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CONTAMINATION ASSESSMENT PLAN AND REMEDIATION REPORT FOR ABOVE  
GROUND STORAGE TANK NS-14 (AST NS-14) ZONE H AREA OF CONCERN 659 (AOC  
659) CNC CHARLESTON SC  
12/01/2004  
CH2M HILL

CH2M-JONES, LLC.



**CH2MHILL**  
Constructors, Inc.

Mr. Darryl F. Gates  
CH2M-Jones  
1330 Kilo Street  
North Charleston, SC 29405

December 20, 2004

Mr. Michael A. Bishop  
SCDHEC  
2600 Bull Street  
Columbia, SC 29201-1708

Subject: Contamination Assessment Plan and Remediation Monitoring Report  
AST NS 14 (Zone H, AOC 659)  
**Site ID. No. 01311**  
Charleston Naval Complex

Dear Mr. Bishop:

CH2M-Jones has completed Contamination Assessment Plan and Remediation Monitoring Report for the above-referenced site. The enclosed Report documents the product recovery activities prior to and following the AFVR event. Product levels have been recorded within the impacted monitoring wells since September, 2002. Although the AFVR attributed to the overall reduction of free product at the site, measurable free product is still present within two of the four site monitoring wells.

CH2M-Jones has proposed the installation of four monitoring wells and one recovery well to determine the extent of the dissolved-phase COCs and to expedite the recovery of free product. Upon SCDHEC's approval, site activities will begin in mid January, 2005. Please feel free to call with questions.

Sincerely,

CH2M HILL

A handwritten signature in black ink that reads "Darryl F. Gates".

Darryl F Gates  
Environmental Scientist

**RECEIVED**

DEC 21 2004

Water Monitoring, Assessment &  
Protection Division

**Contamination Assessment Plan and Remediation Report**

**AST NS 14 (Zone H, AOC 659)**

**Charleston Naval Complex**

**North Charleston, South Carolina**

**SCDHEC Site ID #01311**

**Prepared by:**

**CH2MHILL**

**Charleston Naval Complex**

**1330 Kilo St.**

**North Charleston, South Carolina 29405**

**Prepared for:**

**Southern Division Naval Facilities Engineering Command**

**P.O. Box 190010**

**North Charleston, South Carolina 29419-9010**

**December 2004**

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**AST NS 14 (AOC 659)**

**Charleston Naval Complex**

**North Charleston, South Carolina**

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## **1.0 Introduction**

### **1.1 Background**

In 1993, Naval Base (NAVBASE) Charleston was added to the list of bases scheduled for closure as part of the Defense Base Realignment and Closure Act, which regulates closure and transition of property to the community. The Charleston Naval Complex (CNC) was formed as a result of the dis-establishment of the Charleston Naval Shipyard and NAVBASE on April 1, 1996. Corrective Action (CA) activities for Site 659 are being conducted in accordance with the Underground Storage Tank (UST) Program of the South Carolina Department of Health and Environmental Control (SCDHEC).

### **1.2 General Site Description and Background**

The CNC is located in the City of North Charleston, on the east and west bank of the Cooper River in Charleston County and Berkley 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. This site is located within the developed portion of the base.

AOC 659 (Site ID #01311) consisted of a 30,000-gallon steel above ground storage tank (AST), which was formally designated as Building 14. The AST no longer exists and only the concrete support pad remains. The tank was enclosed by a five-foot high earthen berm and stored diesel fuel for small water craft from 1958 to 1990. Prior to 1958, the site was an undeveloped tidal marsh, **Figure 2**.

## **2.0 Previous Investigations**

### **2.1 Soil investigation**

On June 18, 1998, the Final RCRA Facility Investigation Report for Zone H, Site 659 was completed by EnSafe. During the investigation, eight soil samples were collected from depths of 0-1 foot and 3-5 feet below land surface (bls) from four soil borings. Total petroleum hydrocarbons (TPH), were detected above the Risk Based Screening Levels (RBSLs) within six of the eight soil samples. Please refer to EnSafe's Final RCRA Facility Investigation Report for soil boring locations and analytical results.

On November 20, 2001, eight soil samples were collected within four soil borings by CH2M-Jones. The soil samples were collected at depths of 0-1 and 3-5 feet bls and analyzed for VOCs and SVOCs. Results of the soil analysis indicated the presence of COCs above the RBSLs. Please refer to CH2M-Jones' December 31, 2001, Monitoring Report for soil boring locations and analytical results.

## **2.2 Groundwater Investigation**

Monitoring wells 659GW001 and 659GW002 were installed November 14, 2001, at locations depicted on **Figure 3** and sampled for VOCs and SVOCs on November 20, 2001. Results of the groundwater analysis did not indicate the presence of COCs above the RBSLs.

