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CORRECTIVE ACTION PLAN FOR ZONE B/ SITE 14 QUARTERS S UST FOR QUARTERS S

CNC CHARLESTON SC

8/1/2000

CH2M HILL

CORRECTIVE ACTION PLAN
FOR
ZONE B/ SITE 14 QUARTERS S
UST FOR QUARTERS S

SITE IDENTIFICATION # 01089

Charleston Naval Complex
Charleston, South Carolina

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

Contract Number N62467-99-C-0960

August 2000

CORRECTIVE ACTION PLAN
FOR
ZONE B/ SITE 14-QUARTERS S
UST FOR QUARTERS S

SITE IDENTIFICATION # 01089

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

Contract Number: N62467-99-C-0960

August 2000

PREPARED BY:

28 Aug 2000

Brian R. Crawford
Engineer II
CH2M-JONES, LLC.

APPROVED BY:

29 August 2000

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: 8/31/00

South Carolina Registration No. 14,220

SOUTH CAROLINA PROFESSIONAL ENGINEER
REGISTERED No. 14220
RICHARD R. GARCIA

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

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ACRONYMS

bls	below land surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene Isomers
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
SLA	Standard Limited Assessment
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 B/ Site 14-Quarters S; Underground Storage Tank (UST) S 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: 01089. This CAP provides methods to further evaluate the applicability of intrinsic remediation and monitoring well abandonment as a corrective action for UST S 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], 1999).

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 Standard Limited Assessment (SLA) for Site 14, which includes two (UST) systems for Quarters S Housing at Charleston Naval Complex (CNC) Zone B, in North Charleston, South Carolina. The USTs were used to store fuel oil for the boilers of Quarters S in the Naval housing area. Both 550-gallon steel USTs were removed in April 1998. The assessment was completed under the direction of the South Carolina Department of Health and Environmental Control Rapid assessment guidance dated June 20, 1997, and approval letter dated April 7, 1999.

1.2 Objective

This CAP presents the groundwater monitoring plan to assess the down gradient plume migration and intrinsic bioremediation/natural attenuation of petroleum hydrocarbons contamination in order to validate the assumptions and calculations used in the in the (SLA) completed by TTNUS. Details for the abandonment of monitoring wells at UST S 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. Figures 2 and 3 depict the public utilities located within 250 feet of the former UST S 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). Corrective action data summary forms are provided in Appendix A. The following utility receptors were located:

TABLE 1

Utility	On-Site or Distance/ Direction from Site	Depth to Utility
Buried Communication Cable	35 feet east of former UST S2	2-6 ft bls
Electric	At former UST S1	2-6 ft bls
Water	At former UST locations	2-6 ft bls
Sanitary Sewer	At former UST location	2-6 ft bls
Storm Drain	75 ft south of former UST S1	2-6 ft bls

According to the SLA 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 S is Noisette Creek located approximately 972 feet to the north. No basements are located on the CNC property.

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, 1999).

A receptor survey was completed for the following:

TABLE 2

Receptor	Distance/ Direction from Site
Visitor/Recreator	On-site no complete pathway
On-site Resident	On-site no complete pathway
Off-site Resident	Nearest Building~50 ft south-southeast- no complete pathway
Construction Worker	On-site-working in soils or groundwater
Commercial Worker	On-site no complete pathway
Surface Water	UST to Noisette Creek ~ 972 ft- no complete pathway

2.1 Fate and Transport Modeling

No groundwater concentrations exceeded the SCDHEC Risk Based Screening Levels (RBSLs); therefore, fate and transport modeling is not required for this site.

2.2 Soil Leaching Site Specific Target Level

The naphthalene concentration from soil boring B02 duplicate of 1.8 mg/kg exceeded the soil leaching RBSL for sandy soil of 0.210 mg/kg. The SCDHEC Soil Leachability Model was used to calculate a site-specific target level (SSTL) for naphthalene. Site-specific parameters were input where available; else SCDHEC defaults for sandy soils were used. The minimum calculated groundwater RBSL for construction worker exposure of 1,63mg/L was used as opposed to the groundwater RBSL for ingestion of 0.01 mg/L. The soil leaching SSTL calculated for naphthalene was 250 mg/kg, which is greater than the maximum naphthalene concentration of 1.8 mg/kg found in the soil during the site assessment.

TABLE 3

Chemical of Concern	Concentration in SB02-duplicate (mg/kg)	Soil Leaching SSTL (mg/kg)
Naphthalene	1.8	250

Therefore, since the maximum soil concentration of naphthalene (1.8 mg/kg) found during the site assessment does not exceed the calculated SSTL for naphthalene (250 mg/kg), the construction worker is not at risk if exposed to groundwater by dermal contact, incidental ingestion, or inhalation. The concentration of naphthalene in the groundwater resulting from naphthalene leaching from the soil to the groundwater will not exceed the RBSL for a construction worker in a utility trench (1.63 mg/kg) regardless of distance from the source. This potential receptor is considered nonthreatoned and further analysis is unnecessary (TTNUS 2000).

3.0 PROPOSED REMEDIATION TECHNOLOGY

Based on the results of the SLA modeling, base line groundwater monitoring and soil boring sampling will be performed for the site. The monitoring program will consist of sampling initially all of the surrounding wells adjacent to the source point, and two additional boring sampling points. The proposed monitoring program is described in detail in Sections 4.0 and 5.0 of this plan. The Corrective Action Monitoring plan is provided in Appendix C.

4.0 MONITORING WELL INSTALLATION AND ABANDONMENT

4.1 Monitoring Well Installation

Because the CoC (naphthalene) was only found in a duplicate soil sample at 2-3 feet bls, no additional monitoring wells will be added to this site at this time.

4.2 Monitoring Well Abandonment

A total of thee monitoring wells will be abandoned at Quarters S 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

Surveying of any new monitoring wells will be conducted and certified by a South Carolina State Registered Land Surveyor. Datum to be used will be in accordance with USGS NAD' 27. The surveying subcontractor will report all elevations referenced to mean sea level.

After installation, the ground surface, top of the protective casing will be surveyed to within 0.01-foot vertical accuracy by a state-certified land surveyor. In addition the well will be surveyed to a 0.1-foot horizontal accuracy.

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 GROUNDWATER MONITORING PROGRAM

5.1 Monitoring Frequency and Reporting

For groundwater flow see figure 3 in section 8 and tables in section 7. The groundwater monitoring program proposed at UST S will be performed in accordance with the SCDHEC Corrective Action Guidance dated June, 1997 and consist of the following:

TABLE 4

Sampling date or (Quarter)	Monitoring Wells Sampled	Field Measures	Laboratory Analytical
Fourth Quarter[1]	MW-01, MW-02, MW-03 Two additional soil samples[3]	T°, pH, DO, Conductivity, Depth to water, Total depth, turbidity	Naphthalene By method 8260 Nitrate, sulfate,total dissolved iron, methane, alkalinity
First Quarter[2]	MW-01, MW-02, MW-03	T°, pH, DO, Conductivity, Depth to water, Total depth, turbidity	Naphthalene By method 8260 Nitrate, sulfate,total dissolved iron, methane, alkalinity

1. Forth quarter: defined as October, November December.
2. First quarter: Defined as January, February, March
3. Soil samples: Taken from north and south of the former SB-02; from 1-2, 2-3, and 3-4 feet.

- **Frequency:** Initially all monitoring wells at this site will be sampled along with two soil samples located within two feet north and south of the former SB-02 area, respectively. Following analytical results, should no CoCs be identified above the RBSLs, a re-evaluation of no further action will be considered. In the event that the CoCs are above RBSLs, additional groundwater sampling will be collected from wells CNC14-MW02, CNC14-MW01 and CNC14-MW03. A schedule of this event would continue on a quarterly basis as discussed above.

- **Reporting:** Semi-annual groundwater monitoring reports will be submitted to SCDHEC.

Included in the semi-annual reports will be field and analytical information from the certified laboratory indicating well numbers, analytical methods used, date sampled, date analyzed, and method detection limits.

At the end of the 6-month period, a performance evaluation will be submitted to SCDHEC providing the effectiveness of the intrinsic biodegradation/natural attenuation occurring and any recommendations for the site. In addition to the performance evaluation, modeling may be performed after each sampling event.

- **Groundwater Sampling**

5.0 PROPOSED GROUNDWATER MONITORING PROGRAM

5.1 Monitoring Frequency and Reporting

The groundwater monitoring program proposed at UST S will be performed in accordance with the SCDHEC Corrective Action Guidance dated June, 1997 and consist of the following:

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First Quarter[2]	MW-01, MW-02, MW-03	T°, pH, DO, Conductivity, Depth to water, Total depth, turbidity	Naphthalene By method 8260 Nitrate, sulfate,total dissolved iron, methane, alkalinity

1. Forth quarter: defined as October, November December.
2. First quarter: Defined as January, February, March
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- **Reporting:** Semi-annual groundwater monitoring reports will be submitted to SCDHEC.

Included in the semi-annual reports will be field and analytical information from the certified laboratory indicating well numbers, analytical methods used, date sampled, date analyzed, and method detection limits.

At the end of the 6-month period, a performance evaluation will be submitted to SCDHEC providing the effectiveness of the intrinsic biodegradation/natural attenuation occurring and any recommendations for the site. In addition to the performance evaluation, modeling may be performed after each sampling event.

- **Groundwater Sampling**

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.

- **Soil Sampling**

Soil samples will be collected along with the first round of groundwater sampling, in order to verify the accuracy of the sample indicating the naphthalene readings.

5.2 Analytical Parameters

The following constituents will be analyzed for each groundwater and soil samples:

- Naphthalene using method 8260.

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

- Nitrate (NO^{-3})
- Sulfate (SO^{-4})
- Total dissolved iron
- Methane (CH_4)
- Alkalinity

5.3 Field Measurements

The following parameters will be sampled in the field:

- Temperature
- pH
- Dissolved Oxygen
- Depth to water table
- Depth of well
- Turbidity
- Specific Conductance

Field measurements will be recorded in the field book and in field forms provided in Appendix D.

5.4 Groundwater Level Measurements

Groundwater measurements will be taken from all monitoring wells at the site during each sampling event. All water level measurements will be taken on the same day as anticipated sampling.

Measurements will be taken with an electrical water level meter or interface probe if floating product is present using the highest part of the top of the casing as a reference point for determining depths to water and total depths. Water level measurements will be recorded to the nearest 0.01 foot in the field book.

5.5 Sample Handling

Sample handling will be conducted in accordance the following references:

EPA EISOPQAM (EPA May, 1996)
Charleston Naval Complex Sampling and Analysis Plan (July, 1999)

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 bills

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

TABLE 5

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 D.

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 41 (Quarters S), 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.

D H E C

PROMOTE PROTECT PROSPER

Corrective Action Data Summary
Division of Underground Storage Tank Management

GENERAL

Facility ID #: 01089 County: CHARLESTON

Facility Name: CHARLESTON NAVAL COMPLEX

Facility Address: 1545 HOBSON AVENUE, NORTH CHARLESTON, SC 29405

UST Owner/Operator: SOUTHERN DIVISION NAVAL FACILITIES ENG. COMM. Phone #: 843-820-7307

Address: 2155 EAGLE DRIVE NORTH CHARLESTON, SC 29406

Current use of facility/property: NOT IN USE

Current property owner name: SAME AS ABOVE

Current property owner address: SAME AS ABOVE

# of USTs: two Replaced / Tested: _____ (date) Removed: _____ (date)
(Circle one)

Type of product: ☐ Gasoline ☐ Diesel ☐ Kerosene ☐ Waste Oil ☒ Other: HEATING OIL (specify)

Previous Treatment: ☐ Yes ☐ No Effectiveness: _____

The release occurred in: ☐ UST Basin ☐ Dispensers ☐ Line ☐ Other Please specify: UST S-2 (two 3/8" diameter holes found about

EXPOSURE AND POINTS OF COMPLIANCE INFORMATION

. the exposure points, points of compliance and the x, y, and z coordinates for each.

