Depth (ft.) To Base of Tank	6.5'
G.	Spill Prevention Equipment Y/N.....	
I	Visible Corrosion or Pitting Y/N	Y
	Visible Leaks Y/N.....	

The UST was removed from the ground, drained, and cleaned It was then cut up

UST

up. See 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.....	* 1'					
C.	Number of Dispensers.....	1					
D.	Type of System P/S.....	S					
E.	Was Piping Removed from the Ground? Y/N....	Y					
F.	Visible Corrosion or Pitting Y/N.....	N					
G.	Visible Holes Y/N.....	N					
H.	Age.....	1967					

*UST BLDG 54 was located 1' from Bldg 54. It provided diesel fuel for fresh water pumps.

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

Piping was corroded, but sound.

VII. BRIEF SITE DESCRIPTION AND HISTORY

Bldg 54 of the Charleston Naval Base is a former fresh water pumphouse for the base water system. UST BLDG 54 was a registered but unregulated tank which provided diesel fuel for the diesel powered pumps. The tank was made of steel and installed in 1967.

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)? 5 1/2', center of excavation	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? 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 0075-1	East end of tank.	Soil	4'	6/12/96 1300	R. Atkins	Not Taken
SPORT 0075-2	West end of tank.	Soil	4'	6/12/96 1300	R. Atkins	Not Taken
SPORT 0075-3	Center of excavation.	Water	5.5'	6/12/96 1300	R. Atkins	Not Taken
SPORT 0075-4	Center of excavation (40ml vials)	Water	5.5'	6/12/96 1300	R. Atkins	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 BLDG 54 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
Soil Sample	UST54-1	=	SPORT -0075-1
Soil Sample	UST54-2	=	SPORT -0075-2
Ground Water Sample	UST54-3	=	SPORT -0075-3
Ground Water Sample	UST54-4	=	SPORT -0075-4

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 where the ends of the tanks had rested. Ground water samples were taken from the bottom center of the excavation.

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? 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? [*electricity, gas, & water] 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.		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, 2, and 3
Photographs 1- 5

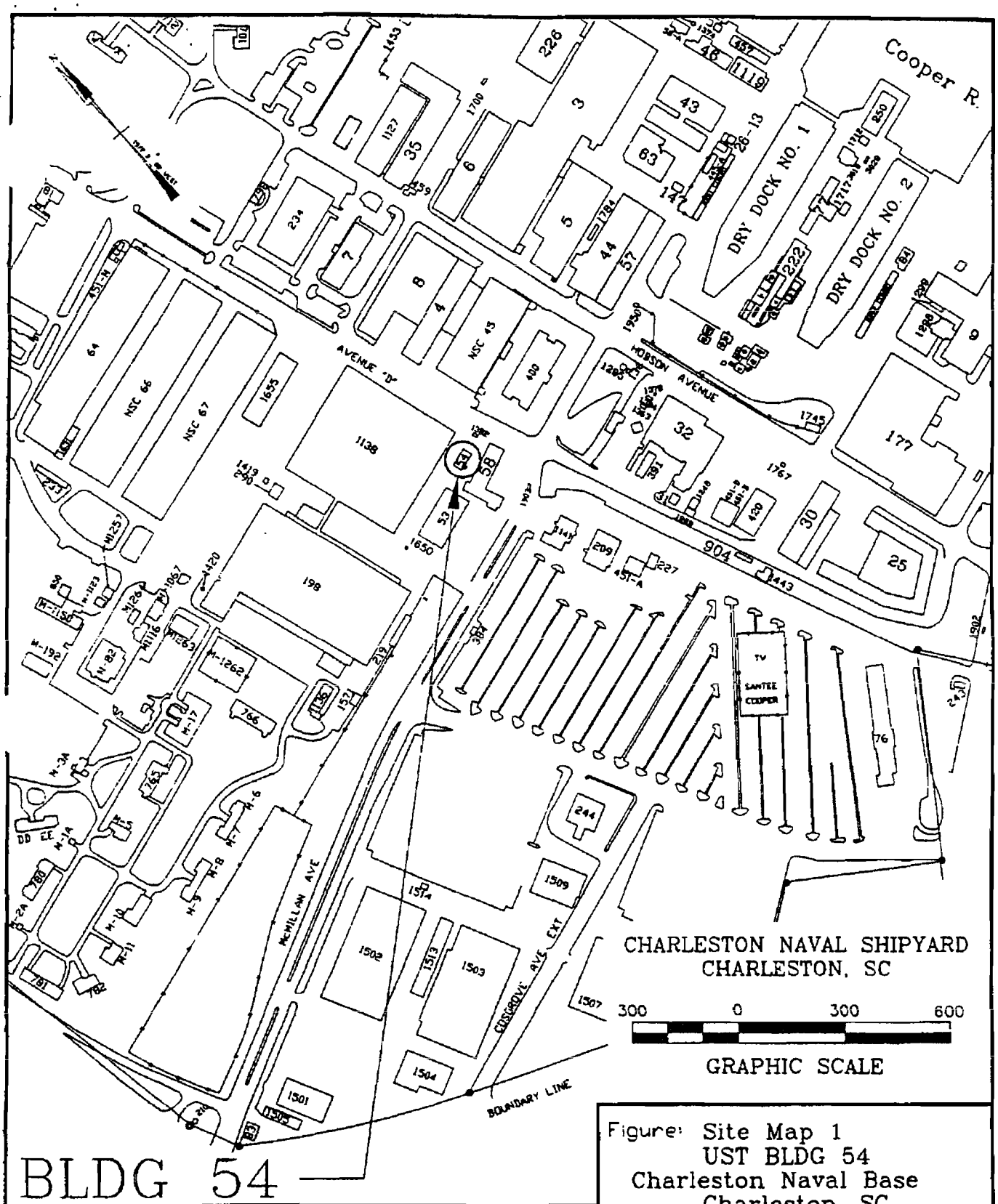
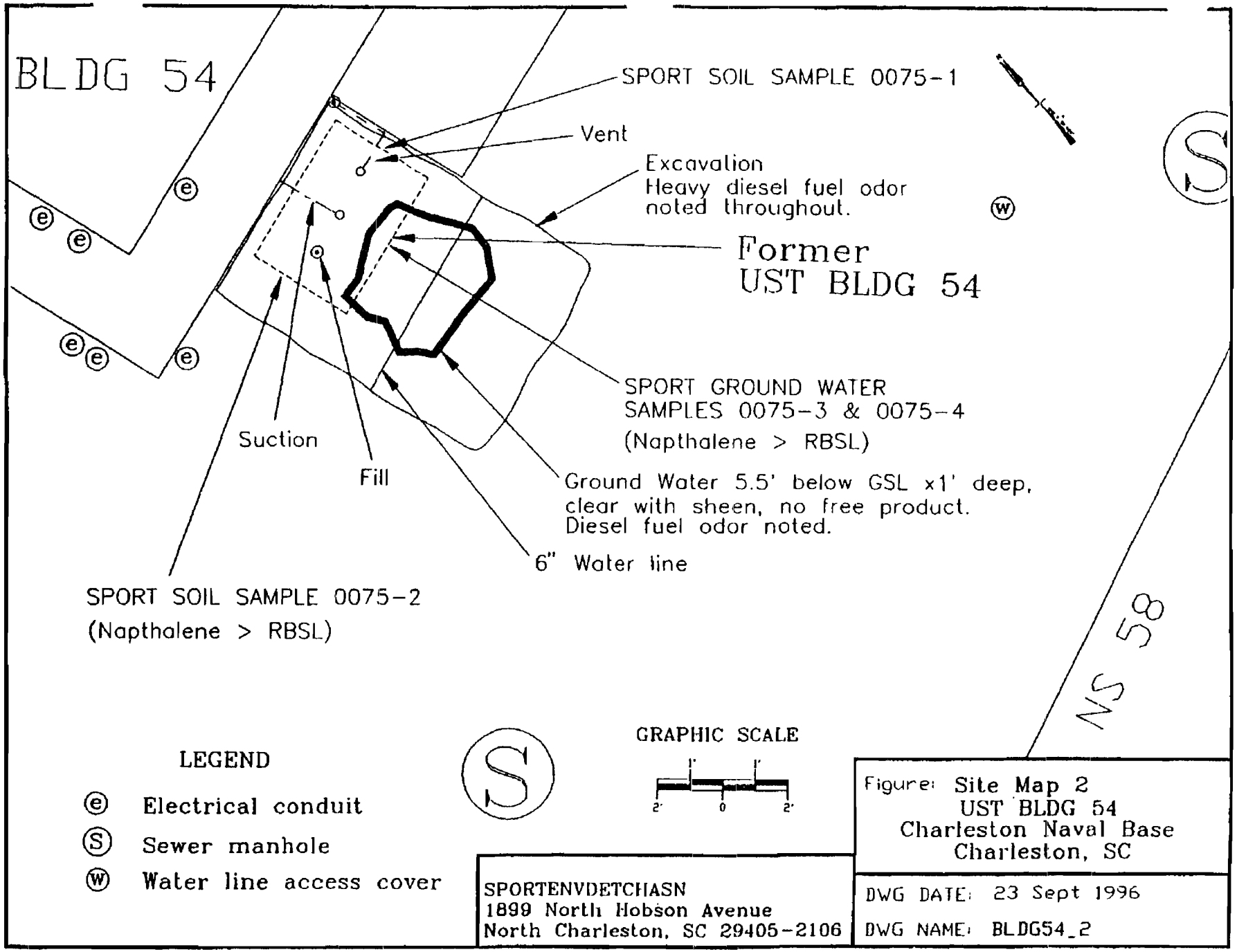


Figure: Site Map 1
UST BLDG 54
Charleston Naval Base
Charleston, SC

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

DWG DATE: 18 Sept 1996

DWG NAME: BLDG54_1


BLDG 54
SPORT SOIL SAMPLE 0075-1
Vent
Excavation
Heavy diesel fuel odor
noted throughout.
Former
UST BLDG 54
SPORT GROUND WATER
SAMPLES 0075-3 & 0075-4
(Napthalene > RBSL)
Suction
Fill
Ground Water 5.5' below GSL x1' deep,
clear with sheen, no free product.
Diesel fuel odor noted.
6" Water line
SPORT SOIL SAMPLE 0075-2
(Napthalene > RBSL)
NS 58
LEGEND
Electrical conduit
Sewer manhole
Water line access cover
GRAPHIC SCALE
2'
0
2'
SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106
Figure: Site Map 2
UST BLDG 54
Charleston Naval Base
Charleston, SC
DWG DATE: 23 Sept 1996
DWG NAME: BLDG54_2

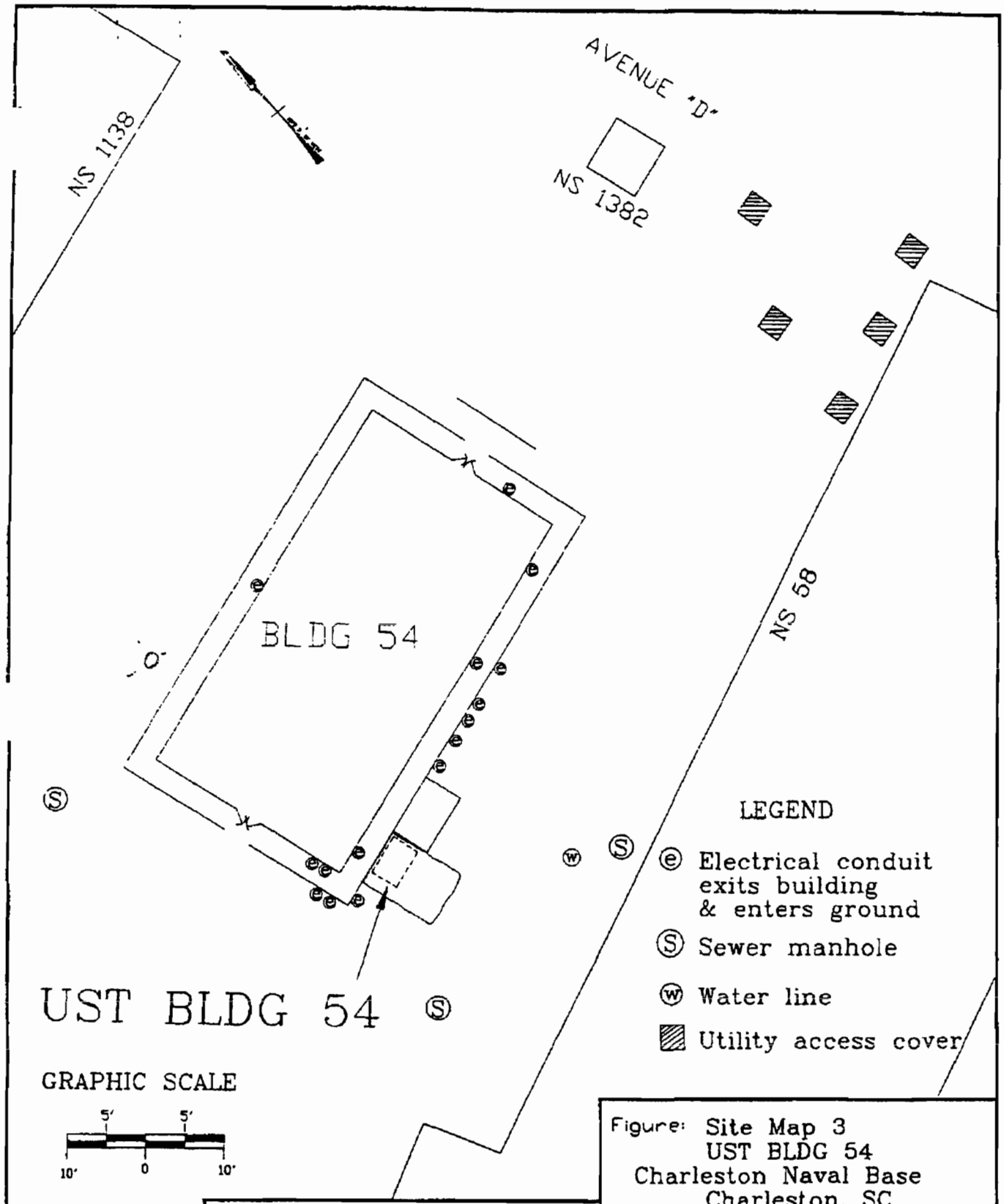


Figure: Site Map 3
UST BLDG 54
Charleston Naval Base
Charleston, SC

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

DWG DATE: 18 Sept 1996

DWG NAME: BLDG54_3

UST BLDG 54

Photo 1: Prior to removal. Suction line is being indicated by shovel.

Photo 2: Removal in progress.