On January 8, 2002, SCDHEC requested that the site be monitored semi annually for one year. During the June 28, 2002, monitoring event, monitoring well 659GW001 was not sampled due to the presence of free product; however, a groundwater sample was collected from monitoring well 659GW002 and analyzed for VOCs and SVOCs. Results of the analysis indicated that COCs were not present above the RBSLs.

On July 17 - 18, 2002, monitoring wells 659GW003 and 659GW004 were installed to delineate free product in the vicinity of monitoring well 659GW001. Once installed, each well was developed and allowed to stabilize for 30 days. On August 19, 2002, monitoring wells 659GW001, -002, -003 and -004 were gauged for the presence of free product. During the gauging event, free product was only detected in monitoring well 659GW001. On September 24, 2002, monitoring wells 659GW001, -002, -003 and -004 were again gauged for the presence of free product. Free product was detected within each well with the exception of monitoring well 659GW002.

## **3.0 Free Product Remedial Activities**

### **3.1 Free Product Recovery (Bailing)**

Free product was gauged and recovered using a disposable bailer within monitoring wells 659GW001, -003 and -004. The recovery efforts were performed periodically from September 24, 2002, through May 30, 2003. Refer to **Table 1** for free product thickness, recovery dates and quantities. Approximately 11.30 gallons of free product were recovered from monitoring well 659GW001, 4.80 gallons from 659GW003, and 1.15 gallons from 659GW004 during bailing activities. Recovered product was containerized in a DOT-approved drum and stored within a locked compound at building 1824 on COC.

### **3.2 Aggressive Fluid Vapor Recovery (AFVR)**

On June 17, 2003, CH2M-Jones completed an AFVR event performed on monitoring wells 659GW001, -003 and -004 at Site 659. EQ Industrial Services of Atlanta, GA, pumped approximately 301 gallons of oily water from the three monitoring wells using a vacuum truck. The oily water was consolidated with AFVR fluid extracted from SCDHEC Site Nos. 02099 and 01093 and containerized in a 3,000-gallon truck-mounted tank. The consolidated AFVR fluid from each site totaled approximately 760 gallons. The fluid was manifested as non-hazardous oily water and transported off site for proper disposal.

### **3.3 Free Product Recovery (Absorbent Socks)**

Following the AFVR, on July 28, 2003, monitoring wells 659GW001, -002, -003 and 004 were gauged for the presence of free product, which was detected and measured within monitoring wells 659GW001, -003 and -004. Oil-only absorbent socks with the capacity to absorb approximately 0.25 gallon of free product each were installed within wells 659GW001, -003 and -004 and replaced periodically. Approximately 1.25 gallons of free product has been recovered from monitoring wells 659GW001 and 659GW004, and 1.0 gallon of free product has been recovered from monitoring well 659GW003 using the absorbent socks. During the October 25, 2004, gauging event, monitoring wells 659GW001 and 659GW004 displayed free product thickness at 1.01 feet and 0.72 feet, respectively. Free product thickness recorded for monitoring well 659GW003 was measured at only a sheen. Monitoring well 659GW002 remains unaffected by free product.

## **4.0 Proposed Assessment and Remedial Activities**

### **4.1 Monitoring Well Installation and Groundwater Analysis**

In an effort to determine the lateral and horizontal extent of dissolved-phase groundwater COCs, CH2M-Jones proposes the installation of three shallow and one deep groundwater monitoring well (Figure 3). The wells will be installed by a South Carolina Licensed well contractor using a truck-mounted Rotosonic drill rig. The shallow wells will be installed to a depth of approximately 12 feet bls and screened from 2 to 12 feet bls. The deep well will be installed to a depth of approximately 20 feet bls and will be screened from 15 to 20 feet bls (Table 2). Following the development of the new wells, groundwater samples will be collected from the newly installed wells and existing well 659GW002 and analyzed for volatile organic compounds, including EDB, and semi-volatile organic compounds using EPA Methods 8260B and 8270C, respectively.

The groundwater flow direction will be interpreted from water level information from site monitoring wells during collection groundwater samples. The water level data will be applied to a scaled site plan with surveyed well locations and casing elevations. The data will be used to produce groundwater contours across the site.