EP	PC	x	y	z
N/A				

SOIL SSTL's

Units: mg/kg

CoC	SSTL
Benzene	
NAPHTHALENE	250 mg/kg

Corrective Action Data Summary

Facility ID#: 01089 Facility Name: CHARLESTON NAVAL COMPLEX

LS

These SSTLs are established for each point of compliance. _____ Units: mg/kg

Chemical of Concern	MW-GW	MW-GW	MW-GW	MW-GW
Benzene				
* NAPHTHALENE *				

* GW RESULTS INDICATED ALL COCS WERE BELOW RBSLS.

These SSTLs are established for each point of compliance. _____ Units:

Chemical of Concern	MW-GW	MW-GW	MW-GW	MW-GW

These SSTLs are established for each point of compliance. _____ Units:

Chemical of Concern	MW-GW	MW-GW	MW-GW	MW-GW

The technical file is available for review through the Freedom of Information Office.
Please call 803-734-5376 for an appointment.

Selected Remedial Approach

☐ Active ☑ Intrinsic

:eptors

.. the receptors and exposure pathways (include distance from source).

(1) VISITOR / RECREATOR: ON SITE - NO COMPLETE PATHWAY
(2) ON SITE RESIDENT: ON-SITE - NO COMPLETE PATHWAY
(3) OFF SITE RESIDENT: NEAREST BUILDING ~ 50-FT SOUTH-SEAST / NO COMPLETE PATHWAY.
(4) CONSTRUCTION WORKER: ON-SITE / WORKING IN SOILS + GROUNDWATER.
(5) COMMERCIAL WORKER: ON-SITE / NO COMPLETE PATHWAY.
(6) SURFACE WATER: UST S2 TO NOISETTE CREEK ~ 972-FT / NO COMPLETE PATHWAY
(7) COMMUNICATION CABLE: ~35-FT EAST OF UST SITE
(8) ELECTRIC: ~ AT FORMER UST S1
(9) WATER: AT FORMER UST LOCATIONS.
(10) SANITARY SEWER: AT FORMER UST LOCATIONS.
(11) STORM SEWER: ~75-FT SOUTH OF UST S1.

* ALL UTILITIES ARE ~ 2 to 6-FT BELOW LAND SURFACE.

References

Please see the following reports for site specific information.
(List the report title and date)

TETRA TECH NUS, INC. MARCH 2000. STANDARD LIMITED ASSESSMENT REPORT for SITE 14, QUARTERS S (ZONE 13), CHARLESTON NAVAL COMPLEX, NORTH CHARLESTON, SC.

SUMMARY OF SLUG TEST

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID #: 01089 **COUNTY:** Charleston

FACILITY NAME: Site 14, Quarters S, Charleston Naval Complex

Slug Data

See Appendix: Final Zone B RFI Report **Table:** 2.3 and 2.4 **Figure:** **for a list of all data measurements. (water level logs, etc.) (Complete as appropriate.)**

Water Level Recovery Data was measured by See Final Zone B RFI Report
(Hermit Data Logger, Manually with Water Level Indicator, etc.) (List Method).

Complete the following table for each well tested.

COMPLETE A SECOND SHEET IF MORE THAN FOUR WELLS ARE TESTED

Slug Test Conducted in well(s) number	NBCB-GDB-001	NBCB-GDB-002	NBCB-GDB-004	NBCB-GDB-04D
nitial Rise/Drawdown in well (feet)				
adius of Well Casing (feet)				
Effective Radius of Well (feet)				
Static Saturated Aquifer Thickness (feet)				
Length of Well Screen (feet)				
Static Height of Water Column in Well (ft)				

Calculations

See Appendix: Final Zone B RFI Report **Table** **Figure:** **for calculations. (Complete as appropriate.)**

The method for aquifer calculations was: Bouwer and Rice (1976) for shallow, Cooper for deep **(i.e. Bouwer-Rice, Cooper, etc.)**

Calculated values by well were as follows:

Slug Test Conducted in well(s) number	NBCB-GDB-001	NBCB-GDB-002	NBCB-GDB-004	NBCB-GDB-04D
Hydraulic Conductivity	0.00134	0.792	7.92	0.276 (deep well)

Thickness of the aquifer used to calculate hydraulic conductivity was **feet.**
The aquifer is **confined** **semi-confined** X **water table (Check as appropriate.)**
he estimated seepage velocity is 10.31 **feet per year based on**
a hydraulic conductivity of 2.9 **, a hydraulic gradient of** 0.00458 **, and**
a porosity of 0.47 **per cent for** sandy **soil (list type i.e., silty sand, clay, etc).**

D H E C

PROMOTE PROTECT PROSPER

Corrective Action Monitoring Plan

.lity ID#: _____

Proposed Monitoring Program

_____ Active Corrective Action ✓ Intrinsic Corrective Action

List method used to verify intrinsic remediation:

Tracer compounds: N/A _____ _____

Time vs. concentration: _____

Other: _____

Proposed Sampling Parameters and Frequency

Parameter	Frequency	Well #
NAPHTHALENE	*QUARTERLY*	MW 01 / MW 02 / MW 03
FIELD: DO, pH, Conductivity		
TURBIDITY + TEMPERATURE		

* PLEASE SEE SECTION 3-4 and 5 OF THE CORRECTIVE ACTION PLAN.

References

_____

_____

Appendix Check List

- [ ] Soil Quality Data Table
- [ ] Ground-Water Quality Data Table/Graph
- [ ] Potentiometric Data Table/Graph
- [ ] Site Map (topographic or county map)
- [ ] Tax Map
- [ ] Soil Impact Map
- [ ] Ground-Water Impact Map
- [ ] Cross Section
- [ ] Predicted Future Migration Map(s)
- [ ] North Arrow and Bar Scales on all maps

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Zone B
Project No.:

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

Sample ID No.: 14SLB02020
Sample Location: B03
Sampled By: RF/JA
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6 2 99 Time: 1450 Method: Monitor Reading (ppm):	2-3'	dk br.	Clayey sand

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX/EDB	4 encores		
DUP	4 encores		
PAH	1 4oz		
DUP	1 4oz		
TPH	1 4oz		
DUP	1 4oz		

OBSERVATIONS / NOTES:

Duplicate taken

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: 14SLB02020 3D 1455

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Zone B
Project No.:

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

Sample ID No.: 14SLB04Ø3Ø4
Sample Location: B04
Sampled By: RF
C.O.C. No.:

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

GRAB SAMPLE DATA:

Date: 6 2 99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1505	3-4'	br.	Silty sand
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH	1 4 oz		
BTEX EDB	4 encore		
Grain Size	1 32 oz		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Zone B
Project No.:

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

Sample ID No.: 1452B05B3d4
Sample Location: 10CWC14B05
Sampled By: N. Franklin
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/2/99 Time: 1525 Method: Monitor Reading (ppm):	3-4' bgs	Brown	Clayey Sand Trace Silt

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX/EDB	4 - 5g. Encores	✓	
PAH	1 4oz	✓	
TOC/FOC	1 4oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): N. Franklin

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Zone B
Project No.:

[] Surface Soil
[X] Subsurface Soil
[] S diment
[] Other:
[] QA Sample Type:

Sample ID No.: 145LB06405
Sample Location: 145LB06
Sampled By: KJ
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/2/99			
Time: 1540	4-5'bgs	brown	Sandy clay
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX/EDB	4-4oz Encore	✓	
PAH	1 4oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

MONITORING WELL DEVELOPMENT RECORD

Well: MW-1
Site: 14
Date Installed:
Date Developed: 7-2-99
Dev. Method: Pump
Pump Type:

Depth to Bottom (ft.): 13.95
Static Water Level Before (ft.): 4.41
Static Water Level After (ft.):
Screen Length (ft.): 10.0'
Specific Capacity: 1.55
Casing ID (in.): 2"

Responsible Personnel: R. Hill
Drilling Co.: Custom Drilling
Project Name:
Project Number:

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)	D.O
1145		1		27.1	6.09	.588	999	Gray	2.77
1152		10		22.5	6.13	.516	999	"	5.50
1154		20		22.1	6.06	.493	999	"	5.55
1156		30		22.0	6.01	.475	999	"	5.31
1158		40		22.1	6.08	.478	999	"	5.55
1201		45		21.9	6.02	.467	600	"	5.25
1205		50		22.1	6.01	.447	277	"	5.20
1207		55		22.1	5.99	.442	204	"	5.28
1213		65		22.0	5.96	.475	650	"	5.40
1216		75		21.9	5.99	.461	749	"	5.11
1221		80		22.4	6.03	.483	561	"	5.23
1228		85		21.8	5.89	.481	306	"	4.11
1230		95		21.6	5.86	.465	121	"	4.15
1231		100		21.5	5.86	.473	95	Cloudy	4.60
1234		105		21.6	5.90	.473	26	"	4.56
								Total Purged-	
								105 gals.	

Drum # DW-CNC14-MW01

MONITORING WELL DEVELOPMENT RECORD

Page ___ of ___

Well: CNC14-MW2
Site: Site 14
Date Installed: 8/25/99
Date Developed: ~~10~~ 8/26/99
Dev. Method: pump
Pump Type: ___

Depth to Bottom (ft.): 13
Static Water Level Before (ft.): 5.00
Static Water Level After (ft.): ___
Screen Length (ft.): 10 ft
Specific Capacity: ___
Casing ID (in.): 2"

Responsible Personnel: J. Hofer
Drilling Co.: Custom
Project Name: CNC
Project Number: 0141

Tim	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1029		0	5.00	25.2	5.66	1.54	>999	Gray
1037		30	10.5	23.9	5.83	0.609	7999	Gray
1039		40	10.8	23.8	5.83	0.564	774	Gray
1045		60	11.0	23.6	5.72	0.543	486	Gray
1050		75	9.75	23.8	5.80	0.543	409	Gray
1055		95	10.0	23.7	5.80	0.533	316	lgt gray
1102		115	10.20	23.7	5.79	0.530	270	lgt gray
1107		130	10.00	23.7	5.80	0.529	206	lgt gray

MONITORING WELL DEVELOPMENT RECORD

Pag ___ of ___

Well: CNC14-MW3
Site: ~~Bt~~ Site 14
Date Installed: 8/25/99
Date Developed: 8/26/99
Dev. Method: pump
Pump Type:

Depth to Bottom (ft.): 14
Static Water Level Before (ft.): 4.21
Static Water Level After (ft.):
Screen Length (ft.): 10 ft
Specific Capacity:
Casing ID (in.): 2"

Responsible Personnel: J. Hofer
Drilling Co.: Custom Drilling
Project Name: CNC
Project Number: 8141

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1115		10	11.2	23.2	5.84	0.585	>999	Gray
1123		35	11.5	22.8	5.83	0.555	>999	Gray
1129		65	10.8	22.7	5.85	0.531	189	lgt gray
1132		85	10.9	22.7	5.84	0.527	54	Clear

GROUNDWATER LEVEL MEASUREMENT SHEET

Pr ject Name: Site 14 Project N .: 0141
Location: CNC Charleston Personnel: Jason McCann / Thomas Thomp
Weather Conditions: Ptly Cloudy Measuring Device:
Tidally Influenced: Yes ___ No ___ 11:10 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
CNCH MW01	9/8/99	0915		14.26	4.71			
MW02	9/8/99	0917		14.35	5.15			
MW03	9/8/99	0918		13.07	4.20			