UST BLDG 54

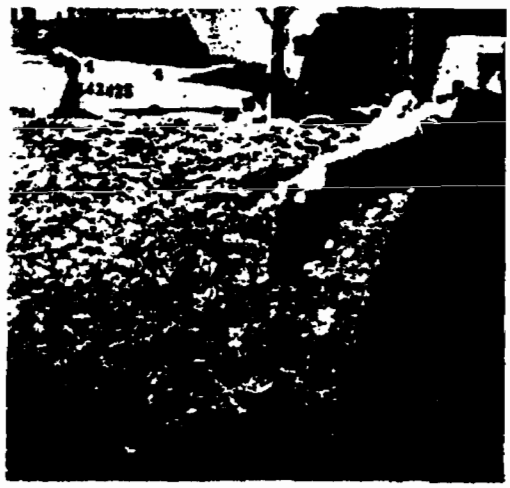


Photo 3: Quarter-inch hole is being indicated.

Photo 4: A second 1/4 inch hole is being indicated.

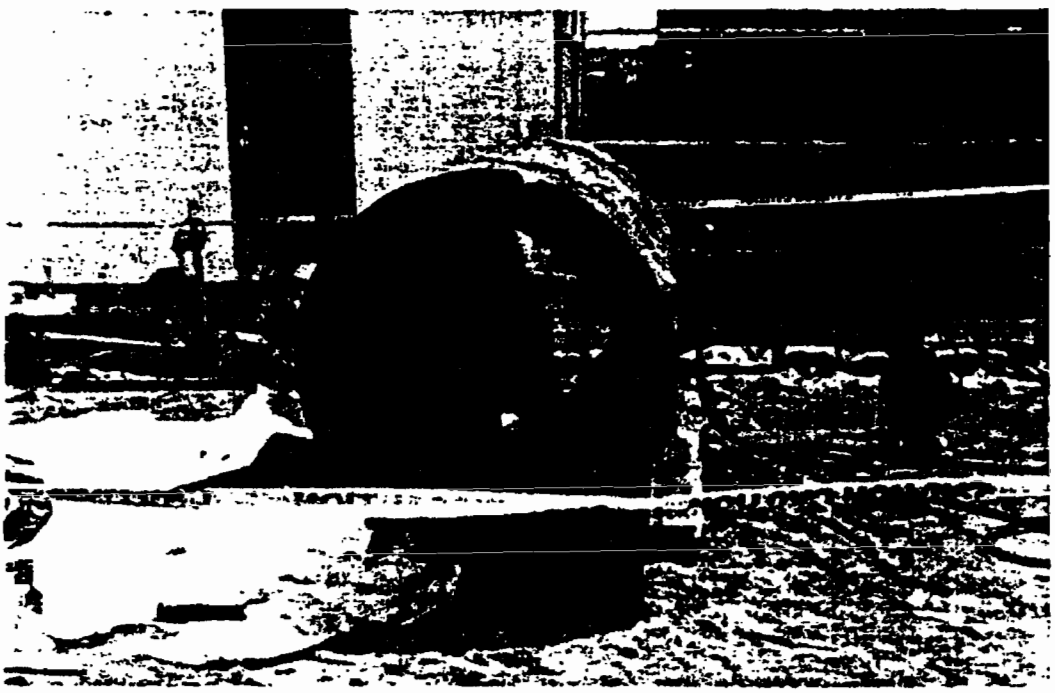


Photo 5: UST BLDG 54 ends cut open for steam cleaning.

BORING LOG

Page ___ of ___

PROJECT NAME: CNC site 32 BORING NUMBER: CNC32-MW06D
PROJECT NUMBER: N0164 Bldg 54 DATE: 6/22/99
DRILLING COMPANY: Custom Drilling GEOLOGIST: Marty Ruf
DRILLING RIG: DRILLER: Custom Drilling (Rod)

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 Classification Y/N or Rock Hardness	Color	Material Description (Soil Classification)	USCS*	Remarks	PID/FID Reading (ppm): Background	Drilling Area	Breathing Zone	Borehole
#1	24'	6/6"			Firm		Sandy silt vf grain		well sorted				
		4/6"	2'/2'				Some shell hash		0.0 PPM				
	↓	8/6"					Pale olive green						
	26'	10/6"					No odor						
							well sorted						
							damp						
#2	26'	4/6"			Firm		Sandy silt to silt						
		4/6"					vf grain, some shell hash						
		8/6"					Pale olive green, well sorted		0.0 PPM				
					Firm		silt, some shell hash						
	28'	7/6"					Pale olive green						
							No odor						
							damp						
#3	28'	9/6"			Firm		Silt w/trace very fine sand						
		10/6"					some shell hash						
							Pale olive green (very wet 8")						
	↓	14/6"					well sorted						
							No odor						
	30'	19/6"					damp to wet						
					Firm		slightly silty clay						
							Pale olive green, No odor						
#4	30'	4					Some shell hash						
		8			Firm	dive	very tight						
	↓	11					clay, olive color						
							trace shell hash						
	32	12					cohesive						
							(plastic)						

black specs observed throughout (phosphate?)

* 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):

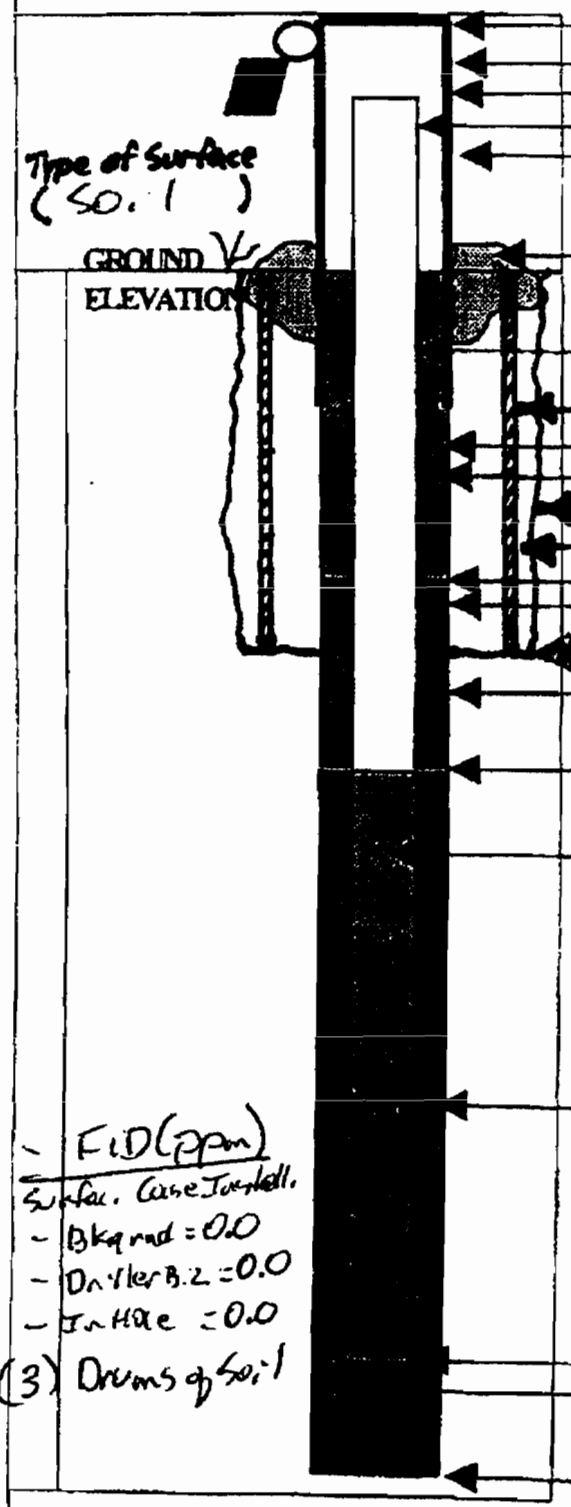
Converted to Well: Yes ____ No ____ Well I.D. #: ____

BORING NO: CNC32 MW06D

OVERBURDEN MONITORING WELL SHEET

PROJECT Chas. Naval Complex	LOCATION: S. to 32 / B&C	DRILLER Custom Drilling
PROJECT NO. N0164	BORING CNC32-MW06D	METHOD: [redacted] 8.25 HSA
ELEVATION	DATE 6/30/99	DRILLING Darrell Martin
FIELD GEOLOGIST Mark Darrington		DEVELOPMENT: [redacted]

Boring Methods: Surface Casing: 8.25 HSA / Inner Casing



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.:
TYPE OF RISER PIPE:
Type of Surface Case (S.C.) PVC / Sch. 40 / Dia. 6in.
BOREHOLE DIAMETER:
TYPE OF SEAL: grout
Bore hole Dia. 12.25 - in
Type of S.C. Seal Portland Cement Type I
ELEVATION / DEPTH OF SEAL: 16'TO
TYPE OS SEAL: 30/65
Depth of S.C. 20.0'
DEPTH TOP OF SAND PACK: 18'
ELEVATION / DEPTH TOP OF SCREEN: 24.0'
TYPE OF SCREEN: 20
SLOT SIZE X LENGTH: 10 slot 5'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: 20/30 sand
ELEVATION / DEPTHBOTTOM OF SCREEN: 25'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 32'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 32'

- FID (ppm)
Surface Case Installed.
- Bkgrnd = 0.0
- Driller B.Z. = 0.0
- In Hole = 0.0

SC. (3) Drums of Soil
6/20/99

BORING LOG

PROJECT NAME: Site 32 Bldg 54
PROJECT NUMBER: N0164 ZZnc C
DRILLING COMPANY: J Hewitt
DRILLING RIG: Geoprobe
BORING NUMBER: CNC32-B01
DATE: 5/15/99
GEOLOGIST: BDH
DRILLER: DD

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**
				1.1	loose	mod br	Sand, f.gr, silty		sl moist	%			0
S1 @ 1017			4.0/4.0		firm	dk gray	Clay, sandy, mottled		sl moist	0			
							grdnish gray, reddish			0			
	4												
				4.8'					32-SFB010506	%			0
S2 @ 1021			4.0/4.0	5.2 5.5 6.0	loose firm	br gr gray	Sand, v.f. to v.f. grnd, clayey; gray clay, sandy; gray sand, clayey brn clay		sl moist; sl moist wet @ 6'; moist	0			
	8				loose	dk gray to tan	Sand, fine grnd, mottled rough yellow		wet	0			
							TD 8'						

*When rock coring, enter rock brokeness.

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

Remarks:

Drilling Area Background (ppm): 0

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

BORING LOG

PROJECT NAME: Site 32 Bldg 54
PROJECT NUMBER: ND164 Zone C
DRILLING COMPANY: Tidewater
DRILLING RIG: Geoprobe
BORING NUMBER: CNC32-B02
DATE: 5/14/99
GEOLOGIST: BDH
DRILLER: DD

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/ Consistancy or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				1.1	loose	med brn	Sand, f grd silty		sl. moist	0/0			0
					firm	med yellow	Clay, sandy, mottled		sl. moist				
			4'/4'				greenish gray			0			
	4									0			
				4.4'					325F-B02-0506				
				5.1					sl moist				
			4'/4'	5.5'	loose	tan	Sand, f. grd		get @ 6'	0/2			
					firm		clay sandy		moist				0
	8						Sand, clayey, f grd			0			
							mottled olive yellow						
										0			
							TD 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

PROJECT NAME: Site 32 Bldg 54
PROJECT NUMBER: N0164 Zone C
DRILLING COMPANY: Tidewater
DRILLING RIG: Geoprobe
BORING NUMBER: CNC32-B03
DATE: 5/15/99
GEOLOGIST: BDH
DRILLER: DD

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**
				1.0	loose	mod brn	Sand, f. grd, silty		sl. moist	0/3			0
			4/4'		firm	med brn	clay, sandy, mod		sl. moist				
5-1 @ 1142	4						tan, mod brn, w/ oxidized rock frag		325FB03050b	0			
				4.8' 5.2	firm	med gray	clay, sandy		sl. moist	0			
			4'/4'		firm	tan to med gray	Sand, clayey, less clayey @ base		wet @ 6.2'	3/30			0
5-2 @ 1147	8						~~Air staining~~ @ 6.5' and ~~light~~ fuel odor			0			

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

Drilling Area Background (ppm):

Remarks:

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

BORING LOG

PROJECT NAME: Site 32 Bldg 54 BORING NUMBER: CNC32-B04
PROJECT NUMBER: No 164 Zone C DATE: 5/15/99
DRILLING COMPANY: Tidewater GEOLOGIST: BDH
DRILLING RIG: Geoprobe DRILLER: DD

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**
				1.0	loose	lt brn	Sand, fine and silty 3" layer under/above base		sl. moist	0/1			0
SS-1 @ 1-10			4/4'		firm	~~gray~~ brn	Clay, sandy, mottled blk, gray and gray		sl. moist	0			
	4			4.4'					325FB040506				
					firm	~~gray~~ to orange brn	Sand, clayey		sl. moist	0			
			3.6/4'				less sand @ base		moist	0/1			0
S-2 @ 2	8								Wet @ 6'				
							↓			0			

* When rock coring, enter rock brokeness.

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

Remarks:

Drilling Area Background (ppm):

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

BORING LOG

PROJECT NAME: Site 32 Bldg 54
PROJECT NUMBER: N0164 Zone C
DRILLING COMPANY: Sidewater
DRILLING RIG: Geoprobe
BORING NUMBER: CNC32B05
DATE: 5/15/99
GEOLOGIST: BPH
DRILLER: DD

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**
				0.9'	loose	med brn			sl. moist	0/1			0
S-1 @ 1334			4/4'		firm	med brn	Clay, sandy, silty mottled blk		sl. moist	0			
	4												
				4.7'					325FB050506				
			38/4'	5.1'	firm	med gray	clay, silty		sl. moist	0/2			
S-2 @ 1336	8				firm	tan to gray	Sand, sl. clayey		moist wet @ 6'	0			0
							TD - 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

PROJECT NAME: Site 32 Bldg 54
PROJECT NUMBER: N0164 Zone C
DRILLING COMPANY: Tidewater
DRILLING RIG: Geoprobe
BORING NUMBER: CNC32B06
DATE: 5/15/99
GEOLOGIST: BDH
DRILLER: DD

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/ Consistancy or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				1.2'	loose	med brn	Sand, silty w/ umber - 2" thick @ base		sl. moist	0/2			0
			4'/4'		firm	orange brn	clay, sdy, mottled		sl. moist	0			
				3.1'			rdsh brn, blk						
	4				firm	tan	Sand, clayey		sl. moist	0			
									325FB060506				
			4'/4'				thin clay intervals		1-2" sh. moist	0/3			0
				6.8'					Wet @ 6'	0			
	8					tan	Sand, f. grnd						
			4'/4'			to tan gray				0			0
	12									0			
			4'/4'			lt to med gray	Sand, med grnd		Wet	0			0
							sand, finer grnd, sl clayey			0			
	16			15.5'			abnd shell frags - coquina - weakly cemented						
			3.8'/4			lt gray to tan	Sand, fine to med, abnd shell frags / black frags - glauconite (loose)			0			0
	20												
			4'/4'			tan to lt gray	Sand, fine grnd		Wet	0			0
				22'			Sand, med grnd, abnd black glauconite, shell frags						
	24			23'			Sand, f. grnd to silt w/ abnd shell frags						

* 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

PROJECT NAME: Site 72 Bldg 54 BORING NUMBER: CNC 32B06
PROJECT NUMBER: N0164 Zone C DATE: 5/15/99
DRILLING COMPANY: Johnston GEOLOGIST: BDH
DRILLING RIG: Geoprobe DRILLER: DD

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**
S7 @ 1433			4'/4'		firm	olive	Silt to v.f. sand, w/ abundant shell frags, phosphate grs?		wet	0			0
	28												
S8 @ 1600	30				firm	olive	Silt, clayey to clay, silty		moist	0			0

*When rock coring, enter rock brokeness.