### **4.2 Recovery Well Installation and Free Product Remediation**

CH2M-Jones proposes the installation of an 8-inch diameter recovery well that will be installed to a depth of 12 feet bls and screened from 2 to 12 feet bls (Figure 3). The well will be installed by a South Carolina Licensed well contractor using a truck-mounted Rotosonic drill rig. Free product will be recovered using 8-inch diameter by 18-inch long sump-skimming absorbent socks with the capacity to absorb 1.8 gallons of product each. The socks will be replaced as needed and an inventory of recovered free product quantities will be maintained. Smaller diameter absorbent socks will continue to be used within monitoring wells 659GW001 and 659GW004 as needed until the free product has been abated.

### **4.3 Assessment and Remedial Action Reporting**

CH2M-Jones will complete a groundwater monitoring and remediation report upon receipt of groundwater analytical data. The report will document the extent of dissolved-phase COCs, aquifer characteristics and free product recovery efforts. The report will conclude with recommendations for further action.

### **4.4 Proposed Schedule**

- 1/15/05 - 2/15/05 Installation of groundwater monitoring and free product recovery wells.
- 2/15/05 - 2/21/05 Collect groundwater samples and initiate free product recovery.
- 2/21/05 - 3/15/05 Complete monitoring and remediation report

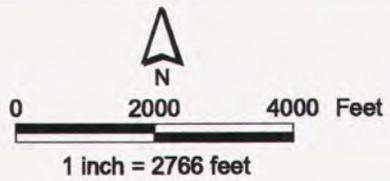


# Figures



Site 659

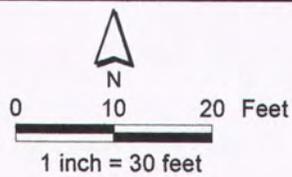
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- ▤ Roads - Lines
- ▤ Shoreline
- ▤ Buildings
- ▤ Surrounding Area



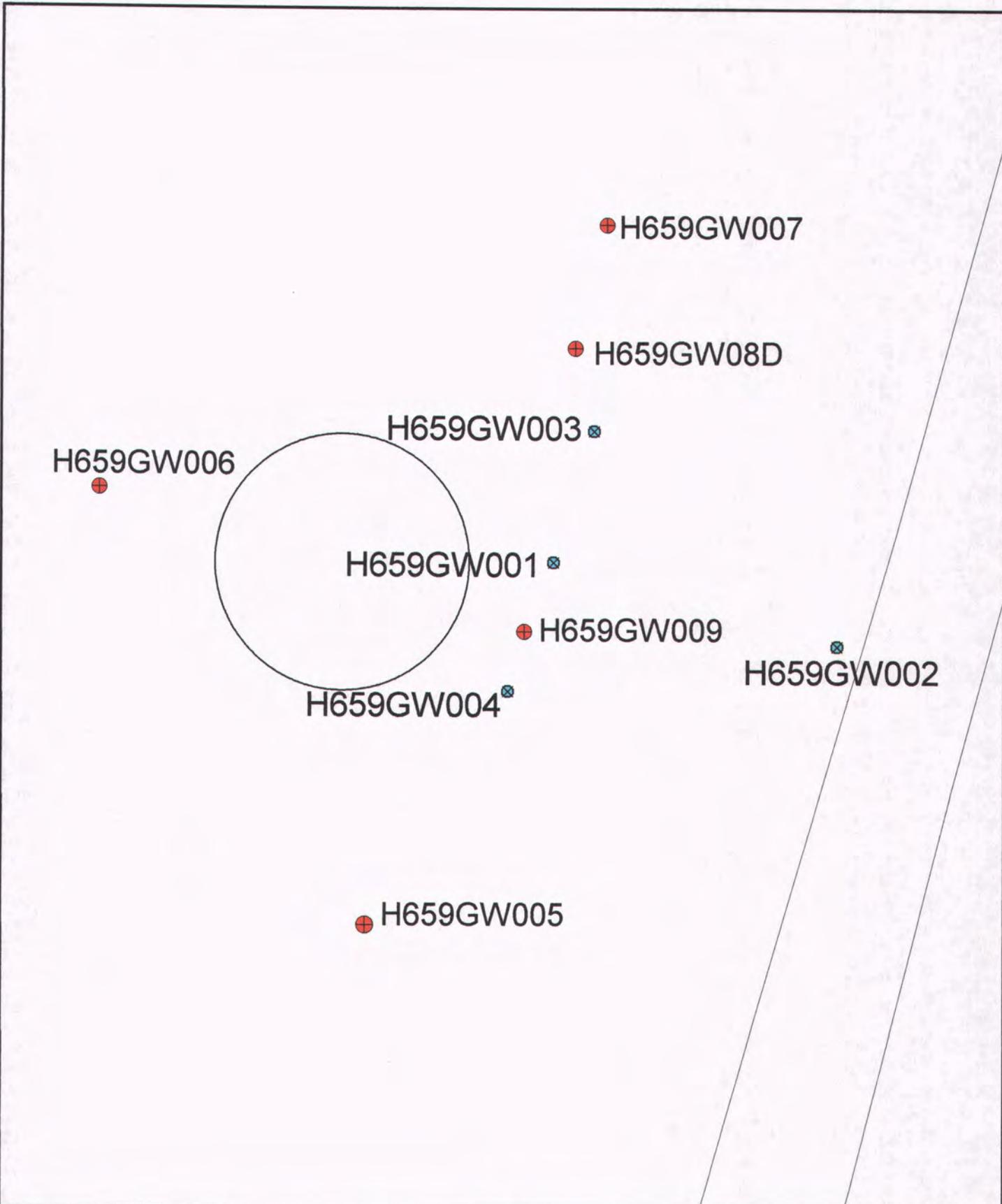
**Figure 1**  
 Site Location Map  
 Zone H, Site 659  
 Charleston Naval Complex