* All measurements to the nearest 0.01 foot

Page ____ of ____

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: CNC Site 14
Project No.: N0141
Sampled By: JJM & TT.
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14GLM0101
Sample Location: CNC14MW01
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

	Color (Visual)	ORP (Eh) (+/- mv)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (Meter, mg/l)	Sal. (%)	pH (SU)
Date: 9/8/99								
Time: 1225								
Method: peristaltic	clear	—	0.618	22.0	0	2.39	—	6.66

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT (CHEMetrics (Range: 0-1 mg/L)) Analysis Time: 14:48

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: 0.6 mg/L

Notes:

Alkalinity:

Equipment: (HACH Digital Titrator AL-DT) CHEMetrics (Range: _____mg/L) Analysis Time: 10:15 Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	_____ & _____	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	_____ & _____	x 0.4	= mg/L
☑	100-400 mg/L	100 ml	1.600 N	1.0	0 & 267	x 1.0	= 267 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:	0	0	267

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: 11:04

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

Titration Count		Concentration
_____	x 0.1	= mg/L
_____	x 0.2	= mg/L
_____	x 1.0	= mg/L
262	x 2.0	= 524 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

Project Site Name: CNC Site 14
Project No.: N0141
Sampled By: JJM & TT
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14GLM0101
Sample Location: CNC 14 MW01
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 (DR-850) HS-C Color Chart HS-WR Color Wheel Analysis Time: 1420
Program/Module: 610nm 93 Other: _____

Concentration: 0.13 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: 14:56
Equipment: DR-700 (DR-850) Other: _____ Filtered: ☐
Program/Module: 60
Concentration: 0.048 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:

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: CNC Site 14
Project No.: N0141
Sampled By: JJM & TT
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14GLM0101
Sample Location: CNC14MW01
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 (DR-850) HACH MN-5 Other: _____ Analysis Time: 12:30
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-850) IR-18C Color Wheel Other: _____ Analysis Time: 11:30
Program/Module: 500nm 33
Concentration: 3.04 mg/L
Filtered: ☐
Notes:

Hydr gen Sulfide (H_2S):

Equipment: (HS-C) Other: _____ Analysis Time: 11:39
Concentration: 3.0 mg/L Exceeded 5.0 mg/L range on color chart: ☐
Notes:

QA/QC Checklist:

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

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: CNC Site 14
Project No.: N0141
Sampled By: JJM TTT
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14GLM0201
Sample Location: CNC14MW02
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

	Color (Visual)	ORP (Eh) (+/- mv)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (Meter, mg/l)	Sal. (%)	pH (SU)
Date: 9/8/99								
Time: 1430								
Method: peristaltic	clear	—	1.24	22.9	0	0.73	—	6.52

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT (CHEMetrics (Range: 0-1 mg/L)) Analysis Time: 14:45

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: 0.4 mg/L

Notes:

Alkalinity:

Analysis Time: _____

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

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	= mg/L
☑	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	= mg/L
☑	200-800 mg/L	50 ml	1.600 N	2.0	0 & 208	x 2.0	= 416 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:	0	0	416

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: 11:09

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

Titration Count		Concentration
	x 0.1	= mg/L
	x 0.2	= mg/L
	x 1.0	= mg/L
362	x 2.0	= 724 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

Project Site Name: CNC Site 14
Project No.: N0141
Sampled By: JJM & TT
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14GLM0201
Sample Location: CNC 14 MW02
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 (DR-850) HS-C Color Chart HS-WR Color Wheel Analysis Time: 12155
Program/Module: 610nm 93 Other: _____
Concentration: 0.0 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: 14:50
Equipment: DR-700 (DR-850) Other: _____ Filtered: ☐
Program/Module: 60
Concentration: 0.055 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.

Project Site Name: CNC Site 14
Project No.: N0141
Sampled By: JJM & TT
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14 GLM 0201
Sample Location: CNC 14 MW02
Duplicate: ☐
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-850 HACH MN-5 Other: _____ Analysis Time: 12:20
Program/Module: 525nm 41
Concentration: 0.2 mg/L
Filtered: ☐
Digestion: ☐
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-850 IR-18C Color Wheel Other: _____ Analysis Time: 11:41
Program/Module: 500nm 33
Concentration: 3.36 mg/L
Filtered: ☐
Notes: Limit

Hydr gen Sulfide (H_2S):

Equipment: HS-C Other: _____ Analysis Time: 11:47
Concentration: 0.5 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: CNC Site 14
Project No.: N0141
Sampled By: JJM & TT
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14GLM0301
Sample Location: CNC 14 MW03
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

	Color (Visual)	ORP (Eh) (+/- mv)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (Meter, mg/l)	Sal. (%)	pH (SU)
Date: 9/8/99								
Time: 1210								
Method: peristaltic	clear	–	5.29	22.0	0	1.27	—	6.03

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT (CHEMetrics (Range: 1-12 mg/L)) Analysis Time: 14:53

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

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

CHEMetrics: 1.0 mg/L

Notes:

Alkalinity:

Analysis Time: 10:50

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	0 & 140	x 0.4	= 56 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:	0	0	56

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: 11:15

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

Titration Count		Concentration
_____	x 0.1	= mg/L
_____	x 0.2	= mg/L
_____	x 1.0	= mg/L
168	x 2.0	= 336 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

Project Site Name: CNC Site 14
Project No.: N0141
Sampled By: JJM & TT
Field Analyst: JJM
Field Form Checked as per QA/QC Checklist (initials): JJM

Sample ID No.: 14GLM0301
Sample Location: CNC 14MW03
Duplicate: ☒
Blank: ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 (DR-850) HS-C Color Chart HS-WR Color Wheel Analysis Time: 14:30
Program/Module: 610nm 93 Other:
Concentration: 0.0 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: 14:58
Equipment: DR-700 (DR-850) Other: Filtered: ☐
Program/Module: 60
Concentration: 0.034 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 SAMPLE LOG SHEET

Project Site Name: CNC | Site 14
Project No.: N0141

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

Sample ID No.: CNC14MW02
Sample Location: Site 14
Sampled By: JJM & TT
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9/8/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 0° 1430	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: peristaltic	clear	6.52	1.24	22.9	0	0.73	—	—

PURGE DATA:

Date: 9/8/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other	mL/min Flow Rat
Method: peristaltic	Initial	6.50	1.45	23.6	0	1.28	—	—	850
Monitor Reading (ppm): 0	1	6.56	1.44	23.3	0	1.55	—	1.47 gal	"
Well Casing Diameter & Material	2	6.59	1.36	23.0	0	1.31	—	2.94 gal	"
Type: 2" PVC	3	6.54	1.27	23.0	0	1.14	—	4.41 gal	"
Total Well Depth (TD): 14.35	4	6.53	1.24	22.9	0	1.08	—	5.88 gal	"
Static Water Level (WL): 5.15	5	6.52	1.24	22.9	0	0.73	—	7.35 gal	"
One Casing Volume(gal/L): 1.47									
Start Purge (hrs): 0931									
End Purge (hrs): 1006									
Total Purge Time (min): 35									
Total Vol. Purged (gal/L): 7.35									

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
Anions	—	500 mL plastic	yes
PAH	—	1 L Amber	yes
BTex, EDB, MTBE, Total Napl.	HCL	40 mL glass	yes
Dis. Methane	HCL	40 mL glass	yes

OBSERVATIONS / NOTES:

Volume	Time	DTW
1	0938	5.49
2	0945	5.52
3	0952	5.52
4	0959	5.53
5	1006	5.53

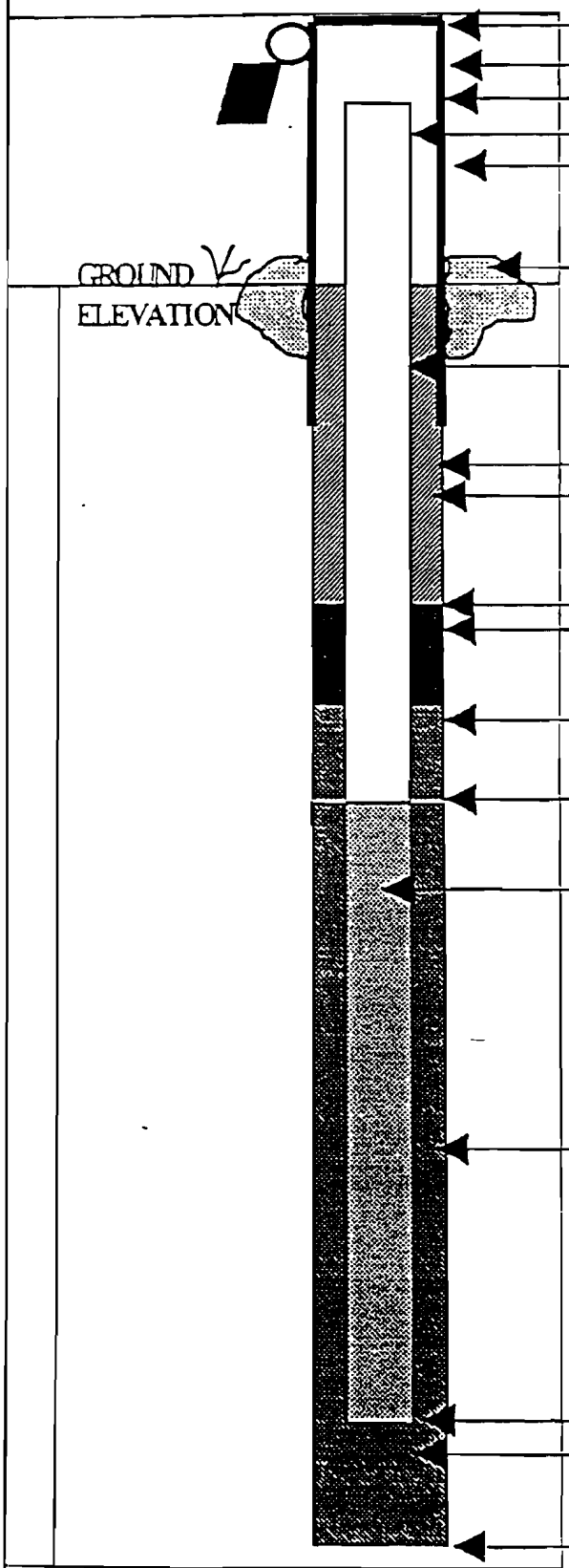
Circle if Applicable:
MS/MSD | Duplicate ID No.:

Signature(s):

BORING NO.: CNC14-MW01

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC	LOCATION:	CNC14-MW01	DRILLER	Rod
PROJECT NO.	CNC 14	BORING	CNC14-MW01	METHOD:	~~DPT~~
ELEVATION		DATE	6/21/99	DRILLING	HSA
FIELD GEOLOGIST	Marty Ray			DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE: Flush

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 8"

TYPE OF SURFACE CASING: steel man-hole with cover

TYPE OF SURFACE SEAL: concrete pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: sch 40 PVC

BOREHOLE DIAMETER: 4.25 inch

TYPE OF SEAL: grout to 8" bls

ELEVATION / DEPTH OF SEAL: 1'6"

TYPE OS SEAL: 30/65 sand

DEPTH TOP OF SAND PACK: 3' 0"

ELEVATION / DEPTH TOP OF SCREEN: 4'00

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE X LENGTH: 10 slot x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 14'0"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 14'6"