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

Remarks:

Drilling Area Background (ppm):

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

BORING LOG

PROJECT NAME: Site 32 Bldg 54
PROJECT NUMBER: N0164 Zone C
DRILLING COMPANY: Subcontractor
DRILLING RIG: Geoprobe

BORING NUMBER: CNC 32 B07
DATE: 5/16/99
GEOLOGIST: BDH
DRILLER: DP

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**
					loose	brown	Sand, silty, w/ lx fine		sl. moist	0/1			0
			36/4'	1.1' / 1.6'	loose		Sand, fine grnd		sl. moist	0			
						orange brn	Sand, clayey, f. grnd mottled grnish gray		sl. moist	0			
	4												
			3.3'/4'	5.2' / 5.8'		dk gray	Sand, silty, f. grnd.		moist 325FB070506	0/2			0
						brown	becomes sl. clayey		wet @ ~6'				
	8					brn	~ 0.5' @ 6.5', sha			0			
							v.f. sd						

* 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

PROJECT NAME: Site 32 Bldg 54 BORING NUMBER: CNC32 B08
PROJECT NUMBER: N0164 Zone C DATE: 5/16/99
DRILLING COMPANY: Tidewater GEOLOGIST: BDH
DRILLING RIG: Geoprobe DRILLER: DD

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**
				1.3'	loose	med brn	Sand, silty, w/ trace		sl. moist	0/0			0
S-1 @ 832					firm	reddish brn	clay, sandy, mottled		sl. moist				
							gnl gray, rdsh brn			0			
	4												
									32SFB080506				
S-2 @ 839				5.4'		tan to brown	Sand, f. gnd, clayey wood ~6.3'-6.5'		sl. moist to moist; 0/0 @ ~6'	0/3			0
	8									0			

*When rock conng. 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

PROJECT NAME: Site 32 Bldg 54 BORING NUMBER: NC32B09
PROJECT NUMBER: N0164 Zone C DATE: 5/16/99
DRILLING COMPANY: Tiburtia GEOLOGIST: BPH
DRILLING RIG: Geoprobe DRILLER: DD

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/ Consistancy or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
					loose	med brn	Sand, silty, sr/rd		sl. moist	0/2			0
-1 @ 1917			4'/4'	3.0			frag, clayey @ base		Fill				
					firm	Tan to gray brown	Clay, sandy, mottled		sl. moist	0			
	4												
									325FB090506	0/2			0
-2 @ 1922			4'/4'	6.5'					sl. moist to wet				
									wet @ ~6'				
	8					lt. gray to tan	Sand, f. grad, clayey intervals ~ 2" th.			0			
							sand, f. grad						
							TD 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):

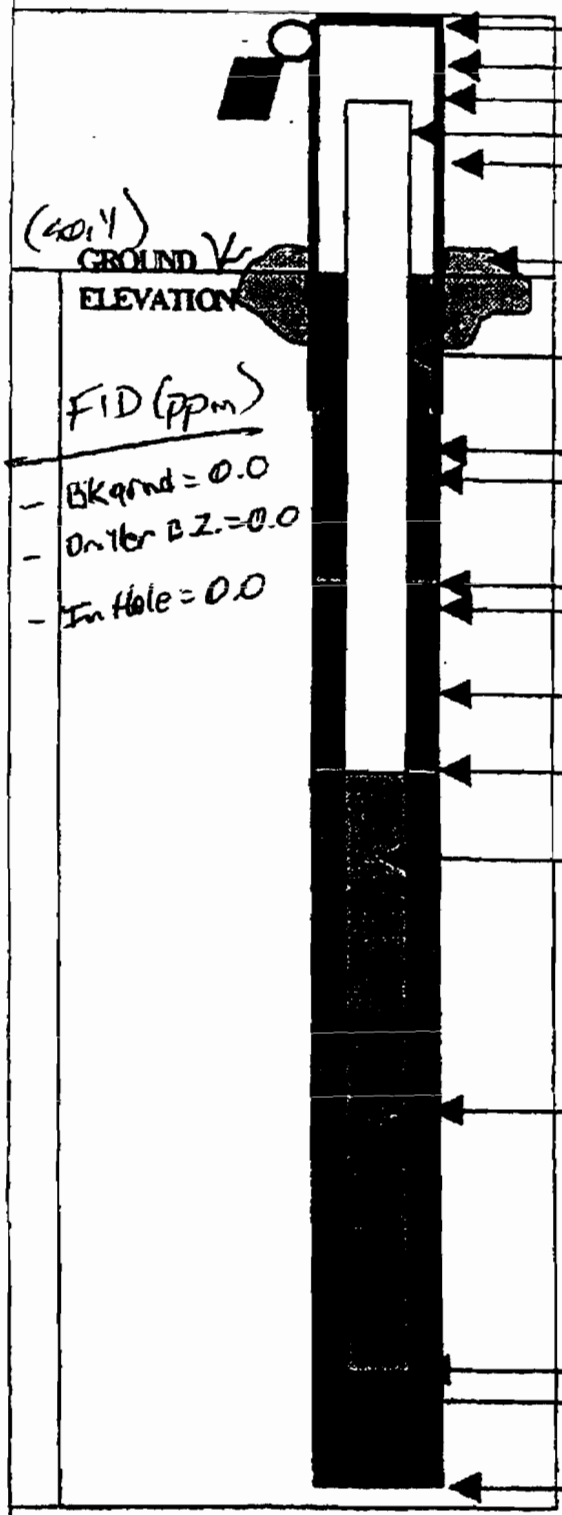
Remarks:

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

BORING NO. CNC32-MW01

OVERBURDEN MONITORING WELL SHEET

PROJECT Chas. Naval Complex	LOCATION: S. Yard 32 / Zone C	DRILLER Custom Drilling
PROJECT NO. N0164	BORING CNC32-MW01	METHOD: ~~DPT~~ 4.25-in HSA
ELEVATION	DATE 6/17/99	DRILLING Darrell Wilkins
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)

TYPE OF SURFACE SEAL: Concrete pad (Quickcrete) 2 ft x 2 ft x 6 in.

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: 11.0'

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

DEPTH TOP OF SAND PACK: 1.5'

ELEVATION / DEPTH TOP OF SCREEN: 13.0'

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: Standard sand (20/30) Qtz sand (20/30)

ELEVATION / DEPTHBOTTOM OF SCREEN: 113.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 113.0'

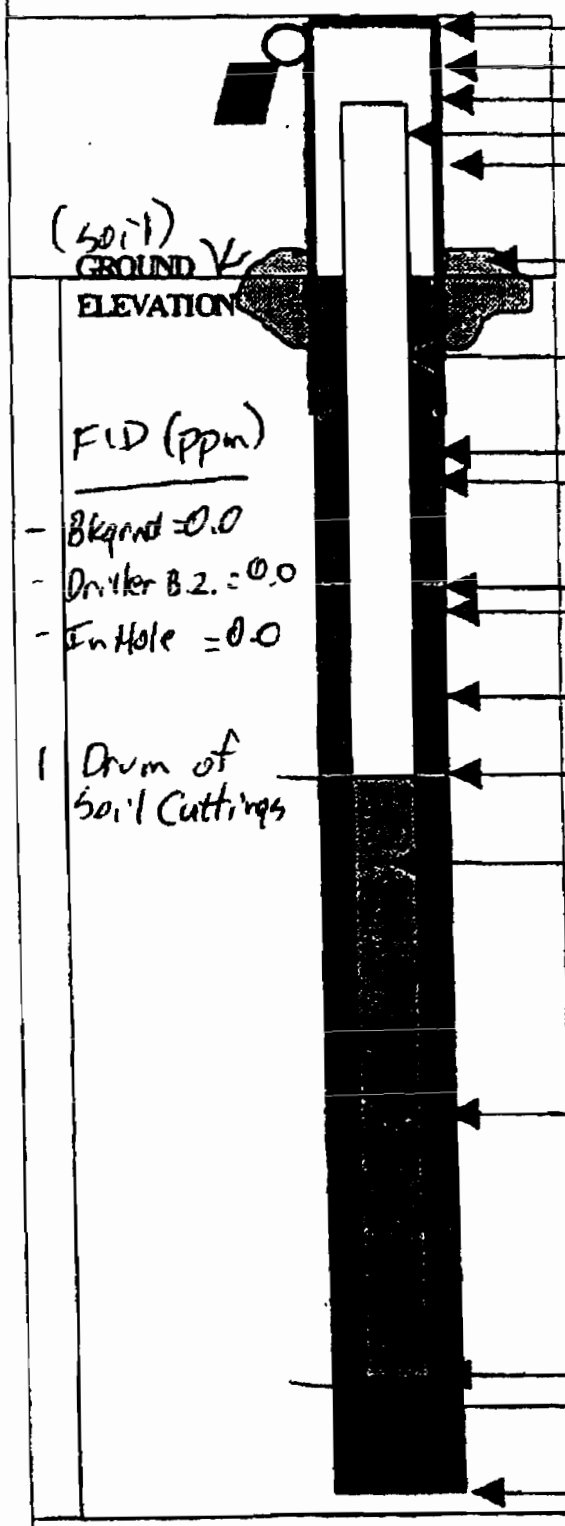
TYPE OF BACKFILL BELOW OBSERVATION WELL: Sand (20/30)

ELEVATION / DEPTH OF HOLE: 113.0'

BORING NO. CNC32-MW02

OVERBURDEN MONITORING WELL SHEET

PROJECT Chas. Naval Complex	LOCATION: Site 32/Zone C	DRILLER Custom Drilling
PROJECT NO. N0164	BORING CNC32-MW02	METHOD: ~~DPT~~ 4.25-in. HSA
ELEVATION	DATE 6/17/99	DRILLING Darrell Martin
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 in ID x 10" OD

TYPE OF SURFACE CASING: Steel cover w/ bolt-on lid (flush)

TYPE OF SURFACE SEAL: Concrete Pad (Quickcrete) 2 ft. x 2 ft. x 6 in

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: 12.0'

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

DEPTH TOP OF SAND PACK: 2.50 ~~2.00'~~

ELEVATION / DEPTH TOP OF SCREEN: 13.00'

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: Standard Sand™ Qtz. sand (20/30)

ELEVATION / DEPTHBOTTOM OF SCREEN: 113.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 113.0'

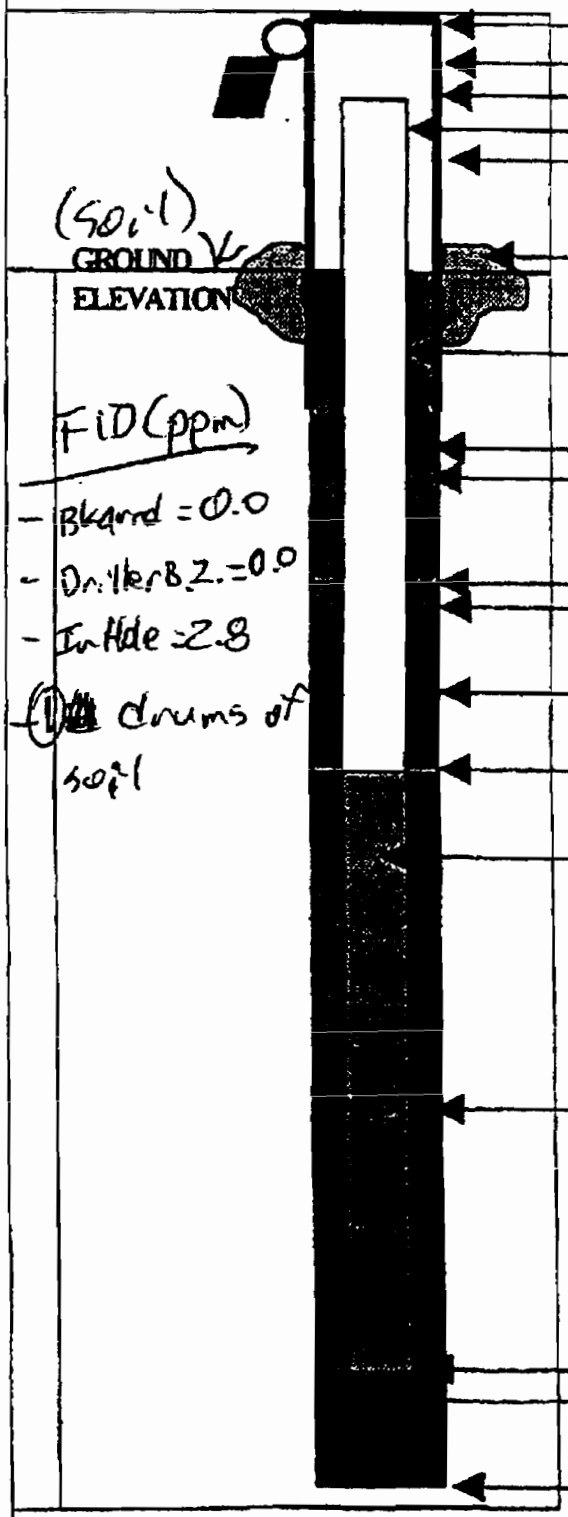
TYPE OF BACKFILL BELOW BSERVATION WELL: Sand (20/30)

ELEVATION / DEPTH OF HOLE: 113.0'

BORING NO CNC32-MW03

OVERBURDEN MONITORING WELL SHEET

PROJECT Chas. Naval Complex	LOCATION: S. 1032 / Zone C	DRILLER Custom Drilling
PROJECT NO. N0164	BORING CNC32-MW03	METHOD: ~~DPT~~ 4.25-in. HSA
ELEVATION	DATE 6/17/99	DRILLING Darrell Martin
FIELD GEOLOGIST Nicole Darragh		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.