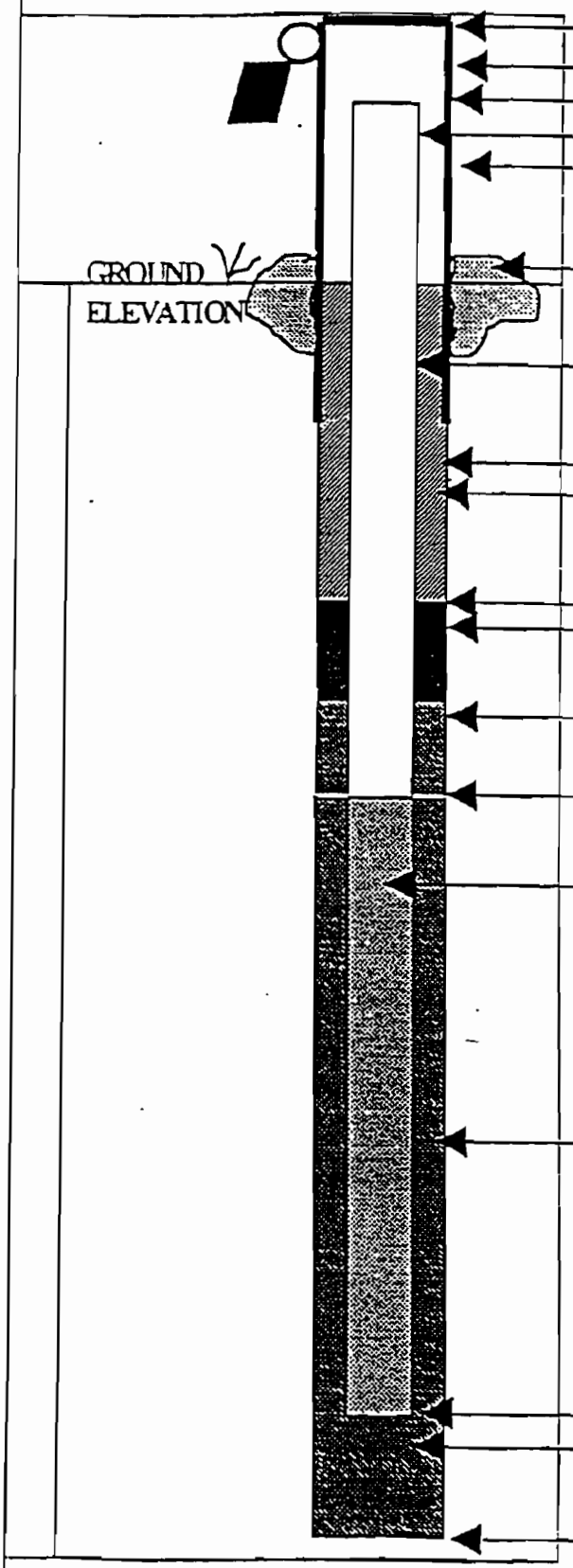
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand.

ELEVATION / DEPTH OF HOLE: 14'6"

BORING NO.: MW02

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC	LOCATION:	Site 14	DRILLER	R Fuller
PROJECT NO.		BORING	MW-2	METHOD: ~~DPT~~	
ELEVATION		DATE	8/25/99	DRILLING	HSA
FIELD GEOLOGIST	J. Hafer			DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING: NA

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: NA

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: flush mount

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6"

TYPE OF SEAL: Cement

ELEVATION / DEPTH OF SEAL: 12

TYPE OS SEAL: fine sand

DEPTH TOP OF SAND PACK: 3

ELEVATION / DEPTH TOP OF SCREEN: 14

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 0.01 X 10 ft

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30

ELEVATION / DEPTHBOTTOM OF SCREEN: 119.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 119.5

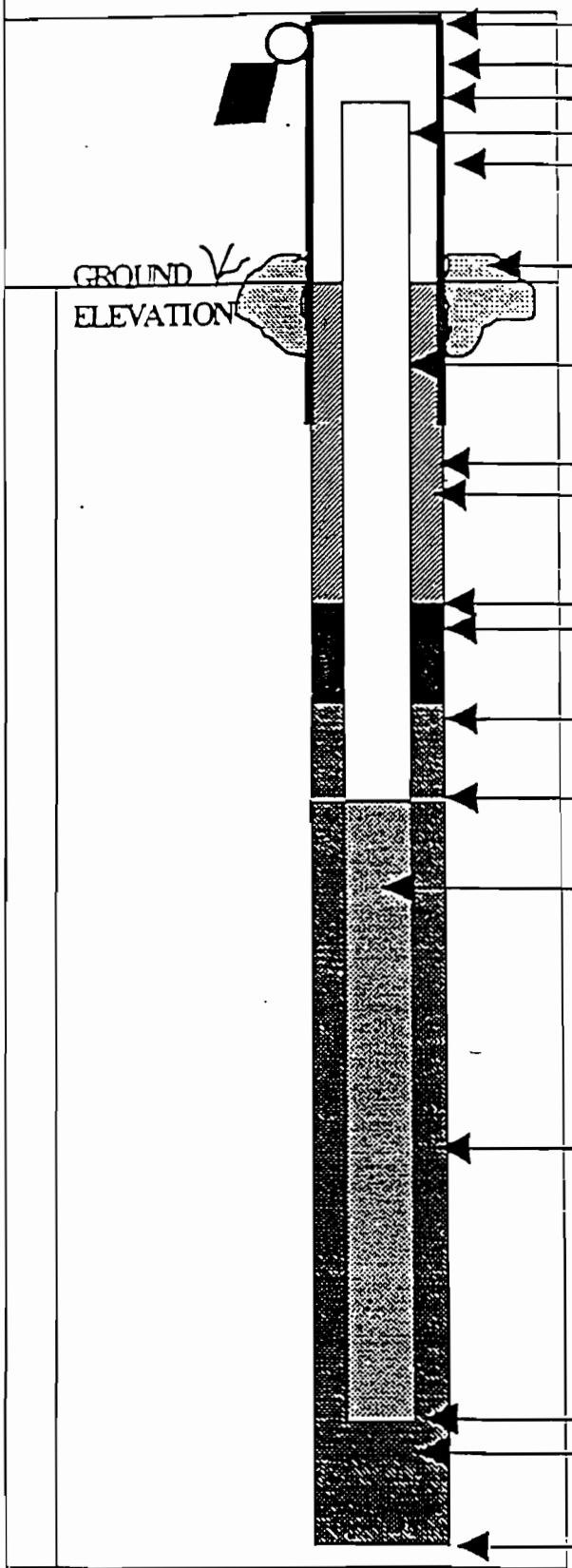
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

ELEVATION / DEPTH OF HOLE: 119.5

BORING NO.: CNC14-MW03

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC	LOCATION:	Site 14	DRILLER	R Fuller
PROJECT NO.		BORING	MW3	METHOD ~~OR~~	
ELEVATION		DATE	8/25/99	DRILLING	HSA
FIELD GEOLOGIST	J. Hofer			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING: NA

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: NA

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: flushmount

TYPE OF SURFACE SEAL: concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6"

TYPE OF SEAL: Cement

ELEVATION / DEPTH OF SEAL: 11.5

TYPE OS SEAL: fine sand

DEPTH TOP OF SAND PACK: 2.5

ELEVATION / DEPTH TOP OF SCREEN: 13.5

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 0.01 x 10ft

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30

ELEVATION / DEPTHBOTTOM OF SCREEN: 113.5

ELEVATION / DEPTH BOTTOM OF SAND PACK: 114.0

TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

ELEVATION / DEPTH OF HOLE: 174.0

BORING LOG

PROJECT NAME: Site 14
ROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: CNC14B01
DATE: 5/25/99
GEOLOGIST: BDH
DRILLER: RB

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'			asphalt @ sfc for ~3"						
S-1 @ 1212			1.8'/4.0'	1'	firm	tan	clay, sandy		slt moist to wet	3			0
									145FB010203				
	4			3.5'									
				4.2'	loose	rd brn	Sand, silty, sl.		moist	0			
			2.5'/4.0'	5.1'	firm	dk gray	Clayey, mottled dark gray, rust colored, rd wood frags.		sulfur odor	0	90/100	nd	filter
S-2 @ 1215	8												
					loose	rd brn	Sand, silty		moist to 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):

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

BORING LOG

PROJECT NAME: Site 14
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratagraphe

BORING NUMBER: CNC14B02
DATE: 5/25/99
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) 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		loose	med brn	Sand, v. grad, silty,		sl. moist	0/3			0
5-1			2-8/4'	1.8'			sl clayey		145F8020203	0			
@ 1410						tan	clay, sandy		moist to wet	50		w/ filter	
	4								@ ~3.4', sl.	5/10/150		HASP	
					fin	grnish gray	clay, sandy	sl moist	fnd odor				
			2.1/4'										
5-2				7'									
@ 1415	8			7.5'	loose tan		Wood frags, fuel stains		fuel odor, moist	90			
					loose tan		Sand, v. grad		to wet	400			

* 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 14
ROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Geoprobe

BORING NUMBER: CNC14B03
DATE: 5/25/99
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) 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	med tan	Sand, silty, sl. clayey some, w/ frags		sl. moist	0/5			
S-1 @ 1434			3.3/4	1.4'									
					firm	tan	Clay, silty, w/ frags		sl. moist	0			
	4						hardwood		145FB030304				
					firm	blue gray	Clay, silty		moist	0/0			
S-2 @ 1440			1.6/4	7'		tan	Wood		moist to wet	0			
	8			7.5'			Sand, v. gnd		~~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):

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

BORING LOG

PROJECT NAME: Site 14
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe

BORING NUMBER: CNC14BOH
DATE: 5/25/99
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) 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	tan	Sand, f. grnd, silty w/ roots		sl. moist	0/0			0
S-1 @ 1550			3.8'/4'	1.7'									
				2.5'	firm	tan	Clay, sandy, silty		sl. moist	0			
	4					tan	Sand, f. grnd, sl. clayey		145FB040304 moist	0			
			3.8'/4'							120/ 1100		w/ fibers	
S-2 @ 1553	8			~7' 7.5'	firm	grnd gray	Clay, silty		sl moist				
						tan	Wood		wet				
						tan	Sand, f. grnd		wet				

* 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 14
ROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratapuble

BORING NUMBER: CNC 14 B05
DATE: 5/25/99
GEOLOGIST: BDH
DRILLER: RB

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	grd br	Silt, sl clayey		sl. moist	0/0			
S1			3.5/4	1.3'			rootlets						
@				2.5'	firm	tan	clay, silty, shell frags		sl. moist 145FB050304				
1611				2.8'			Sand, silty		moist				
	4					tan	clay, silty		wet				
					firm to soft	to grnish gray	sl moist, sulfur odor			30/25	w/ filter-bag		
S2			2.4/4	6.5'									
@				7.1'		tan	wood		wet				
1614	8					rd br	Sand, silty, sl. clayey		wet				
							TD 8'						

When rock conng, 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 14
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratagroba

BORING NUMBER: CNC14B06
DATE: 5/25/99
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) 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	med brn	Silt, w/ roots,		sl moist	0			0
			2.3'/4'	1.6'			w/ cinders						
S-1 @ 1638	4						Sand, clayey, also shell frags		sl. moist ~~wet~~ moist				
									145FB060405	0			0
S-2 @ 1640	8		0.9'/4'			tan	Wood		Wet @ ~6'				
						tan	Sand, silty		wet	0			
							TD 8'						

* 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 14
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strategy rig

BORING NUMBER: CNC14B07
DATE: 5/26/99
GEOLOGIST: BDH
DRILLER: RB

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**
				1.2'	loose	med br	Silt, sandy, sl. clayey		sl. moist	0/0			0
			3.8/4										
S-1 @ 0909	4					tan	Clay, sandy mottled, mottled colored		sl. moist 145FB070305				
										0/120	180	w/	filter 0
				5.5' 6.0'		tan	Wood		~~moist to wet~~				
S-2 @ 0911	4		2.6/4'			med br	Sand, sl clayey		wet ~ 5'	0			
							TD 8'						