TYPE OF SURFACE SEAL: Concrete Pad (Quickcrete) 2ft. x 2ft. x 6in.

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 Seal" Very fine Qtz. sand (30/65)

DEPTH TOP OF SAND PACK: 2.5'

ELEVATION / DEPTH TOP OF SCREEN: 13.0

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: Standard sand Qtz sand (20/30)

ELEVATION / DEPTHBOTTOM OF SCREEN: 113.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 113.0

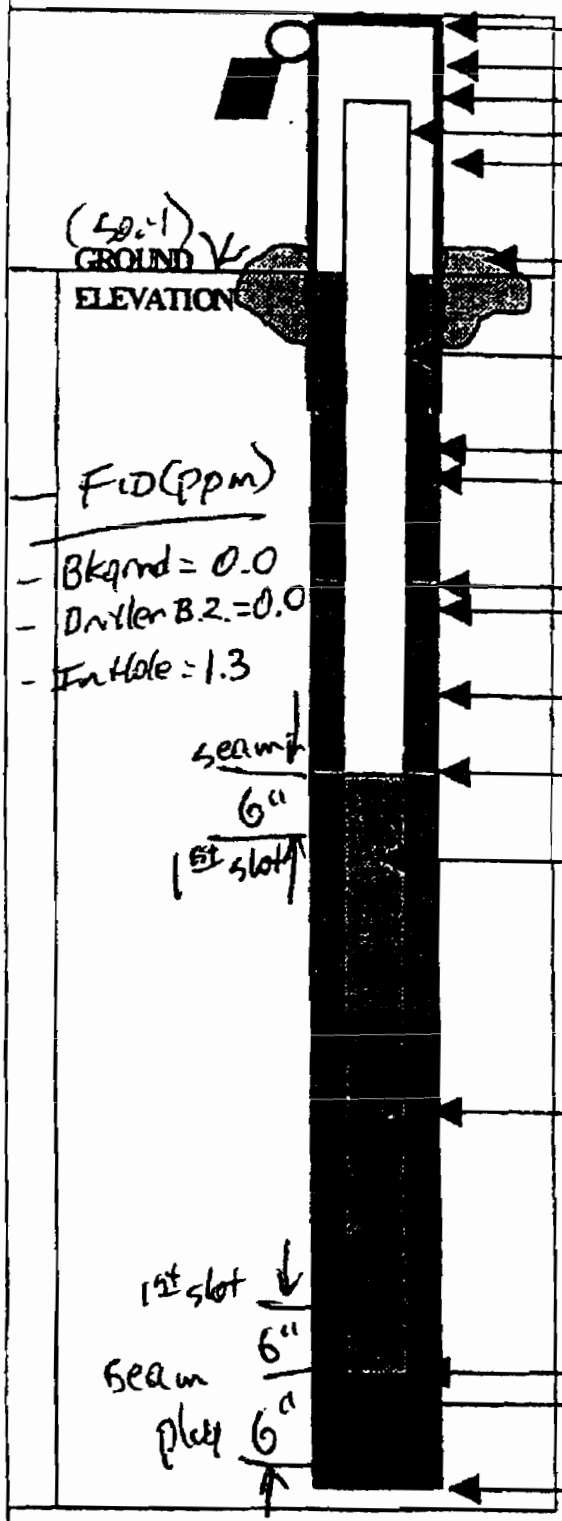
TYPE OF BACKFILL BELOW OBSERVATION WELL: Sand (20/30)

ELEVATION / DEPTH OF HOLE: 113.0

BORING NO. CNC32-MW04

OVERBURDEN MONITORING WELL SHEET

PROJECT Chas. Naval Complex	LOCATION: Site 32/Zone C	DRILLER Cutton Drilling
PROJECT NO. N0164	BORING CNC32-MW04	METHOD: ~~DPT~~ 4.25 in. HSA
ELEVATION	DATE 6/17/99	DRILLING Darrell Martin
FIELD GEOLOGIST Mark Barrington		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)

TYPE OF SURFACE SEAL: Concrete Pad (Sakrete Quickcrete) 2ft. x 2ft. x 6in.

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" Very fine Qtz. sand (30/65)

DEPTH TOP OF SAND PACK: 2.5'

ELEVATION / DEPTH TOP OF SCREEN: 13.0'

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: Standard Sand (20) Qtz sand (20/30)

ELEVATION / DEPTHBOTTOM OF SCREEN: 113.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 113.0'

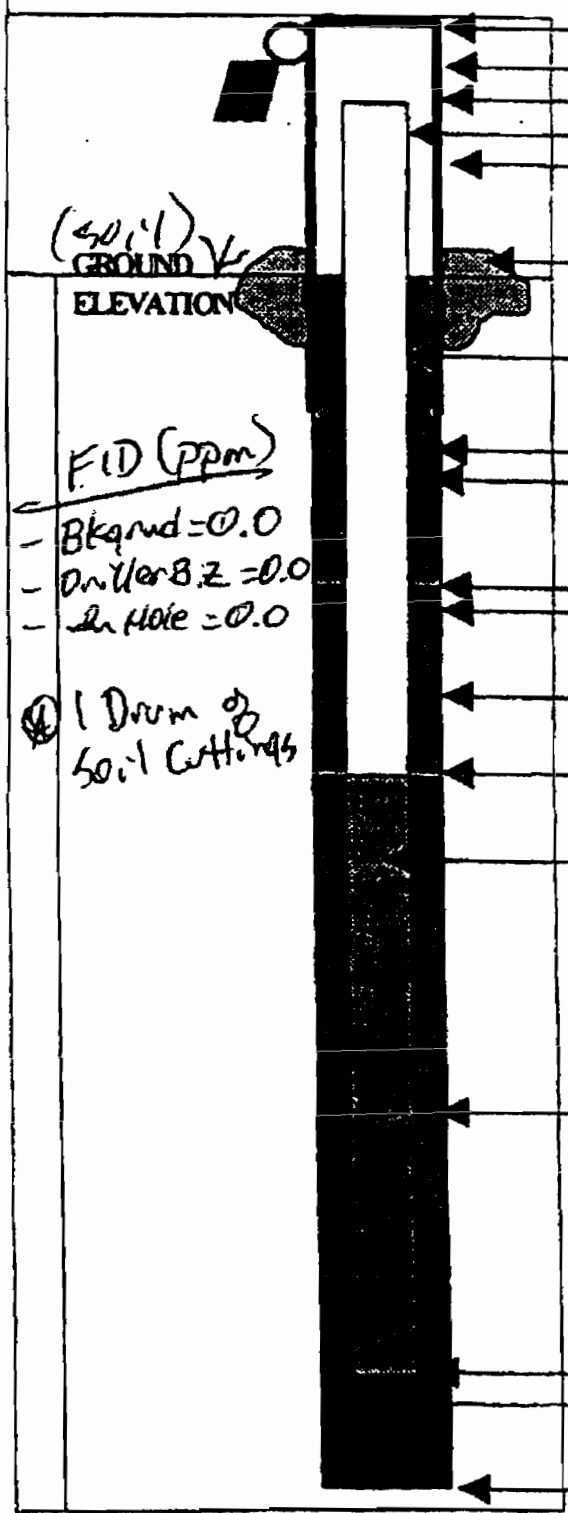
TYPE OF BACKFILL BELOW OBSERVATION WELL: Sand (20/30)

ELEVATION / DEPTH OF HOLE: 113.0'

BORING NO. CNC32-MW05

OVERBURDEN MONITORING WELL SHEET

PROJECT Chas. Naval Complex	LOCATION: Site 32 Zone C	DRILLER Custom Drilling
PROJECT NO. N0164	BORING CNC32-MW05	METHOD: ~~DPT~~ 4.25-in. HSA
ELEVATION	DATE 6/17/99	DRILLING Darrell Martin
FIELD GEOLOGIST Mark Dewington		DEVELOPMENT: ~~NA~~



FID (ppm)
- Bkgnd = 0.0
- Driller B.Z = 0.0
- In Hole = 0.0

(*) 1 Drum of Soil Cuttings

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)
TYPE OF SURFACE SEAL: Concrete Pad (Quickrete) 2 ft. x 2 ft. x 6 in.
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" Very Fine Qtz sand (30/65)
DEPTH TOP OF SAND PACK: 2.5'
ELEVATION / DEPTH TOP OF SCREEN: 13.0'
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: Standard Sand (TM) Qtz. Sand (20/30)
ELEVATION / DEPTHBOTTOM OF SCREEN: 113.0'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 113.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: Sand (20/30)
ELEVATION / DEPTH OF HOLE: 113.0

BORING LOG

Page ___ of ___

PROJECT NAME: CNC site 32 BORING NUMBER: CNC32-MW06D
PROJECT NUMBER: N0164 Bldg 54 DATE: 6/22/99
DRILLING COMPANY: Custom Drilling GEOLOGIST: Marty Rad
DRILLING RIG: DRILLER: Custom Drilling (Rod)

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			USCS*	Remarks	PID/FID Reading (ppm)
#1	24'	6/6"			Firm		Sandy silt vf grain		well sorted	
		4/6"	2'/2'				Some shell hash		0.0 PPM	
	↓	8/6"					Pale olive green			
	26'	10/6"					No odor			
							well sorted damp			
#2	26'	4/6"			Firm		Sandy silt to silt			
		4/6"					vf grain, some shell hash Pale olive green, well sorted		0.0 PPM	
		8/6"			Firm		silt, some shell hash			
	28'	7/6"					Pale olive green No odor			
							damp			
#3	28'	9/6"			Firm		silt w/trace very fine sand			
		10/6"					some shell hash Pale olive green (very wet 8")			
	↓	14/6"					well sorted No odor			
	30'	19/6"					damp to wet			
					Firm		slightly silty clay Pale olive green, No odor			
#4	30'	4					some shell hash.			
		8			Firm	dive	very tight clay, olive color			
	↓	11					trace shell hash cohesive			
	32	12					(plastic)			

black specs observed throughout (phosphate?)

* When rock coring, enter rock broleness.

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

Remarks: _____

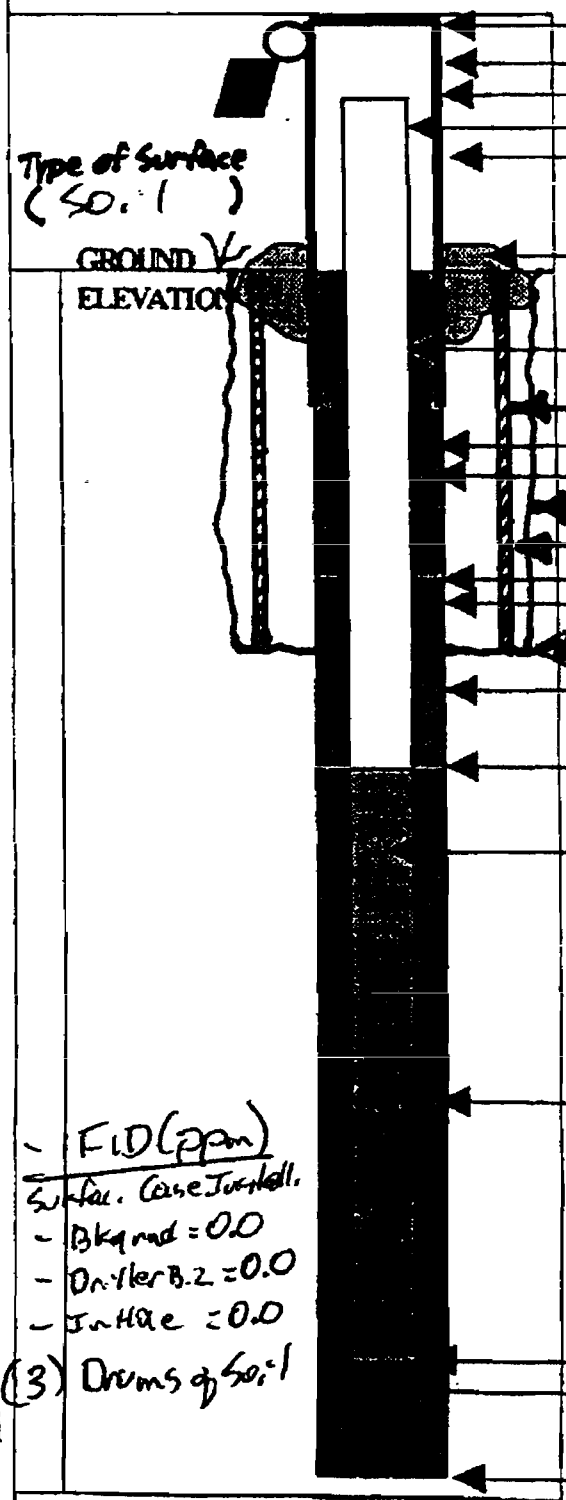
Drilling Area Background (ppm): ____

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

BORING NO: CNC32 MW06D

OVERBURDEN MONITORING WELL SHEET

PROJECT CNAS Naval Complex	LOCATION: Site 32 / BGC	DRILLER Custom Drilling
PROJECT NO. N0162	BORING CNC32-MW06D	METHOD: [redacted] 8.25 HSA /
ELEVATION	DATE 6/30/99	DRILLING Darrell Martin
FIELD GEOLOGIST Mark Darrington		DEVELOPMENT: [redacted]
Boring Methods: Surface Casing: 8.25 HSA Inner Casing		



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.:
TYPE OF RISER PIPE:
Type of Surface Case (S.C.) PVC/Sch.40 Dia. 6in.
BOREHOLE DIAMETER:
TYPE OF SEAL: grout
Borehole Dia. 12.25-in
Type of S.C. Seal Portland Cement Type I
ELEVATION / DEPTH OF SEAL: 16' TO
TYPE OS SEAL: 3a/65
Depth of S.C. 20.0'
DEPTH TOP OF SAND PACK: 18'
ELEVATION / DEPTH TOP OF SCREEN: 20.0'
TYPE OF SCREEN: 20
SLOT SIZE X LENGTH: 10 slot 5'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: 20/30 sand
ELEVATION / DEPTHBOTTOM OF SCREEN: 25'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 32'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 32'

- FID (ppm)
Surface Case Installed.
- Background = 0.0
- Driller B.Z = 0.0
- In Hole = 0.0
(3) Drums of Soil

L. 6/30/99

APPENDIX C

FIELD SAMPLING DATA SHEETS

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Zone C Site 32
Project No.: N0164 Bldg 54

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

Sample ID No.: 32GLMØ1Ø1
Sample Location: CNC32MW1
Sampled By: JA/DA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8 5 99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: Ø93Ø	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Low Flow								