When rock conng, 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 14
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: CNC14B08
DATE: 5/26/99
GEOLOGIST: BDH
DRILLER: RB

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**
				1.4'	loose	med brn	Sand, v.f., silt,		sl. moist	0/0			0
S-1			3.5/4'				sl. clayey, w/roots						
@				3.5'	firm	tan	Clay, sandy		sl. moist				
0940	4								HSFB080304				
					firm	blue gray	Clay, silty		moist				
				5.5'	soft	tan	Wood		moist to wet				
S-2				6.0	loose	tan	Sand, silty		wet	80/80	—	w/filter	
@													
0943	8												
			0/4'										
							No Recovery 8'-12'						
S-3													
	12												
			4/4'			med to dk brn	Sand, silty, vf.grnd		saturated	35/30	K	w/filter	0
S-4				13.5'									
						tan	Sand, f. grnd,		saturated	45/45	K		
	16					to dk gray	sulfur odor			10			
S-5			4/4'							140/140		w/filter	
	20												
S-6			4/4'										
	24												

* 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 14
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe

BORING NUMBER: CNC14B08
DATE: 5/26/99
GEOLOGIST: BDH
DRILLER: AB

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
			4/4'		~~tar~~		Sand, f. grnd		~~saturated~~	40/40	–	10	0/filter
S7					~~lt~~ gray		sl. sulfur odor	-					
	28												
S8	30												
							TD 30'						

When rock conng, 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: CWC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe
BORING NUMBER: 14B09
DATE: 6/8/99
GEOLOGIST:
DRILLER: V. Brand

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1				Gray / Dk Brn		Asphalt w/base / Silty Sand	6" / 6"	Dry				
	2												
	3												
	4		1/4										
0753	5					Olive	Sandy Clay		Moist	18	0	0	0
	6					Bk Brown	Silty Sand		Saturated				
	7												
	8		2.5/4										
0757	9					Blk.	Sandy muck w/ sand & gravel			70	0	0	0
	10												
	11					Lt. Brn	Silty Sand						
0805	12		4/4										

* When rock coring, enter rock brokeness.

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

Drilling Area Background (ppm):

Remarks:

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

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strato probe
BORING NUMBER: 14B10
DATE: 6/9/99
GEOLOGIST:
DRILLER: R. Brand

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	1					Dk Brn	2" Organic / Silty Sand		Dry				
	2					Lt Brn	Sandy Clay		↓				
	3						X						
827 X	4		1.6/4				X			150	0	0	0
	5					Lt Brn	Silty Sand		Moist				
	6					BLR	Silty Clay		Saturated				
	7					↓	↓		↓	990	0	0	0
843	8		4/4			Lt Brn	Silty Sand		↓				
	9								↓				
	10								↓				
	11					Gray	Silty Sand w/ wood Chips		↓				
860	12		1.3/4										

* When rock coring, enter rock brokeness

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

Drilling Area Background (ppm):

Remarks:

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

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID # 01089 Charleston
FACILITY NAME Site 14, Quarters S

Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: NAPHTHALENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	48	days	t 1/2	1
Soil/water partitioning coefficient	1543	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0122	decimal %	f cs	I	1
Leachate Concentration	0.003	mg/l	C w	I	2
Air Filled Porosity	0.40	decimal %	f	II	1
Infiltration Rate Time	3,298	seconds	t	II	2
Velocity of Water	28,519	ft/year	V w	II	3
Soil/Water Distribution Coefficient	18.36	ml/g	K d	III	1
Contaminant Percolation Rate	422	ft/year	V c	III	2
Time to Reach Groundwater	2.584	days	T c	IV	1
Concentration reaching Groundwater	1.692	mg/l	C p	IV	2
Site Specific Target Level	**250.6927**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.

_____ YES X _____ NO

IN-SITU SOIL RISK EVALUATION

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc + TPH/1.724)*1E-6 = 0.0122 decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = 0.00 mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = ø - Wr = 0.40 decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (f/Kf)*(L-(Hw-Hf))*(ln(Hw+((L-Hf)/(Hw-Hf)))) = 3,298 seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = 28519 ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = 18.3617 ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw*(1+((Bd*Kd)/ø)) = 422 ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = 2.58 days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl) + ((Tc/2.3)*(0.693/t1/2))) = 1.69 mg/l

COC concentration in soil pore water (Cp) is greater than Crsbl, therefore the SSTL must be calculated.

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Csstl for NAPHTHALENE in soil = Cp*DAF*(((Bd*Koc*fcs) + Wr + (F*'H'''))/(Wr*1g/cc + Bd)) = 250.692729 mg/kg

PREPARED BY: _____ Date

CHECKED BY: _____ 10/24/99 Date

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID #	01089	COUNTY	Charleston
FACILITY NAME	Site 14, Quarters S		
STREET ADDRESS	Charleston Naval Complex, North Charleston, SC		

Soil Risk Evaluation Data

					Figure
TPH		**553**	mg/kg		
Soil % SAND (Estimated)		**90**	%		
Soil % CLAY (Estimated)		**4**	%		
Worst Case	Benzene		mg/kg	Cs	
Soil Analyses	Toluene		mg/kg	Cs	
	Ethylbenzene		mg/kg	Cs	
	Xylenes		mg/kg	Cs	
	Naphthalene	**1.8**	mg/kg	Cs	
			mg/kg	Cs	
Natural Organic Carbon Content		**11900**	mg/kg	foc	
Average Annual Recharge		25	cm	Hw	
Distance from highest Soil Impact to water table		**91**	cm	L	
Bulk Density of Soil		*1.56*	g/cc	Bd	1
Wetting Front Suction		*10*	cm	Hf	2
Soil Hydraulic Conductivity		*5.60E-03*	cm/sec	Kf	3
Porosity		*0.43*	decimal %	Φ	4
Residual Water Content		*0.03*	decimal %	Wr	5

List possible human exposure pathways from surface soil.
Soil leaching to groundwater - off-site ingestion or irrigational use of shallow groundwater.

Bold indicates site specific input
Italic indicated estimated value from charts on pages C3 through C5 of SCDHEC soil leaching model guidance.

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR NAPHTHALENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site: Site 14, Quarters S

Location: Charleston Naval Complex, North Charleston, SC

Charleston

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 5.

INPUT:

			NAPHTHALENE
COC	Chemical of Concern		
Bd	Soil Bulk Density (1)	g/cm3	1.56
Crsbl	Risk Based Screening Level	mg/L	1.63
Cs	Concentration of COC in soil	mg/kg	1.8
DAF	Dilution/Attenuation Factor (2)	unitless	8
foc	Organic Carbon Content in Soil (3)	mg/kg	11900
H'	Henry's Law Constant (4)	unitless	0.002
Hf	Wetting front suction head (always negative) (5)	cm	-10
Hw	Average Annual Recharge (3)	cm	25
Kf	Soil Hydraulic Conductivity (6)	cm/s	0.0056
Koc	Soil/Water Partioning Coefficient (2)	ml/g	1543
L	Depth between soil sample with greatest COC concentration to groundwater.	cm	91
ø	Porosity (7)	unitless	0.43
t1/2	Biodegradation "half life" (2)	days	48
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	553
Wr	Residual Water Content (8)	volume fraction	0.03

Construction Worker Inhalation RBSLs

Chemical			Dair	Dwater	H	θ_{scap}	θ_{wcap}	θ_{as}	θ_{ws}	θ_T	Deff-cap	Deff-s
			cm^2/s	cm^2/s	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^3/cm^3	cm^2/s	cm^2/s
Benzene			0.093	1.10E-05	2.26E-01	0.038	0.342	0.33	0.15	0.48	1.35E-05	1.01E-02
Toluene			0.085	9.40E-06	3.01E-01	0.038	0.342	0.33	0.15	0.48	1.07E-05	9.20E-03
Ethylbenzene			0.076	8.50E-06	2.80E-01	0.038	0.342	0.33	0.15	0.48	9.85E-06	8.22E-03
Xylenes			0.072	8.50E-06	2.78E-01	0.038	0.342	0.33	0.15	0.48	9.55E-06	7.79E-03
Naphthalene			0.072	9.40E-06	2.00E-03	0.038	0.342	0.33	0.15	0.48	5.79E-04	7.83E-03
MTBE			0.102	1.05E-05	4.16E-02	0.038	0.342	0.33	0.15	0.48	3.90E-05	1.10E-02

Chemical			hcap	hv	Deff-ws	Uair	δair	Lgw	W	VFwamb	TR (carc)	HI (nonc)
			cm	cm	cm^2/s	cm/sec	cm	cm	cm	$mg/m^3/mg/L$		
Benzene			5	117	3.18E-04	225	200	122	1500	1.97E-05	1.00E-06	NA
Toluene			5	117	2.54E-04	225	200	122	1500	2.09E-05	NA	1
Ethylbenzene			5	117	2.34E-04	225	200	122	1500	1.79E-05	NA	1
Xylenes			5	117	2.27E-04	225	200	122	1500	1.72E-05	NA	1
Naphthalene			5	117	5.17E-03	225	200	122	1500	2.83E-06	NA	1
MTBE			5	117	8.79E-04	225	200	122	1500	9.99E-06	NA	1

Chemical	TR (carc)	HI (nonc)	BWadult	AT	Sfi (carc)	RfD (nonc)	IR air	EF	ED	RBSLair	H	RBSLwater
			kg	yr	$[mg/kg\text{-}day]^{-1}$	[mg/kg-day]	m^3/day	day/yr	yr	mg/m^3	cm^3/cm^3	mg/L
Benzene	1.00E-06	NA	70	70	2.90E-02	NA	20	90	1	3.43E-02	2.26E-01	0.15
Toluene	NA	1	70	1	NA	1.14E-01	20	90	1	1.62E+00	3.01E-01	5.38
Ethylbenzene	NA	1	70	1	NA	2.86E-01	20	90	1	4.06E+00	2.80E-01	14.50
Xylenes	NA	1	70	1	NA	NA*	20	90	1	NA*	2.78E-01	NA*
Naphthalene	NA	1	70	1	NA	3.71E-04	20	90	1	5.27E-03	2.00E-03	2.63
MTBE	NA	1	70	1	NA	8.60E-01	20	90	1	1.22E+01	4.16E-02	293.443

*No inhalation reference dose is available for xylenes; therefore, no RBSL can be calculated for xylene.