PURGE DATA:

Date: 8 5 99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: ~	Initial	5.79	.295	24.5	Ø	1.ØØ	—	
Monitor Reading (ppm):	1	5.87	.255	24.3	Ø	.75		
Well Casing Diameter & Material	2	5.89	.261	24.3	Ø	.66		
Type: 2"	3	5.84	.260	24.4	Ø	.77		
Total Well Depth (TD): 13.28								
Static Water Level (WL): 6.46								
One Casing Volume(gal/L): 1.Ø9								
Start Purge (hrs): Ø836								
End Purge (hrs): Ø93Ø								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

13.28
6.46
6.82 x .16 = 1.Ø9

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Zone C Site 32
Project No.: N0164 Bldg. 54

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

Sample ID No.: 32GLM02Ø1
Sample Location: CNC32MW1
Sampled By: JA/RA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 8 5 99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: ~~A~~ Ø935								
Method: Low Flow								

PURGE DATA:

Date: 8 5 99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	5.77	.313	25.5	Ø	1.Ø2	—	
Monitor Reading (ppm):	1	5.86	.31Ø	25.5	Ø	1.94	—	
Well Casing Diameter & Material	2	5.82	.309	25.5	Ø	1.18	—	
Type: 2"	3	5.82	.310	25.6	Ø	0.95	—	
Total Well Depth (TD): 13.10								
Static Water Level (WL): 6.44								
One Casing Volume(gal/L): 1.07								
Start Purge (hrs): Ø84Ø								
End Purge (hrs): Ø935								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

13.10
6.44
6.66 = 1.06

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Zone C Site 32
Project No : N0164 Bldg 54

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

Sample ID No.: 32GLM03Ø1
Sample Location: CKC32MW3
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8 4 98	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1635	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	5.86	.817	26.C	Ø	1.[illegible]		
Monitor Reading (ppm).	1	5.84	.752	26.Ø	Ø	1.Ø[illegible]		
Well Casing Diameter & Matenal	2	5.82	.714	25.7	Ø	0.6[illegible]		
Type:	3	5.84	.691	25.4	Ø	1.75		
Total Well Depth (TD): 13.Ø4								
Static Water Level (WL): 6.82								
One Casing Volume(gal/L):								
Start Purge (hrs): 1455								
End Purge (hrs): 1642								
Total Purge Time (min): 1Ø7								
Total Vol. Purged (gal/L): ~3 gal								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
BTEX/EPB		3 x 40ml	
PAH		2 1 ltr.	

OBSERVATIONS / NOTES:

13.04
6.82
6.22

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Zone C Site 32
Project No : N0164 Bldg 54

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

Sample ID No.: 32GLM03Ø1
Sample Location: 32MW4
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8 4 98	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 163Ø	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	5.99	187	26.2	Ø	0.61		
Monitor Reading (ppm):	1	6.39	.188	25.3	Ø	1.15		
Well Casing Diameter & Material	2	6.Ø6	.192	25.2	Ø	1.Ø6		
Type:	3	5.99	.186	25.6	Ø	1.Ø9		
Total Well Depth (TD): 13.25								
Static Water Level (WL): 5.98								
One Casing Volume(gal/L):								
Start Purge (hrs): 1457								
End Purge (hrs): 1627								
Total Purge Time (min): 9Ø								
Total Vol. Purged (gal/L): ~3.5								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

13.04 13.25
6.82 5.98
6.22 7.27

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Zone C Site 32
Project No.: ND164 Bldg 54

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

Sample ID No.: 32GLMØ5Ø1
Sample Location: CNC32MW05
Sampled By: JA/DA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8 5 99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: Ø920	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Low Flow								

PURGE DATA:

Date: 8 5 99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	5.74	.15Ø	24.4	Ø	6.78		
Monitor Reading (ppm):	1	5.92	.152	24.5	Ø	1.15		
Well Casing Diameter & Material	2	5.8Ø	.154	24.6	Ø	1.Ø8		
Type: 2"	3	5.89	.155	24.6	Ø	4.92		
Total Well Depth (TD): 13.4Ø								
Static Water Level (WL): 6.82								
One Casing Volume(gal/L): 1.Ø5								
Start Purge (hrs): Ø838								
End Purge (hrs): Ø92Ø								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

2.31
13.40
6.82
6.58 x .16 = 1.05

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: Zone C Site 32
Project No.: N01164 Bldg 54

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

Sample ID No.: 32GLM0601
Sample Location: CNC32MW01
Sampled By: JA
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 8 21 99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: 1557								
Method:								

PURGE DATA:

Date: 8 21 99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method.	Initial	7.35	1.21	23.3	999	0.77		
Monitor Reading (ppm)	1	7.24	1.27	23.3	703	1.43		
Well Casing Diameter & Material	2	7.20	1.25	23.3	93	2.65		
Type:	~~2~~ 25	7.13	1.31	24.7	65	1.99		
Total Well Depth (TD): ~~27.00~~ 24.96	3	7.16	1.53	24.3	10	0.98		
Static Water Level (WL): ~~19.1~~ 10.12								
One Casing Volume(gal/L): 3.744								
Start Purge (hrs): 1412								
End Purge (hrs): 1557								
Total Purge Time (min):								
Total Vol. Purged (gal/L): ~12								

SAMPLE COLLECTION INFORMATION:

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

OBSERVATIONS / NOTES:

24.96
10.12
4

252
14.84
1 .16
18904
14840
3.744

~~14.84~~
+6

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: Zone C Site 32
Project No.: N0164 Bldg 54
Sampled By: DRA/JA
Field Analyst: DRA/JA
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 32GLM02P1
Sample Location: CNC32MW2
Duplicate: ☐
Blank: ☐

SAMPLIN DATA

Date:	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: 1-10 mg/L) Analysis Time: 1095

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: 3 mg/L

Notes:

Alkalinity:

Analysis Time: 1053

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	& 200	x 0.4	= 80 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	&	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.: _____

Carb n Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____ mg/L) Analysis Time: 1101

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
~~360~~	x 0.1	= mg/L
361	x 0.2	= 72.2 mg/L
	x 1.0	= mg/L
	x 2.0	= mg/L

CHEMetrics: _____ mg/L

Notes:

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

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

(A)

Project Site Name: 200 C Site 32
Project No.: ND164 Bldg 54
Sampled By: DRA/JA
Field Analyst: DRA/JA
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 32GLM0241
Sample Location: CMC32MW1
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: _____ Analysis Time: 1126
Program/Module: 525nm 41
Concentration: 0.4 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: 1202
Program/Module: 500nm 33
Concentration: 0.23 mg/L
Filtered: ☐
Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____
Concentration: _____ 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.

Project Site Name: Zone C Site 32
Sample ID No.: 32GLM02Ø1
Project No.: N0164 Bldg 54
Sample Location: CNC 32 MW2
Sampled By: DRA/JA
Duplicate: ☐
Field Analyst: DRA/JA
Blank: ☐
Field Form Checked as per QA/QC Checklist (initials):

SAMPLE COLLECTION/ANALYSIS INFORMATION

Sulfide (S^{2-}):

Equipment: DR-700 DR-8 __ HS-C Color Chart HS-WR Color Wheel Analysis Time: 115Ø
Program/Module: 610nm 93 Other: _____

Concentration: Ø.Ø1 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: 1223

Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: 60
Concentration: 0.130 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: Zone C Site 32
Project No.: ND164 Bldg 54
Sampled By: DRA \ JA
Field Analyst: " "
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 32GLM01 01
Sample Location: CNC 32MW1
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date:	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: 1-10 mg/L) Analysis Time: 1046

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: 2 mg/L

Notes:

Alkalinity:

Analysis Time: 1054

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	— & 190	x 0.4	= 76 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	&	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: 1102

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
340	x 0.2	= 68 mg/L
	x 1.0	= mg/L
	x 2.0	= mg/L

CHEMetrics: _____mg/L

Notes:

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

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: Zone C Site 32
Project No.: N0164 Bldg 54
Sampled By: DRA / JA
Field Analyst: " "
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 32 GCM0101
Sample Location: CNC 32 MW1
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-S Other: _____ Analysis Time: 1127
Program/Module: 525nm 41
Concentration: 0.0 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: 1263
Program/Module: 500nm 33
Concentration: 0.72 mg/L
Filtered: ☐
Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____
Concentration: _____ 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: Zone C Site 32

Project No.: N0164 Bldg 54

Sampled By: DRA/JA

Field Analyst: " "

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

Sample ID No.: 32GLM01

Sample Location: CMC 32MW1

Duplicate: ☐

Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION

Sulfide (S^{2-}):

Equipment: DR-700 DR-8 __ HS-C Color Chart HS-WR Color Wheel Analysis Time: 1157

Program/Module: 610nm 93 Other: _____

Concentration: 0.02 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: ~~1156~~ 1223 DRA

Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐

Program/Module: 60

Concentration: 0.100 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: ~~CNC32~~ DRA Zone C

Project No.: N0164 Bldg 54

Sampled By: DRA / JA

Field Analyst: DRA / JA

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

Sample ID No.: 32GLM0501

Sample Location: ~~[illegible]~~ CNC32MW5 DRA

Duplicate: ☐

Blank: ☐

SAMPLING DATA:

Date:	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: 1-10 mg/L) Analysis Time: 1047

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: 2 mg/L

Notes:

Alkalinity:

Analysis Time: 1055

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	— & 100	x 0.4	= 40 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	____ & ____	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 Di xide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: ____mg/L) Analysis Time: 1103

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
215	x 0.2	= 43 mg/L
____	x 1.0	= mg/L
____	x 2.0	= mg/L

CHEMetrics: ____mg/L

Notes:

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

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

(C)

Page __ of __

Project Site Name: Zone C Site 32
Project No.: ND164 Bldg 54
Sampled By: DRA/JA
Field Analyst: " "
Field Form Checked as per QA/QC Checklist (initials): ☐

Sample ID No.: 32 GLM#5#1
Sample Location: CNC 32 MW5
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: _____ Analysis Time: 1128
Program/Module: 525nm 41
Concentration: 0.0 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: 1204
Program/Module: 500nm 33
Concentration: 0.66 mg/L
Filtered: ☐
Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: _____
Concentration: _____ 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: Zone C Site
Project No.: N0164 Bldg 54
Sampled By: DRA / JA
Field Analyst: " "
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 32GCM0501
Sample Location: CKC32MW5
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION

Sulfide (S^{2-}):

Equipment: DR-700 DR-8 __ HS-C Color Chart HS-WR Color Wheel Analysis Time: 1157
Program/Module: 610nm 93 Other: _____
Concentration: 0.03 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: 1223
Equipment: DR-700 DR-8 __ Other: _____ Filtered: ☐
Program/Module: DRA 60
Concentration: 0.064 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:

GROUNDWATER LEVEL MEASUREMENT SHEET

Pr ject Name: CNC 32 **Project No.:**
Location: Site 32 **Personnel:** R. Hall, J Kroger
Weather Conditions: Clear High of 88°F **Measuring Device:** water level Meter
Tidally Influenced: Yes ___ No ___ **Remarks:**

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Readin (feet)*	Thickness of Free Produc (feet)*	Groundwater Elevation (feet)*	Comments
MW-3	9-11-99	0852			6.96			
MW-2		0854			6.61			
MW-1		0858			6.63			
MW-6D		0908			8.08			
MW-4		0910			6.14			
MW-5		0913			6.90			

* All measurements to the nearest 0.01 foot

Page ____ of ____

TABLE 1

GROUNDWATER ELEVATIONS
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL BASE COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well No.	Total Depth of Well (ft)	Top of Casing Elevation, ft (MSL)	Date Measured	Depth to Free Product (BTOC)	Product Thickness, ft	Depth to Water, ft (BTOC)	Groundwater Elevation, ft (MSL)
CNC32-MW01	13	8.12	8/5/99	ND	ND	6.46	1.66
			9/11/99	ND	ND	6.63	1.49
CNC32-MW02	13	8.38	8/5/99	ND	ND	6.44	1.94
			9/11/99	ND	ND	6.61	1.77
CNC32-MW03	13	8.47	8/4/99	ND	ND	6.82	1.65
			9/11/99	ND	ND	6.96	1.51
CNC32-MW04	13	7.63	8/4/99	ND	ND	5.98	1.65
			9/11/99	ND	ND	6.14	1.49
CNC32-MW05	13	8.03	8/5/99	ND	ND	6.82	1.21
			9/11/99	ND	ND	6.90	1.13
CNC32-MW6D	25	7.95	8/2/99	ND	ND	10.12	-2.17
			9/11/99	ND	ND	8.08	-0.13

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

TABLE 2

GROUNDWATER FIELD MEASUREMENTS
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Purge method	Volume (gallons)	Temp. (° C)	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)
CNC32-MW01	08/05/99	PP	3.2	24.4	5.84	0.260	0	0.77
CNC32-MW02	08/05/99	PP	3.2	25.6	5.82	0.310	0	0.45
CNC32-MW03	08/04/99	PP	3.0	25.4	5.84	0.254	0	1.75
CNC32-MW04	08/04/99	PP	3.5	25.6	5.99	0.186	0	1.09
CNC32-MW05	08/05/99	PP	3.2	24.6	5.89	0.155	0	0.92
CNC32-MW6D	08/04/99	PP	12.0	24.3	7.16	1.33	10	0.98

Notes:
(° C) - Degrees Celsius
PP - Peristaltic pump, low flow technique
uMHOS/cm - Micro HOS per centimeter
NTU - Nephelometric turbidity units
mg/l - milligrams per liter

TABLE 3

GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS
SITE 32, BUILDING 54
ZONE C, 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)	Nitrite (mg/l)	Manganese (mg/l)	Nitrogen/ Nitrate (mg/l)*	Sulfate (mg/l)*	Methane (ug/l)*
CNC32-MW01	8/5/99	2.0	76.0	68	0.02	0.72	0.100	0.0	<0.05	29	130
CNC32-MW02	8/5/99	3.0	80	72	0.01	0.23	0.130	0.4	0.650	34	90
CNC32-MW05	8/5/99	2.0	40	43	0.03	0.66	0.064	0.0	<0.05	20	540

Notes:
mg/l - Milligrams per liter
ug/l - Micrograms per liter
E- Estimated Concentration
* Fixed base laboratory analysis

TABLE 4

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 32, BUILDING 54
ZONE C, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Depth (feet)	Total Organic Vapor Headspace Concentration
CNC32-B01	1-2	ND
	2-3	ND
	3-4	ND
	5-6	ND
	6-7	ND
CNC32-B02	1-2	ND
	3-4	ND
	4-5	ND
	6-7	ND
CNC32-B03	1-2	ND
	3-4	ND
	5-6	ND
	6-7	27
CNC32-B04	1-2	ND
	2-3	ND
	5-6	ND
	6-7	1
CNC32-B05	1-2	2
	2-3	ND
	4-5	ND
	6-7	ND
CNC32-B06	1-2	ND
	2-3	ND
	5-6	ND
CNC32-B07	1-2	ND
	2-3	ND
	3-4	ND
	6-7	ND
CNC32-B08	1-2	ND
	3-4	ND
	6-7	3
CNC32-B09	1-2	ND
	3-4	ND
	5-6	ND

Note:
OVA - organic vapor analyzer equipped with a flame ionization detector

TABLE 5

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Mobile Laboratory Screening Data [1]					
			Benzene (ug/kg)	Toluene (ug/kg)	Ethylbenzene (ug/kg)	Total Xylenes (ug/kg)	Nap-Thalene (ug/kg)	Diesel Range Organics (mg/kg)
CNC32-B01	32SFB01-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC32-B02	32SFB02-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC32-B03	32SFB03-0506	5-6	<5.0	<5.0	<5.0	<5.0	260	49
CNC32-B04	32SFB04-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC32-B05	32SFB05-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC32-B06	32SFB06-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC32-B07	32SFB07-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC32-B08	32SFB08-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC32-B09	32SFB09-0506	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10

NOTES:
[1] Mobile laboratory screening data were analyzed using USEPA Method 8021/8015M. Compounds not detected are reported as less than the instrument detection limit.

ug/kg Micrograms per kilogram
mg/kg Milligrams per kilogram

TABLE 6

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
SITE 32, BUILDING 54
ZONE C, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Laboratory Screening Data)[1]					
		Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Nap-thalene (ug/L)	Diesel Range Organics (mg/L)
CNC32-B01	32GFB01-0608	2.2	11	6.2	38	4.1	0.4
CNC32-B02	32GFB02-0608	<1.0	<1.0	<1.0	<1.0	1200	3.0
CNC32-B03	32GFB03-0608	<1.0	1.8	21	1.7	65	45
CNC32-B04	32GFB04-0608	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC32-B05	32GFB05-0608	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC32-B06	32GFB06-0608	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC32-B07	32GFB07-0608	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC32-B08	32GFB08-0608	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC32-B09	32GFB09-0608	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1

NOTES:
[1] Laboratory screening data were analyzed using USEPA Method 8020/8015M. Compounds not detected are reported as less than the instrument detection limit.

ug/L Micrograms per liter
mg/L Milligrams per liter

TABLE 7

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 32, BUILDING 54
ZONE C, 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
CNC32-B01 / 32SLB010506	18-May-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	< 6
CNC32-B02 / 32SLB020506	18-May-99	< 5	< 5	1800	4 [J]	< 36000	< 36000	< 36000	< 36000	< 36000	42000 [J]
CNC32-B03 / 32SLB030506	18-May-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	< 6
CNC32-B03 [2] / 32SLB030506D	18-May-99	< 6	< 6	< 6	< 6	< 360	< 360	< 360	< 360	< 360	6 [J]
CNC32-B04 / 32SLB040506	18-May-99	< 7	< 7	< 7	< 7	< 360	< 360	< 360	< 360	< 360	4 [J]
CNC32-B09 / 32SLB090506	18-May-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	< 6
CNC32-TL [3] / 3204TL00104	3-May-99	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5

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

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] Duplicate

[3] Trip blank

[J] Indicates the presence of an 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 32, BUILDING 54
ZONE C, 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)	MTBE (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)
RBSL[1]		5	700	1000	10000	40	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]
CNC32-MW01 / 32GLM0101	5-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC32-MW01 / 32GLM0101D[3]	5-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC32-MW02 / 32GLM0201	5-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC32-MW03 / 32GLM0301	4-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC32-MW04 / 32GLM0401	4-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC32-MW05 / 32GLM0501	5-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC32-MW6D[3] / 32GLM0601	21-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10
CNC32TL[4] / 32TL00101	4-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA
CNC32TL[4] / 32TL00201	5-Aug-99	< 5	< 5	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA

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) Duplicate

(4) Trip blank

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

TABLE 9

COMPARISON OF MAXIMUM CONCENTRATIONS TO RBSLs
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Concern	Maximum Concentration (Soil) (ug/kg)	RBSLs (Soil) (ug/kg)[a]	Maximum Concentration (GW) (ug/L)	RBSLs (GW) (ug/L)[b]
Benzene	<7	5	<5	5
Toluene	<7	478	<5	1000
Ethylbenzene	**1800**	364	<5	700
Xylenes	4	11119	<5	10000
MTBE	<650	NA	<5	40
Naphthalene	**42000**	52	<5	10
Benzo(a)anthracene	**36000**	17687	<10	10
B nzo(a)pyrene	36000	NA	<10	10
Benzo(b)fluoranthene	**36000**	7042	<10	10
Benzo(k)fluoranthene	36000	55930	<10	10
Benzo(g,h,I)perylene	36000	NA	<10	10
Chrysene	**36000**	3146	<10	10
Dibenzo(a,h)anthracene	**36000**	21265	<10	10

Notes:
(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.
GW - Groundwater
RBSLs - Risk Based Screening Levels
Bolded value indicates the concentration exceeded the RBSL.
NA = Not Available

TABLE 10

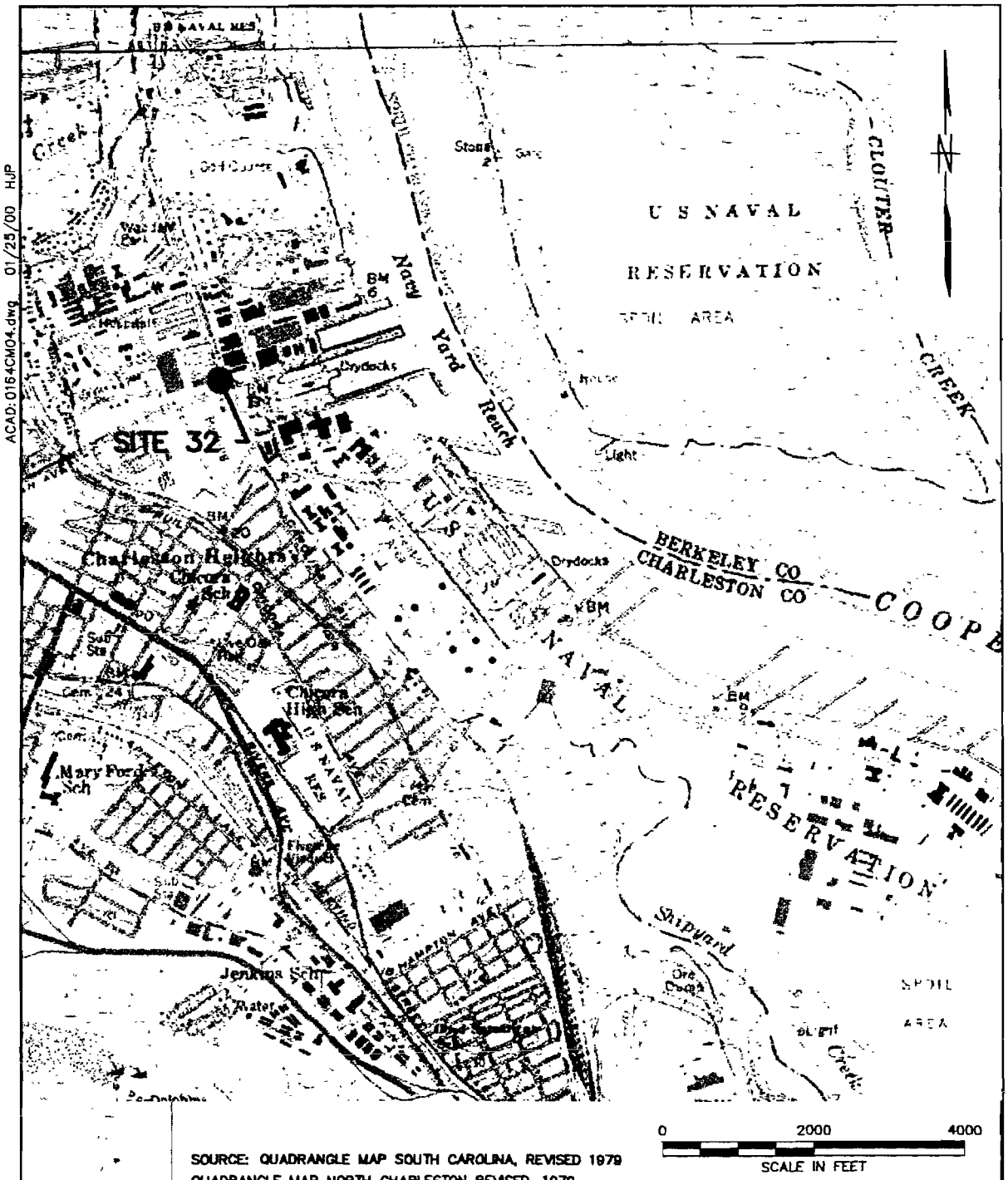
EXPOSURE PATHWAY ASSESSMENT - CURRENT LAND USE
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

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 current groundwater pathways complete. Drinking water provided by city.	
	Dermal contact	No		
	Inhalation	No		
Surface Water	Ingestion	No	No surface water bodies within 1,000 feet	
	Dermal contact	No		
	Inhalation	No		
Surficial Soil	Ingestion	No	No surficial soil impact.	
	Dermal contact	No		
	Inhalation	No		
Subsurface Soil	Ingestion	No	No current complete pathways.	
	Dermal contact	No		
	Inhalation	No		

TABLE 11

EXPOSURE PATHWAY ASSESSMENT - FUTURE USE
SITE 32, BUILDING 54
ZONE C, 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 Explosion Hazard	No No	No volatilization to enclose space. No explosion hazard.	
Groundwater	Ingestion Dermal contact Inhalation	Yes Yes Yes	Groundwater exposure by potential construction worker (most likely in utility corridor). Both direct exposure and exposure by soil leaching to groundwater evaluated.	No additional data needed.
Surface Water	Ingestion Dermal contact Inhalation	No No No	No surface water bodies within 1,000 feet	
Surficial Soil	Ingestion Dermal contact Inhalation	No No No	Soil exposure by potential construction worker (most likely in utility corridor). Although there is no surficial soil impact, subsurface soil evaluated as surface soil for construction worker as direct contact likely in utility trench.	No additional data needed.
Subsurface Soil	Ingestion Dermal contact Inhalation	Yes Yes Yes	Potential exposure to construction worker through soils leaching hydrocarbons to groundwater in utility trench.	No additional data needed.



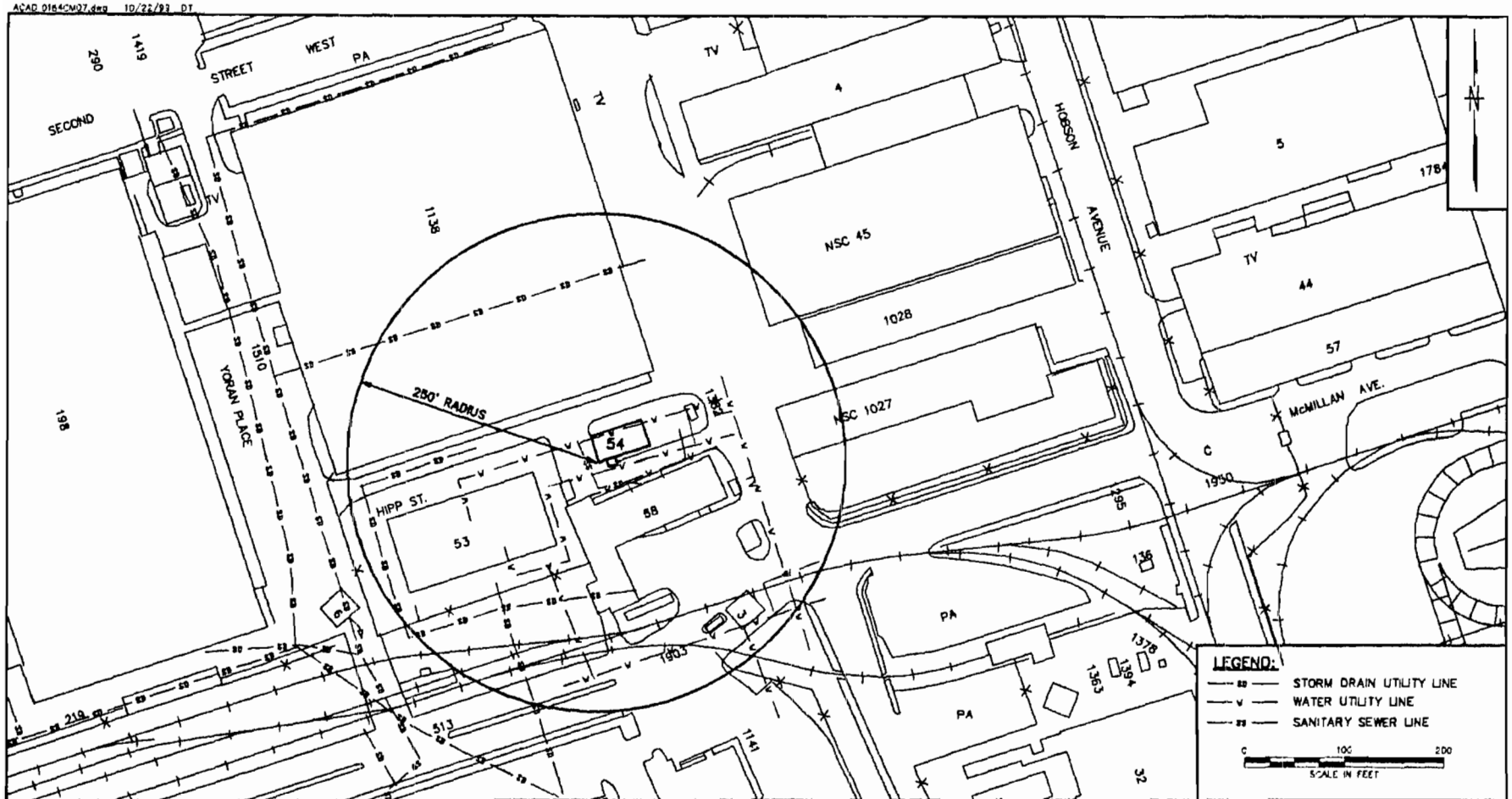
SOURCE: QUADRANGLE MAP SOUTH CAROLINA, REVISED 1979
QUADRANGLE MAP NORTH CHARLESTON REVISED, 1979

DRAWN BY HJP DATE 8/20/99		SITE LOCATION MAP SITE 32, BUILDING 54, ZONE C CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SC	CONTRACT NO. N0164
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