Prepared By: _____

Reviewed By: _____

Construction Worker Incidental Ingestion RBSLs

	BW	AT	IR	ED	EF	Target	CSF oral	Rfd oral	RBSL
	kg	day	L/day	yrs	days/yr	Risk or HQ			mg/L
Benzene	70	25550	0.01	1	90	1.00E-06	2.90E-02		6.85E+01
Toluene	70	365	0.01	1	90	1.0	NA	2.00E-01	5677.778
Ethylbenzene	70	365	0.01	1	90	1.0	NA	1.00E-01	2838.889
Xylene	70	365	0.01	1	90	1.0	NA	2.00E+00	56777.78
Naphthalene	70	365	0.01	1	90	1.0	NA	4.00E-02	1135.556
MTBE	70	365	0.01	1	90	1.0	NA	5.00E-03	141.9444

Prepared By: _____ Reviewed By: _____

Construction Worker Dermal RBSLs

	Kow	MW	Kp	B	τ_{event}	c	b	t*	t_{event}	DAevent
			cm/hr	unitless	hr/event			hr	hr/event	
Benzene	199.5262315	78.1	0.11551543	0.392637855	2.87E-01	6.32E-01	6.03E-01	6.90E-01	1	eq 3.3
Toluene	537.0317964	92.1	0.259561335	0.958068292	3.44E-01	1.13E+00	1.31E+00	1.33E+00	1	eq 3.2
Ethylbenzene	1412.537545	106.2	0.569219802	2.256154884	4.13E-01	2.36E+00	4.39E+00	1.70E+00	1	eq 3.2
Xylene*	1584.893192	106.2	0.638675123	2.531447415	4.13E-01	2.63E+00	5.31E+00	1.72E+00	1	eq 3.2
Naphthalene	1995.262315	128.2	0.605452393	2.636638957	5.48E-01	2.73E+00	5.69E+00	2.29E+00	1	eq 3.2
MTBE	15.136	88.15	0.00769788	0.027797704	3.27E-01	3.52E-01	3.20E-01	7.85E-01	1	eq 3.3

	BW	AT	EV	ED	EF	SA	CSF derm	Rfd derm	Target	RBSL	RBSL
	kg	day	events/day	yrs	days/yr	cm^2	$(mg/kg\text{-}day)^{-1}$	mg/kg-day	Risk or HQ	mg/L	mg/L
Benzene	70	25550	1	1	90	4500	2.99E-02	NA	1.00E-06		8.52E-01
Toluene	70	365	1	1	90	4500	NA	1.60E-01	1.0	2.40E+01	
Ethylbenzene	70	365	1	1	90	4500	NA	9.70E-02	1.0	6.05E+00	
Xylene*	70	365	1	1	90	4500	NA	1.84E+00	1.0	1.02E+02	
Naphthalene	70	365	1	1	90	4500	NA	3.20E-02	1.0	1.63E+00	
MTBE	70	365	1	1	90	4500	NA	5.00E-03	1.0	2.59E+01	

* Kow and MW values for xylene, m-

Prepared By: _____ Reviewed By: _____

Minimum Construction Worker RBSLs

	Dermal	Incidental Ingestion	Inhalation	Minimum
	RBSL	RBSL	RBSL	RBSL
	mg/L	mg/L	mg/L	mg/L
Benzene	0.85	68.52	0.15	0.15
Toluene	23.98	5677.78	5.38	5.38
Ethylbenzene	6.05	2838.89	14.50	6.05
Xylene	102.33	56777.78	NA*	102.33
Naphthalene	1.63	1135.56	2.63	1.63
MTBE	25.92	141.94	293.44	25.92

*No inhalation reference dose is available for xylenes; therefore, no inhalation RBSL can be calculated.

Prepared By: _____ Reviewed By: _____

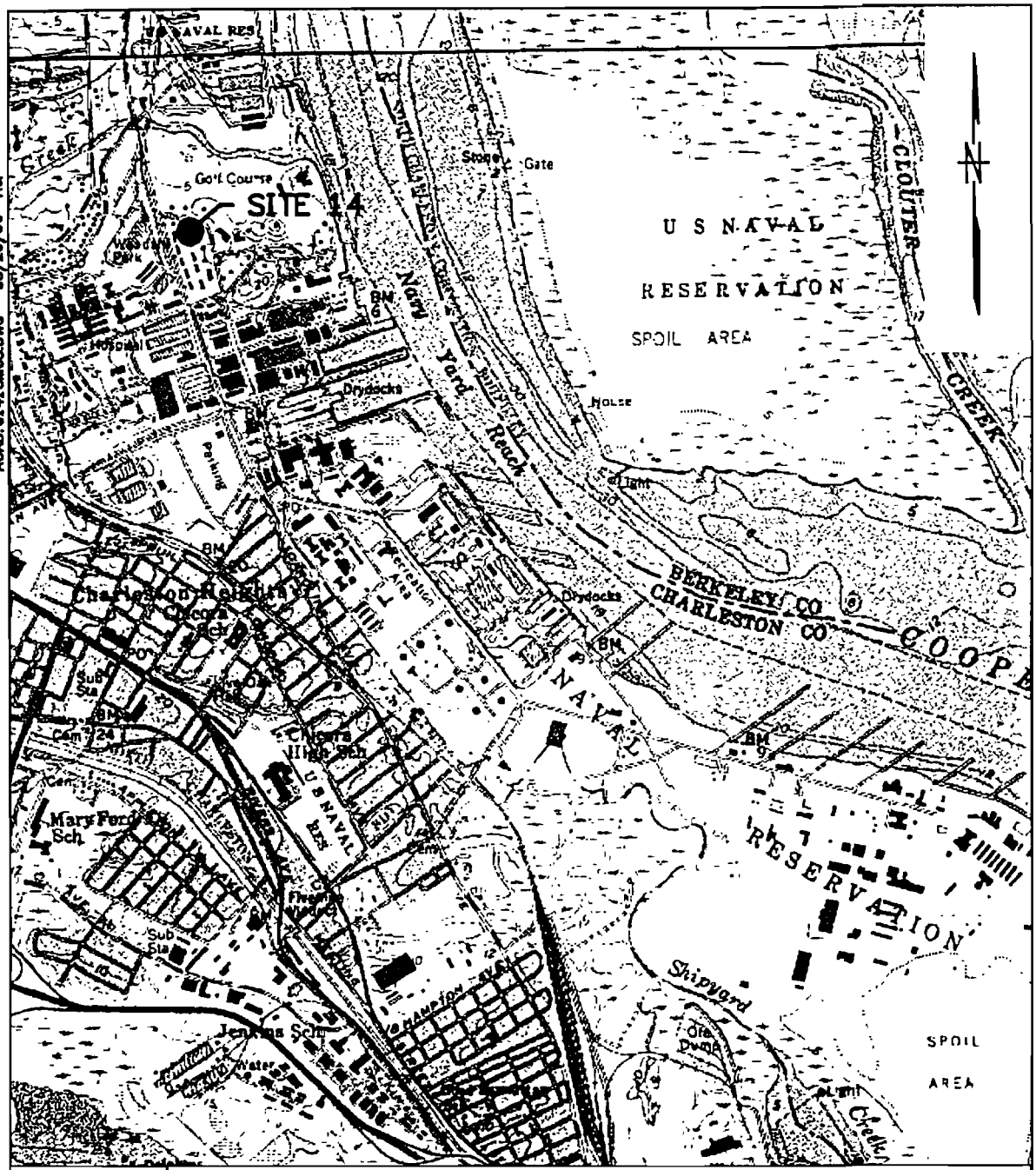
MONITORING WELL AND GROUNDWATER DATA

MW No.	Date Measured	TOC Elevation	Screened Interval (feet BTOC)	Depth to Water	Water Table Elevation
MW-01	7-13-99	7.79	4-14	4.67	3.12
MW-01	9-8-99	7.79	4-14	4.71	3.08
MW-02	9-8-99	8.20	3-13	5.15	3.05
MW-03	9-8-99	7.24	4-14	4.20	3.04

CoC	RBSL	MW-01	MW-01	MW-02	MW-03
Date Sampled		July 13,1999	Sept. 8, 1999	Sept. 8, 1999	Sept. 8, 1999
Free Product	none	0.00	0.00	0.00	0.00
Benzene	5	<5	<5	<5	<5
Toluene	1,000	<5	<5	<5	<5
Ethylbenzene	700	<5	<5	<5	<5
Xylenes	10,000	<5	<5	<5	<5
Total BTEX	na	-	-	-	-
EDB	5	<5	<5	<5	<5
MTBE	40	<5	<5	<5	<5
Naphthalene	25	<5	<5	<5	<5
Benzo(a)anthracene	10	<10	<10	<10	<10
Benzo(b)fluoranthene	10	<10	<10	<10	<10
Benzo(k)fluoranthene	10	<10	<10	<10	<10
Chrysene	10	<10	<10	<10	<10
Dibenzo(a,h)anthracene	10	<10	<10	<10	<10
Ferrous Iron	na	na	3.04 mg/L	3.30 mg/L	3.30 mg/L
Lead	Site specific	na	na	na	na
Nirates (mg/L)	na	na	<0.050	<0.050	0.072
Sulfates (mg/L)	na	na	2.0	2.7	560

- **All units in ppb except as noted.**
- **NA= Not Analyzed.**

COC	RBSL	SB-2	SB-2D	SB-4	SB-5	SB-6
Benzene	**5**	<7	<6	<6	<6	<6
Toluene	**1622**	<7	<6	<6	<6	<6
Ethylbenzene	**1260**	<7	<6	<6	<6	<6
Xylenens	**42,471**	<7	<6	<6	<6	<6
Naphthalene	**210**	<7	**1800**	<6	<6	<6



QUADRANGLE LOCATION

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

0 2000 4000
SCALE IN FEET

DRAWN BY HJP DATE 8/20/99	DEPARTMENT OF THE NAVY · NAVY · SOUTHERN DIVISION · FACILITIES ENGINEERING	SITE LOCATION MAP SITE 14, BUILDING S1 & S2, ZONE B CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SC	CONTRACT NO. N0141
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1 / REV. 0

FORM CADD NO. 3REV_AV.3V6 - REV 0 - 1/28/98

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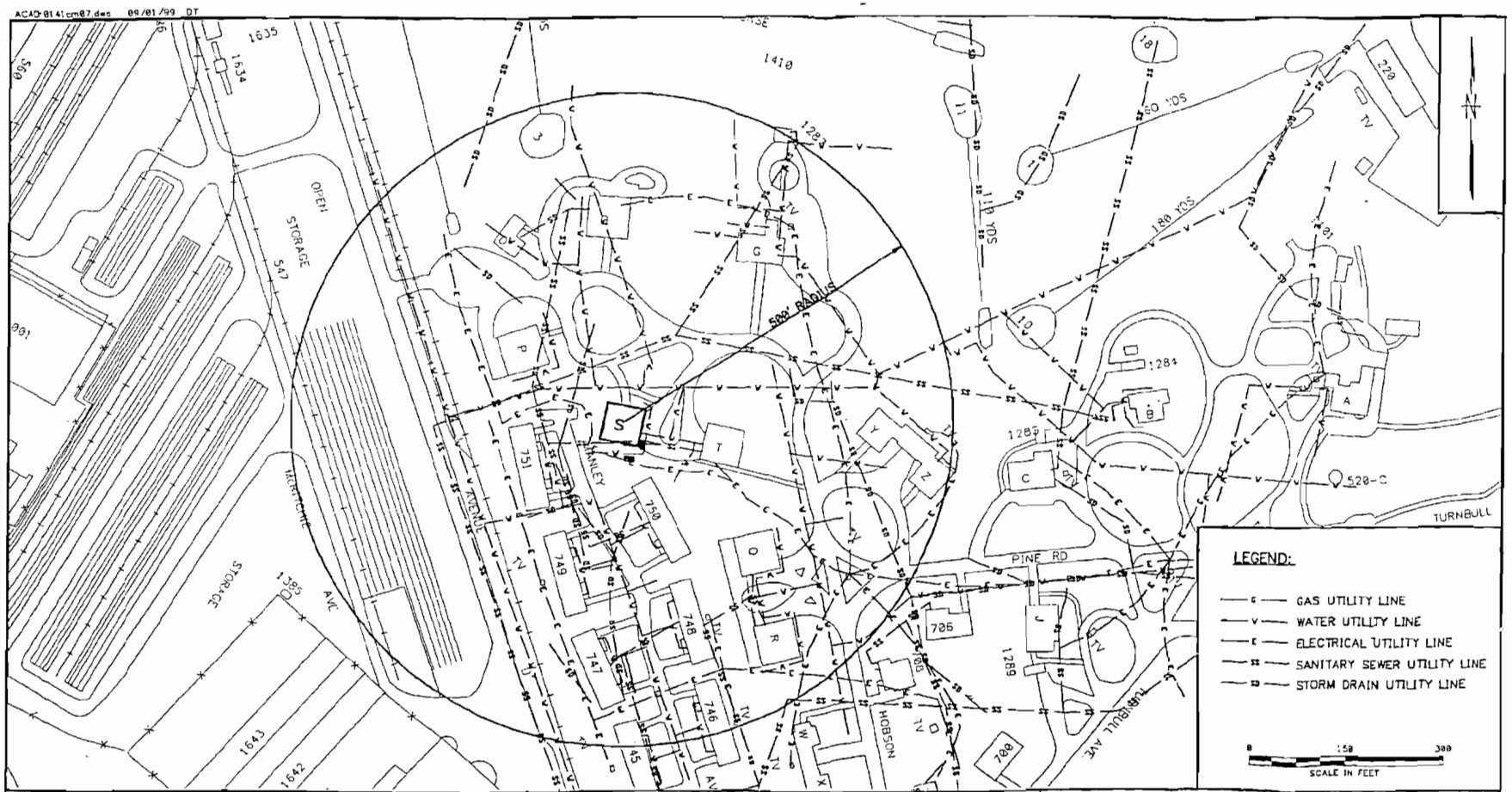
ACAD:0141cm07.dwg 09/01/99 DT