ACAD:0164CM04.dwg 01/25/00 HJP

ACAD 0164CM07.dwg 10/22/93 DT



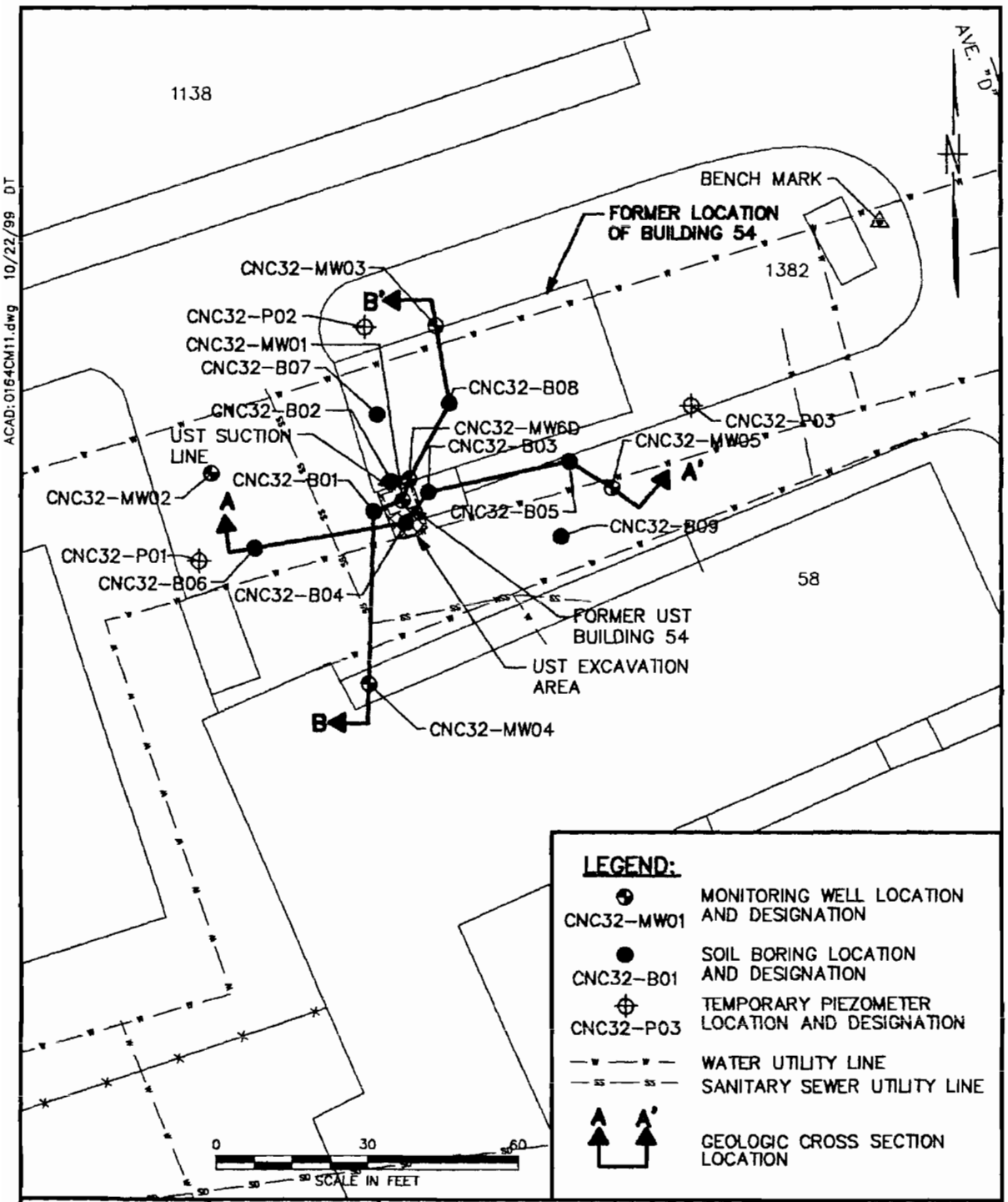
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

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

SITE VICINITY MAP
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0164
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2
REV. 0

FORM CADD NO. 3011_BLDVG - REV 0 - 1/28/98

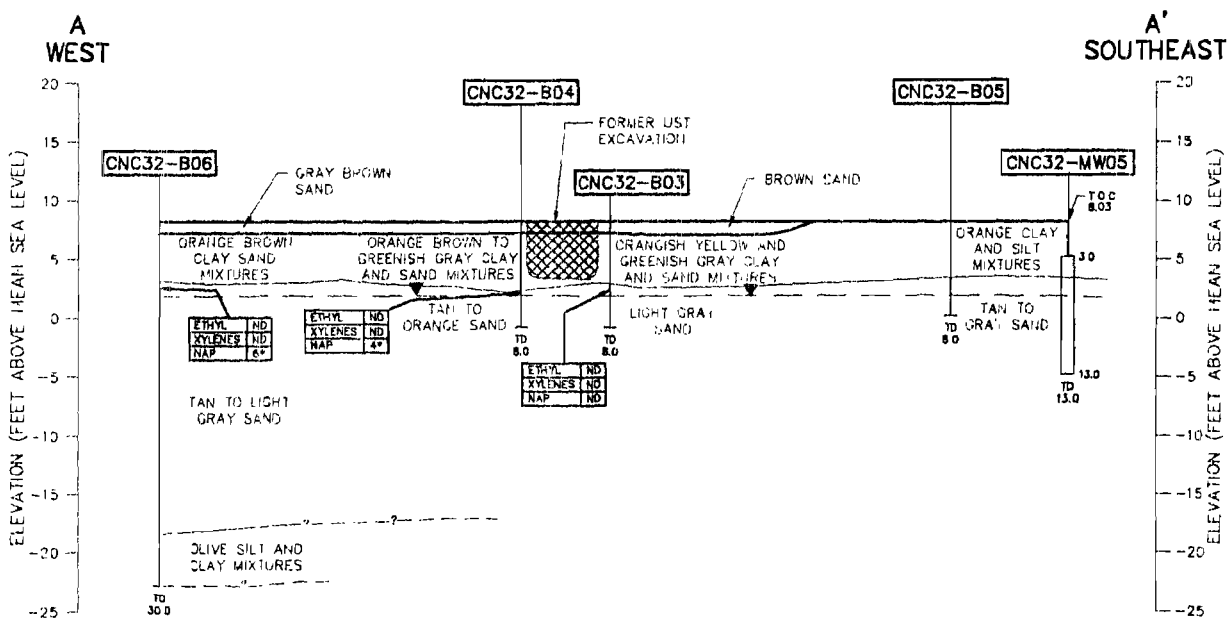


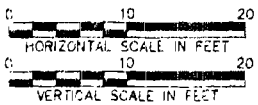
ACAD:0164CM11.dwg 10/22/99 DT

DRAWN BY DLT 10/22/99		SITE MAP AND SAMPLING LOCATIONS SITE 32, BUILDING 54 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0164
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 3 / REV. 0

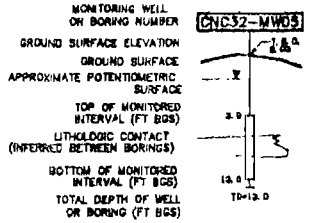
FORM CADD NO. SDIV_AV.DWG – REV 0 – 1/20/98

ACAD 0164GX01.dwg 10/27/99 DT





LEGEND:



DETECTED SOIL PARAMETER CONCENTRATIONS (ug/kg) AT SAMPLE DEPTH

ETHYL	ND
XYLENES	ND
NAP	4*

ETHYL = ETHYLBENZENE
XYLENES = TOTAL XYLENES
NAP = NAPHTHALENE
ND = NOT DETECTED (BELOW LABORATORY DETECTION LIMITS)

NOTE:
GROUNDWATER BTEX, NAPHTHALENE AND PAH PARAMETERS REPORTED BELOW LABORATORY DETECTION LIMITS IN MONITORING WELL CNC32-MW05.

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

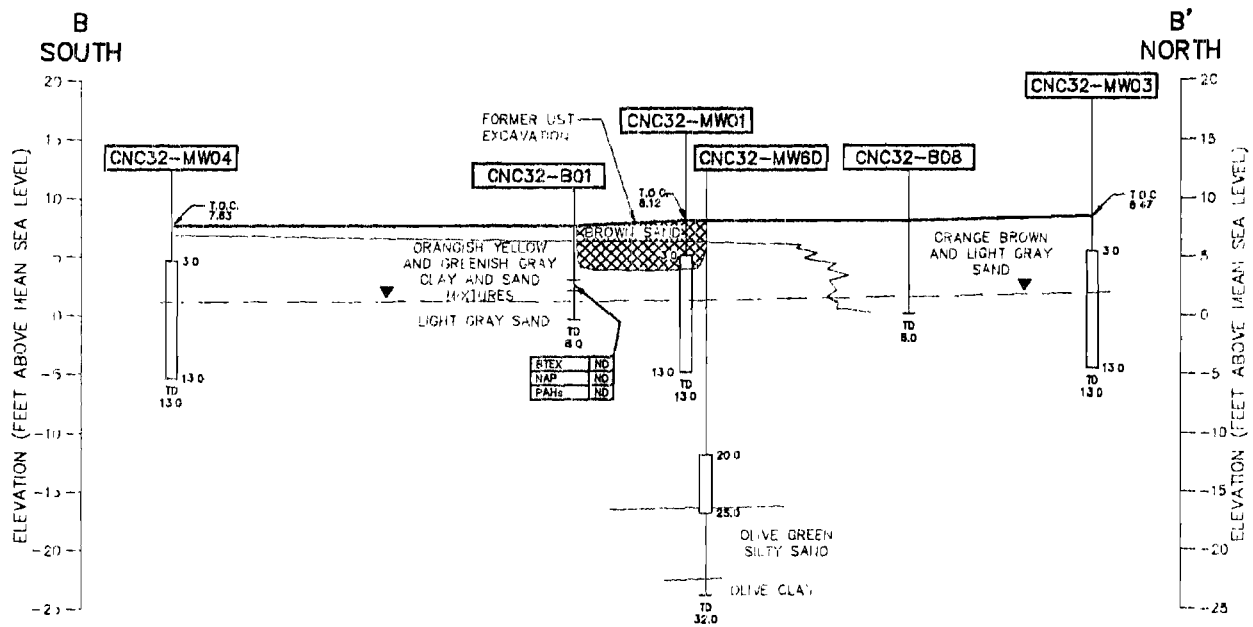
DRAWN BY DLT DATE 10/22/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION A-A'
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO 0164
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO FIGURE 4
REV 0

FORM CADD NO SOUTH-M1BCN - REV 0 - 9/1/99

ACAD 0164CX02.dwg 10/27/99 DT



LEGEND:

MONITORING WELL OR BORING NUMBER — CNC32-MW03

GROUND SURFACE ELEVATION — T.O.C. 8.67

GROUND SURFACE

APPROXIMATE POTENTIOMETRIC SURFACE

TOP OF MONITORED INTERVAL (FT BGS) — 3.0

LITHOLOGIC CONTACT (INFERRED BETWEEN BORINGS)

BOTTOM OF MONITORED INTERVAL (FT BGS) — 13.0

TOTAL DEPTH OF WELL OR BORING (FT BGS) — TD=13.0

DETECTED SOIL PARAMENTER CONCENTRATIONS (ug/kg) AT SAMPLE DEPTH

BTEX	ND
NAP	ND
PAHs	ND

BTEX = BENZENE, TOLUENE, ETHYLBENZENE AND TOTAL XYLENES

NAP = NAPHTHALENES

PAHs = POLYNUCLEAR AROMATIC HYDROCARBONS

ND = NOT DETECTED (BELOW LABORATORY DETECTION LIMITS)

NOTE:

GROUNDWATER BTEX, NAPHTHALENE AND PAH PARAMETERS REPORTED BELOW LABORATORY DETECTION LIMITS IN MONITORING WELLS CNC32-MW01, CNC32-MW03, CNC32-MW04 AND CNC32-MW6D