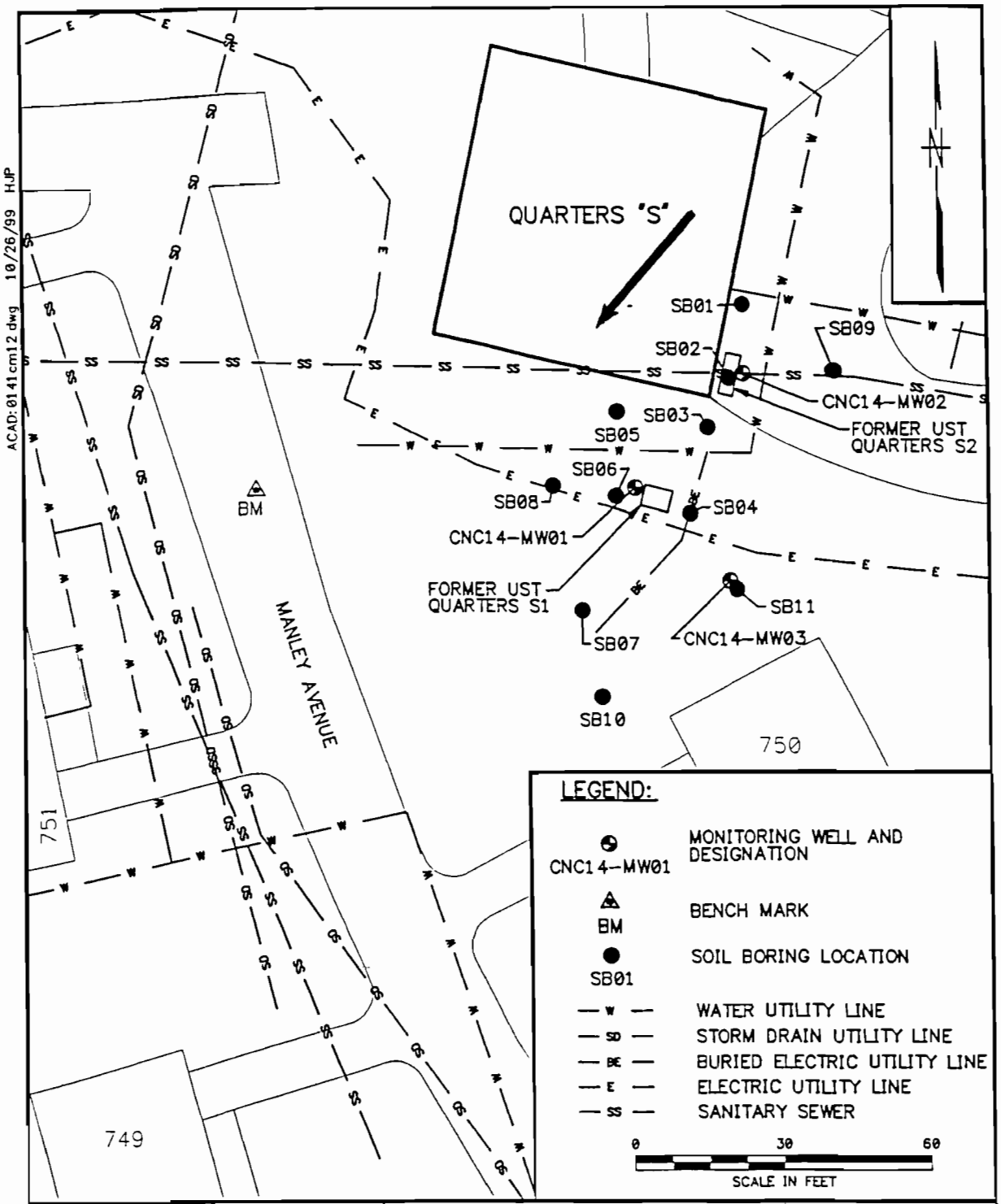
NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DLT DATE 9/1/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

SITE VICINITY MAP
SITE 14, QUARTERS S
ZONE B, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0141
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2
REV. 0

FORM CASD NO. 5010, BMKDWG - REV 0 - 1/20/98

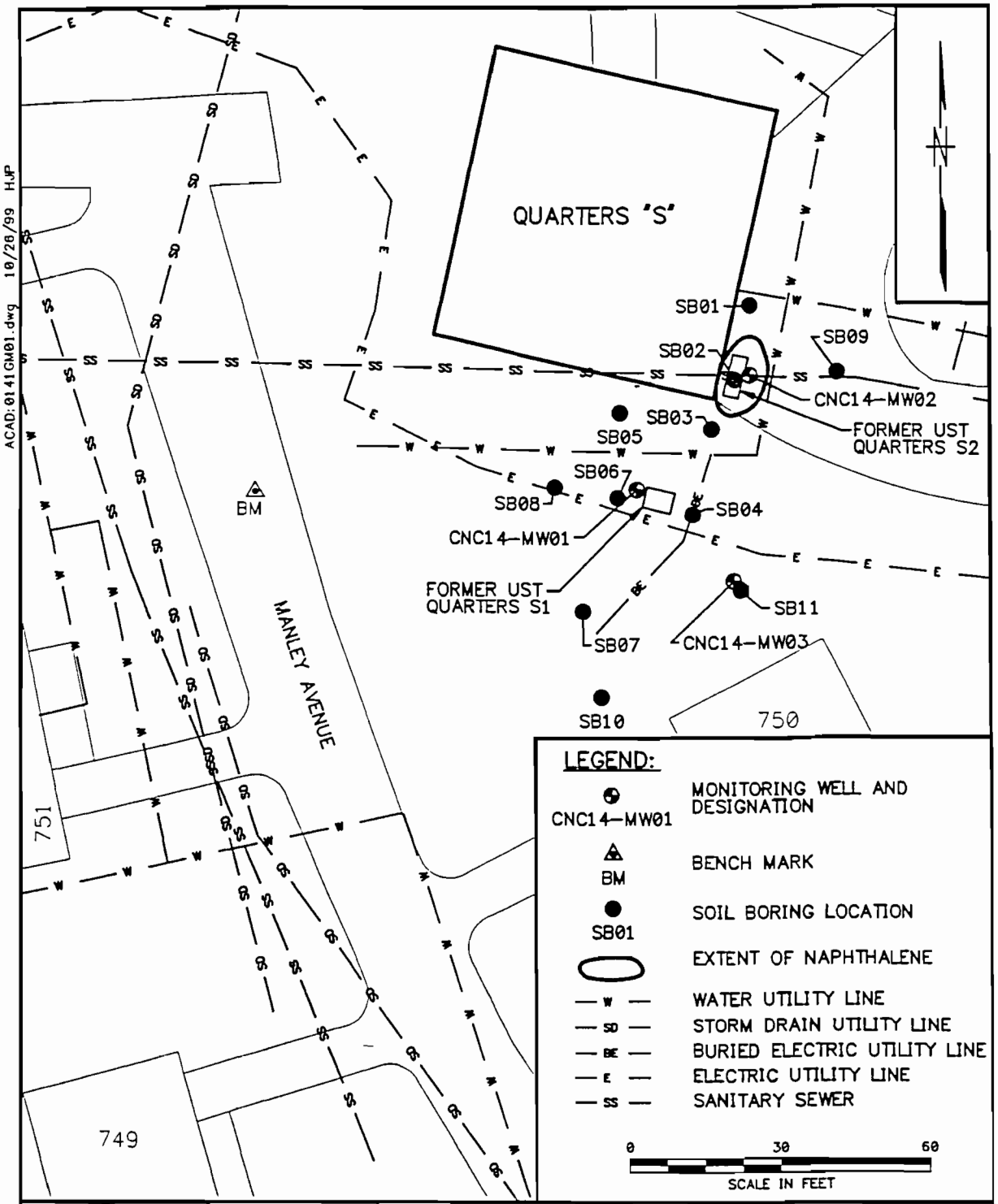


ACAD:0141cm12.dwg 10/26/99 HJP

DRAWN BY NS DATE 10/7/99			CONTRACT NO. 0141
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 3 / REV. 0

SITE MAP
SITE 14, QUARTERS "S"
ZONE B, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

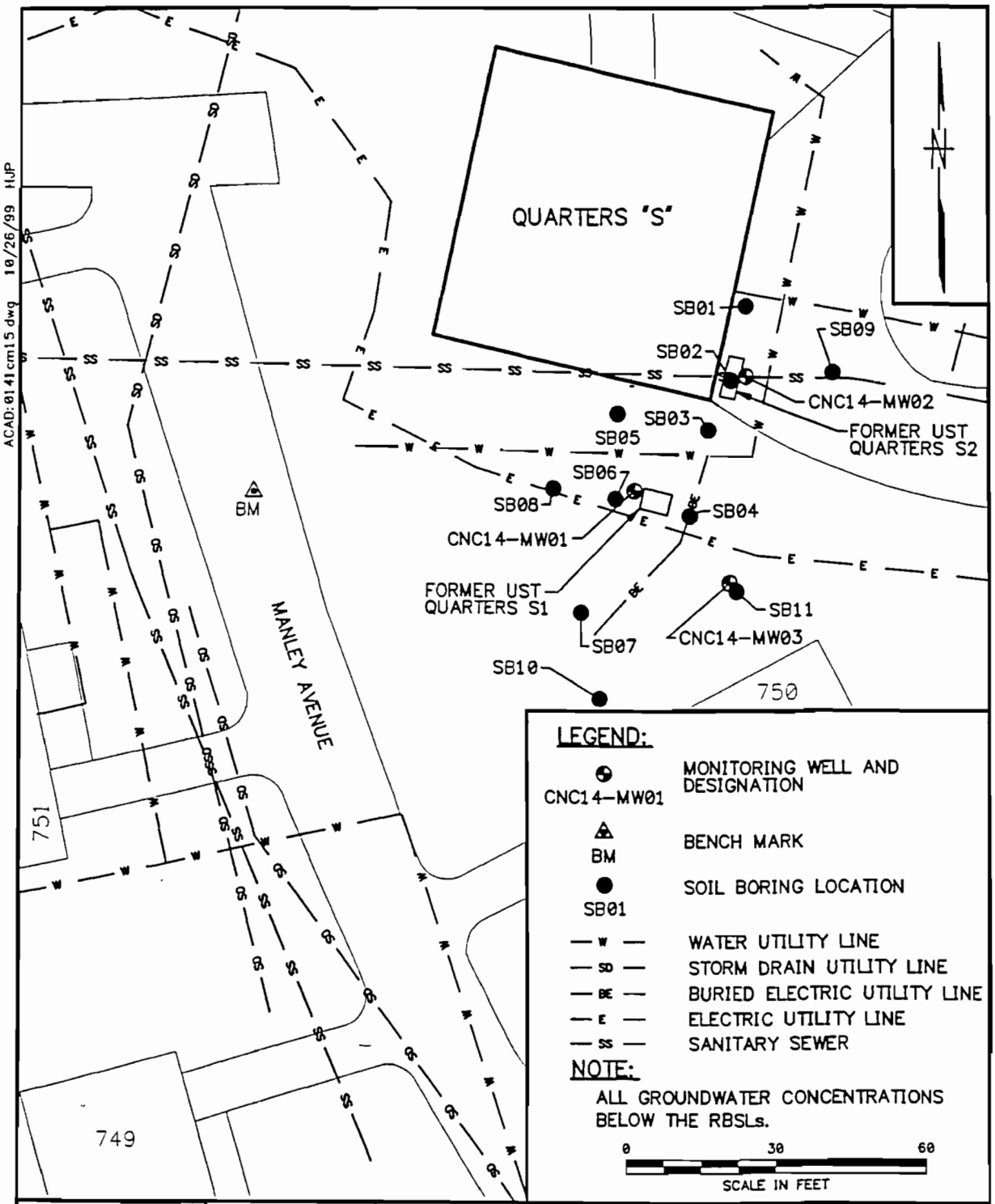
FORM CADD NO. SDIV_AV.DWG – REV 0 – 1/20/98