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DLT DATE 10/22/99

CHECKED BY DATE

COST/SCHED-AREA

SCALE AS NOTED

GEOLOGIC CROSS SECTION B-B'
SITE 32, BUILDING 54
ZONE C, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO 0164

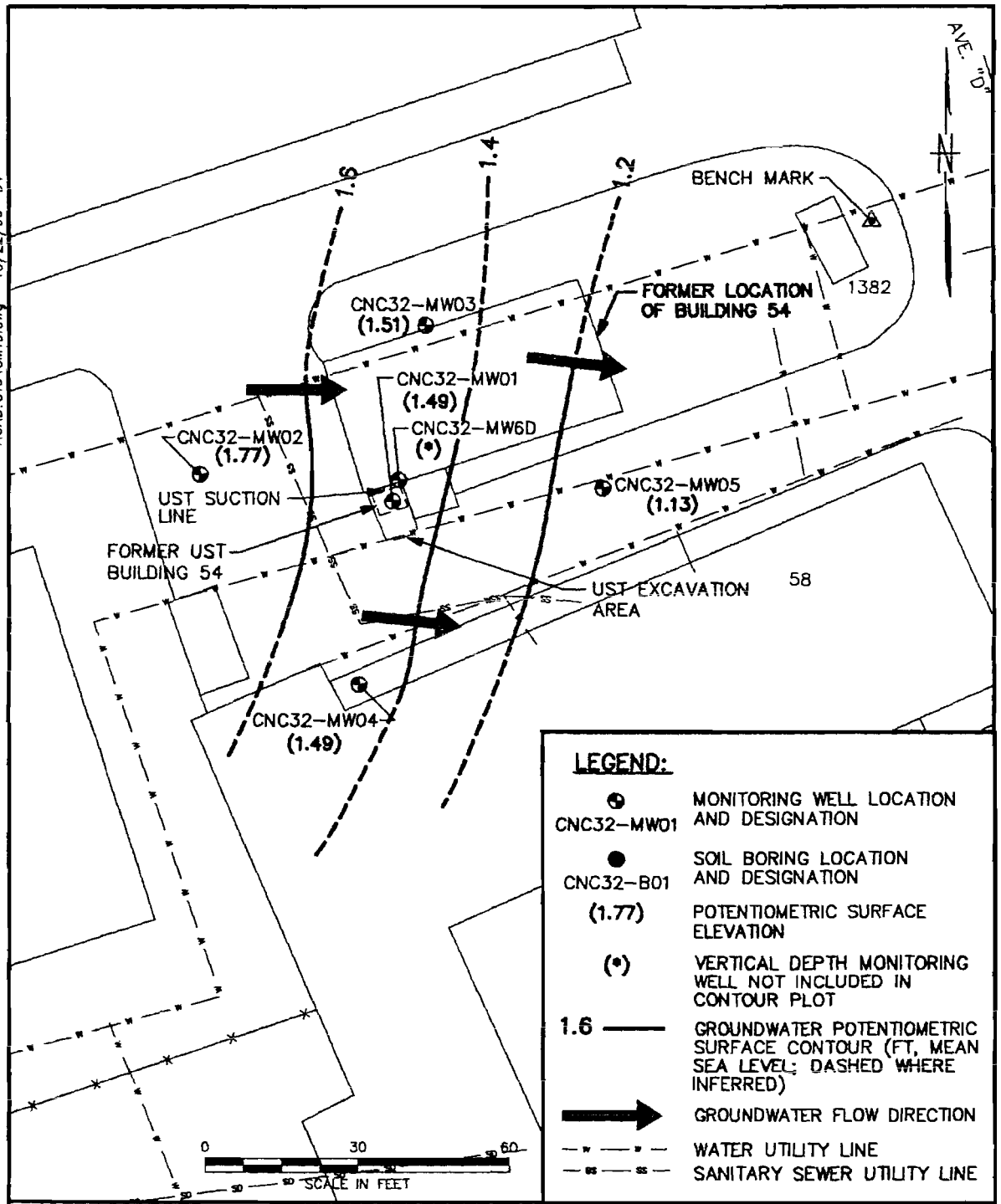
APPROVED BY DATE

APPROVED BY DATE

DRAWING NO FIGURE 5

REV 0

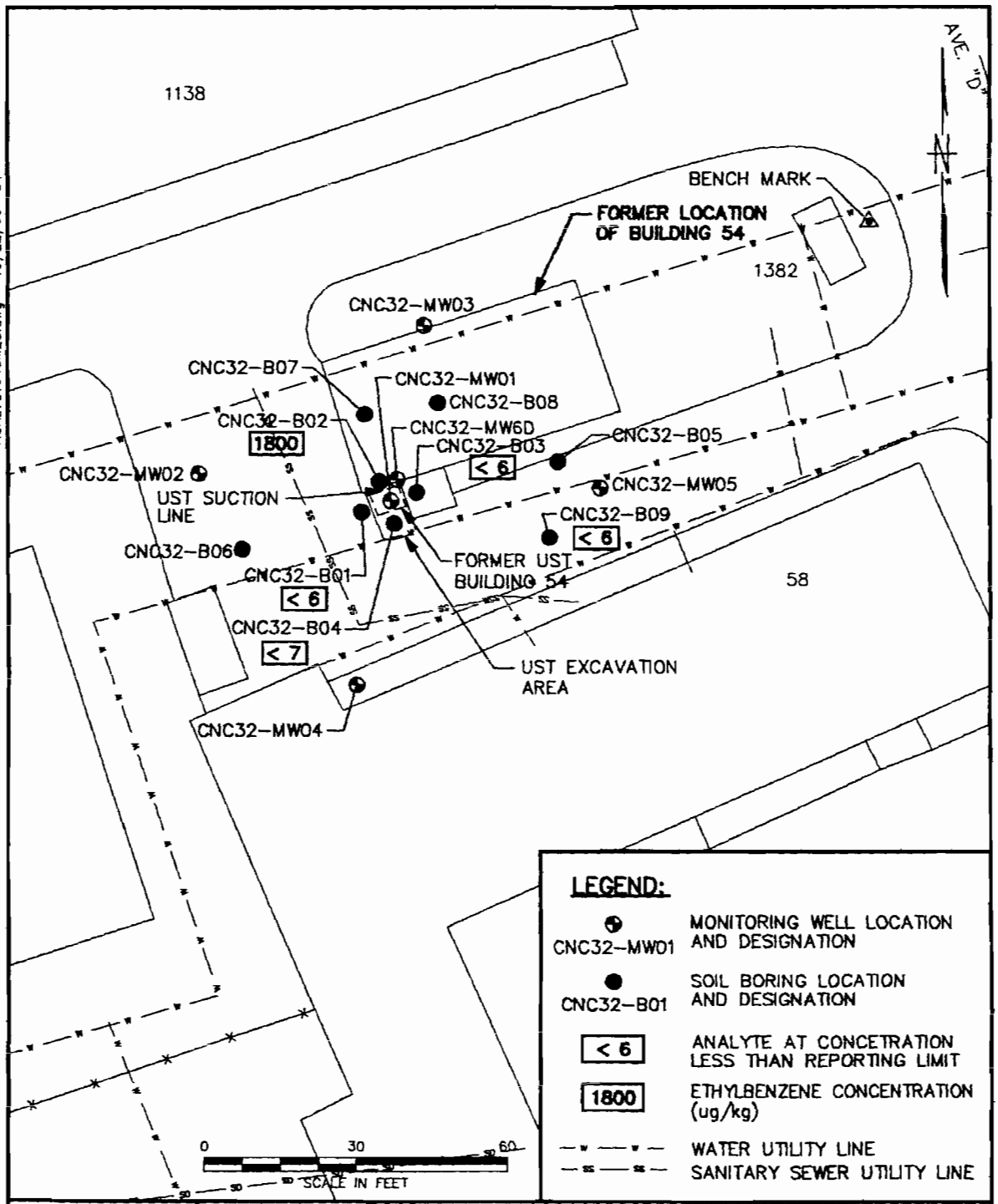
FORM CADD HC SOUTH-B.DGN - REV 0 - 9/2/99



ACAD:0164GM19.dwg 10/22/99 DT

DRAWN BY DLT 10/22/99		GROUNDWATER POTENTIOMETRIC MAP (SEPTEMBER 11, 1999) SITE 32, BUILDING 54 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0164
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 6 / REV. 0

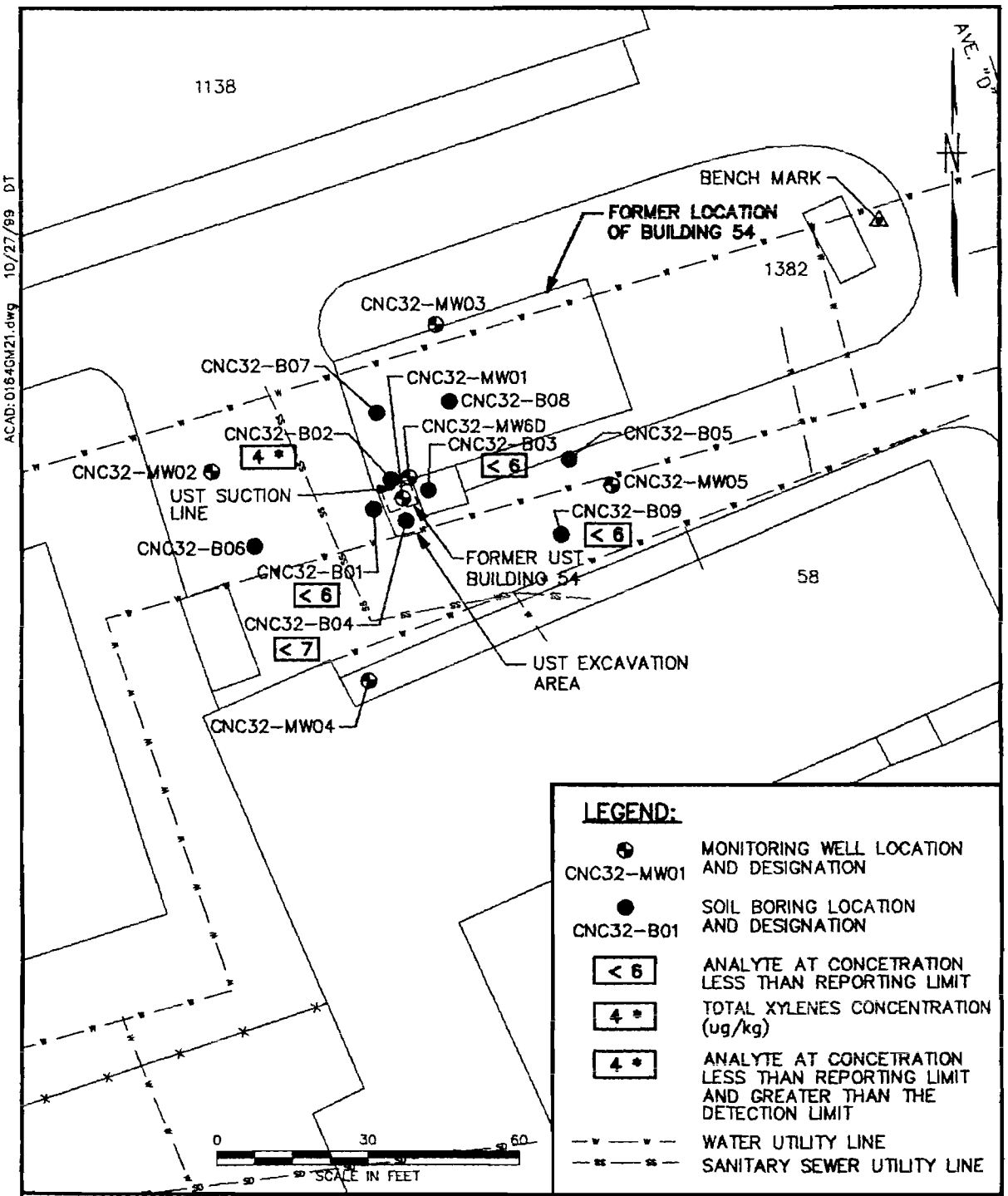
FORM CADD NO. SDIV_AV.DWG – REV 0 – 1/20/98



ACAD:0164GM20.dwg 10/22/99 DT

DRAWN BY DLT 10/22/99 DATE		ETHYLBENZENE SOIL CONCENTRATION MAP (MAY 1999) SITE 32, BUILDING 54 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0164
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7 / REV. 0

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



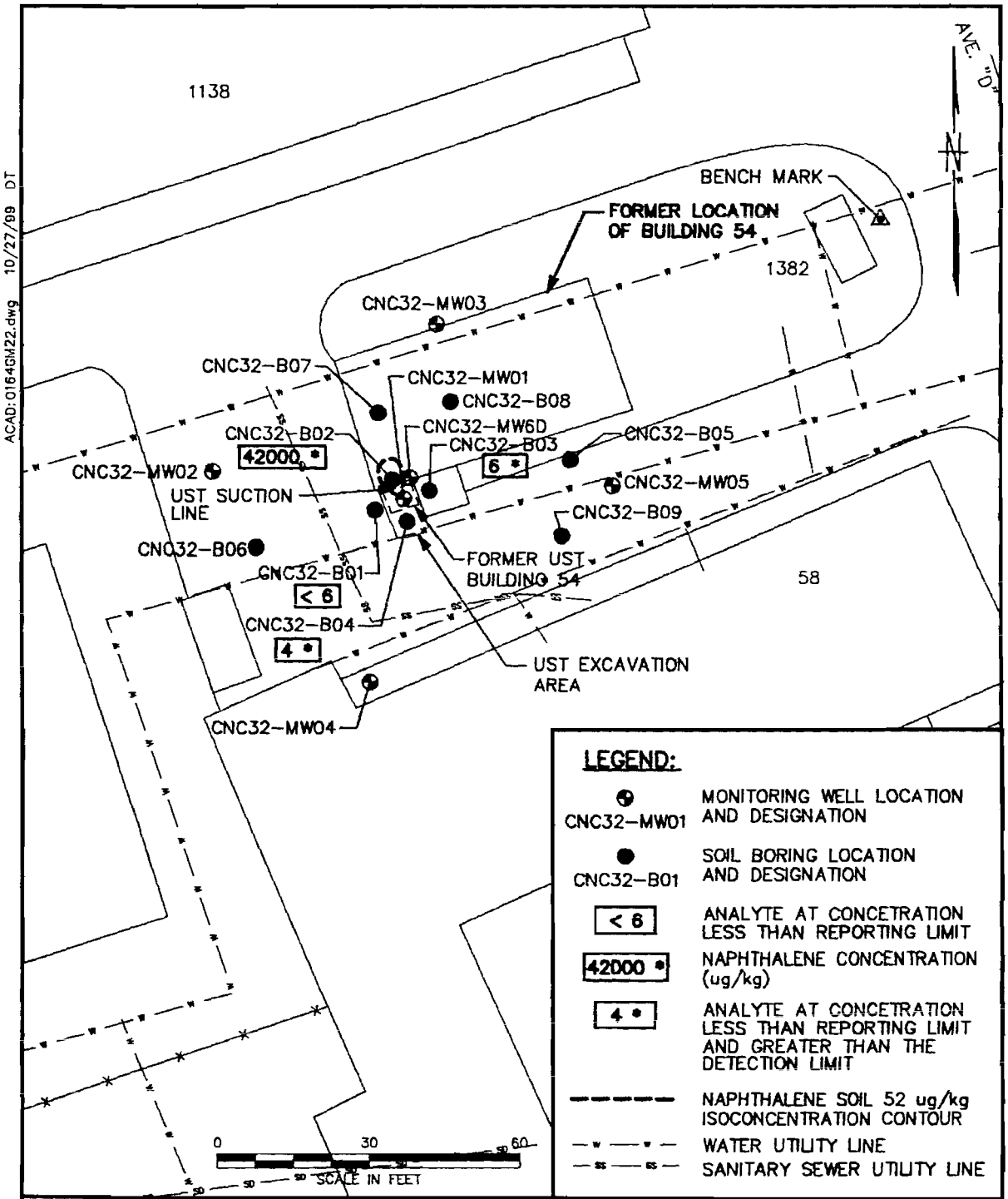
LEGEND:

CNC32-MW01	MONITORING WELL LOCATION AND DESIGNATION
CNC32-B01	SOIL BORING LOCATION AND DESIGNATION
< 6	ANALYTE AT CONCETRATION LESS THAN REPORTING LIMIT
4 *	TOTAL XYLENES CONCENTRATION (ug/kg)
4 *	ANALYTE AT CONCETRATION LESS THAN REPORTING LIMIT AND GREATER THAN THE DETECTION LIMIT
—w—w—	WATER UTILITY LINE
—ss—ss—	SANITARY SEWER UTILITY LINE

ACAD: 0164GM21.dwg 10/27/99 DT

DRAWN BY DATE DLT 10/22/99	TOTAL XYLENES SOIL CONCENTRATION MAP (MAY 1999) SITE 32, BUILDING 54 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0164	
CHECKED BY DATE		APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 8	REV. 0

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



ACAD:0164GM22.dwg 10/27/99 DT

DRAWN BY DATE DLT 10/22/99		NAPHTHALENE SOIL CONCENTRATION MAP (MAY 1999) SITE 32, BUILDING 54 ZONE C, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0164
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 9 / REV. 0

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