ACAD:0141GM01.dwg 10/26/99 HJP

DRAWN BY NS DATE 10/7/99	SOIL COC SITE MAP SITE 14, QUARTERS "S" ZONE B, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0141	
CHECKED BY DATE		APPROVED BY DATE	
COST/SCHED-AREA		APPROVED BY DATE	
SCALE AS NOTED		DRAWING NO. FIGURE 4	REV. 0

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



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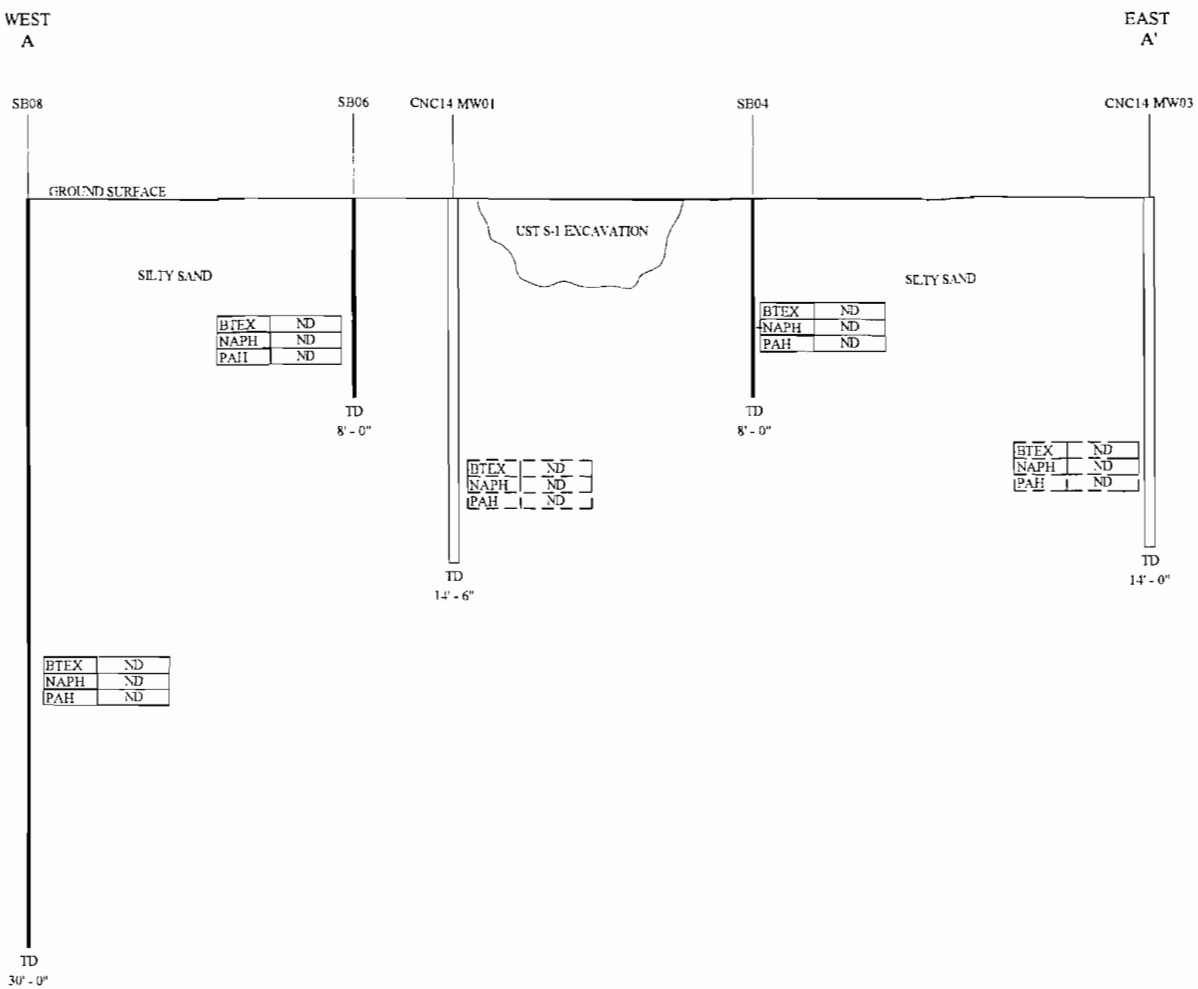
DRAWN BY NS DATE 10/7/99		GROUNDWATER COC MAP SITE 14, QUARTERS "S" ZONE B, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0141
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 5 REV. 0

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



LEGEND

MONITORING WELL OR BORING NUMBER — SB06

GROUND SURFACE

WELL OR BORING

TOTAL DEPTH OF BORING OR WELL (BGS) — TD 8' - 0"

BTEX	ND
NAPH	ND
PAH	ND

SOIL PARAMETER CONCENTRATIONS (mg/kg)

BTEX	ND
NAPH	ND
PAH	ND

GROUNDWATER PARAMETER CONCENTRATIONS (µg/L)

BTEX - BENZENE, TOLUENE, ETHYLBENZENE, AND TOTAL XYLENES

NAPH - NAPHTHALENE

PAH - POLYNUCLEAR AROMATIC HYDROCARBONS

ND - NOT DETECTED (BELOW LABORTORY DETECTION LIMITS)

0 5 10
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

S MAP WAS CREATED BY:
INTEGRATED SCIENCE & TECHNOLOGY, INC.
CHARLESTON, SOUTH CAROLINA

THIS MAP WAS COMPILED FROM BASE DRAWINGS AND/OR SKETCHES SUPPLIED BY OTHERS. IT IS TO BE USED ONLY AS AN APPROXIMATE SOURCE OF REFERENCE. WE ASSUME NO RESPONSIBILITY FOR THE ACCURACY OF BASE MAP RELATED INFORMATION CONTAINED HEREIN

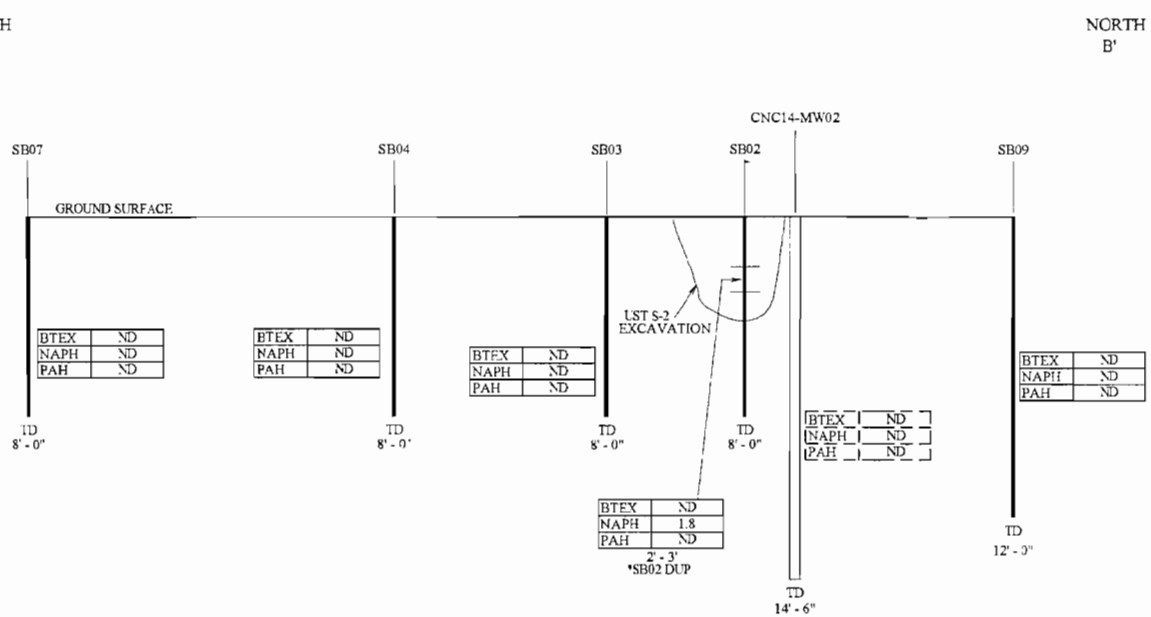
J.A. JONES ENVIRONMENTAL SERVICES

DRAWN BY. C. Broach	DATE. 08/29/2000
REVIEWED BY. B. Crawford	PROJECT NO. :
APPROVED BY. B. Crawford	DRAWING NO JA-01-01

GEOLOGIC CROSS SECTION A-A'

SITE 14, QUARTERS "S"
ZONE B, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

FIGURE



LEGEND

MONITORING WELL OR BORING NUMBER — SB06

GROUND SURFACE

WELL OR BORING

TOTAL DEPTH OF BORING OR WELL (BGS) — TD 8' - 0"

BTEX	ND
NAPH	ND
PAH	ND

SOIL PARAMETER CONCENTRATIONS (mg/kg)

BTEX	ND
NAPH	ND
PAH	ND

GROUNDWATER PARAMETER CONCENTRATIONS (µg/L)

BTEX - BENZENE, TOLUENE, ETHYLBENZENE, AND TOTAL XYLENES

NAPH - NAPHTHALENE

PAH - POLYNUCLEAR AROMATIC HYDROCARBONS

ND - NOT DETECTED (BELOW LABORTORY DETECTION LIMITS)

0 10 20
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

S MAP WAS CREATED BY:
.EGRATED SCIENCE & TECHNOLOGY, INC.
CHARLESTON, SOUTH CAROLINA

THIS MAP WAS COMPILED FROM BASE DRAWINGS AND/OR SKETCHES SUPPLIED BY OTHERS. IT IS TO BE USED ONLY AS AN APPROXIMATE SOURCE OF REFERENCE. WE ASSUME NO RESPONSIBILITY FOR THE ACCURACY OF BASE MAP RELATED INFORMATION CONTAINED HEREIN

J.A. JONES
ENVIRONMENTAL SERVICES

DRAWN BY: C. Broach	DATE: 08/29/2000
REVIEWED BY: B. Crawford	PROJECT NO
APPROVED BY: B. Crawford	DRAWING NO.: JA-01-02

GEOLOGIC CROSS SECTION B-B'

SITE 14, QUARTERS "S"
ZONE B, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

FIGURE