⊗ Active Monitoring Well



**Figure 2**  
Site Map  
AST NS 14 (Zone H, AOC 659)  
Charleston Naval Complex



**Figure 3**  
 Proposed Monitoring Well Location Map  
 AST NS 14 (Zone H, AOC 659)  
 Charleston Naval Complex

# Tables

**Table 1**  
**Free Product Measurement and Collection Quantities**

Well No.	Date	Depth to Product	Depth to Groundwater	Product Thickness	Comments
659GW001	09/24/2002	4.18	not obtained	not obtained	2.5 gallons bailed
	10/01/2002	3.25	4.31	1.06	2.0 gallons bailed
	10/09/2002	3.35	3.91	0.56	1.75 gallons bailed
	10/21/2002	3.37	4.26	0.89	1.20 gallons bailed
	10/29/2002	4.05	4.75	0.7	0.80 gallons bailed
	11/05/2002	3.77	4.72	0.95	1.20 gallons bailed
	11/14/2002	2.78	2.81	0.03	0.10 gallons bailed
	11/22/2002	not obtained	not obtained	not obtained	0.45 gallons bailed
	12/09/2002	5.42	5.96	0.54	0.6 gallons bailed
	12/23/2002	not obtained	not obtained	not obtained	0.50 gallons bailed
	05/30/2003	not obtained	not obtained	not obtained	0.20 gallons bailed
	06/17/2003	not obtained	not obtained	not obtained	AFVR
	07/28/2003	4.15	4.4	0.25	No product removed
	10/03/2003	4.85	6.35	1.5	Installed absorbent sock
	12/12/2003	5.61	7.05	1.44	Replace absorbent sock
	01/12/2004	5.55	6.67	1.12	Replace absorbent sock
	02/12/2004	4.72	5.75	1.03	Replace absorbent sock
	05/28/2004	4.90	5.41	0.51	Replace absorbent sock
	10/25/2004	4.39	5.4	1.01	Replace absorbent sock
	659GW002	09/24/2002	not present	3.45	N/A
10/01/2002		not present	1.81	N/A	
10/09/2002		not present	2.06	N/A	
10/21/2002		not present	2	N/A	
10/29/2002		not present	2.9	N/A	
11/05/2002		not present	3.48	N/A	
11/14/2002		not present	1.1	N/A	
11/22/2002		not obtained	not obtained	not obtained	
12/09/2002		not obtained	not obtained	not obtained	
12/23/2002		not obtained	not obtained	not obtained	
05/30/2003		not obtained	not obtained	not obtained	
06/17/2003		not obtained	not obtained	not obtained	
07/28/2003		not obtained	not obtained	not obtained	
10/03/2003		not obtained	not obtained	not obtained	
12/12/2003		not present	5.33	N/A	
01/12/2004		not present	5.46	N/A	
02/12/2004		not present	4.51	N/A	
05/28/2004		not present	5.41	N/A	
10/25/2004		not present	3.99	N/A	
U659GW003		09/24/2002	3.81	not obtained	not obtained
	10/01/2002	2.71	3.35	0.64	0.25 gallons bailed
	10/09/2002	3.42	3.75	0.33	0.25 gallons bailed
	10/21/2002	3.31	3.94	0.63	0.20 gallons bailed
	10/29/2002	4.06	4.8	0.74	0.40 gallons bailed
	11/05/2002	3.3	3.82	0.52	0.9 gallons bailed

**Table 1 (cont.)**  
**Free Product Measurement and Collection Quantities**

	11/14/2002	not obtained	not obtained	not obtained	well under water due to weather
	11/22/2002	not obtained	not obtained	not obtained	0.25 gallons bailed
	12/09/2002	4.37	4.82	0.45	0.50 gallons bailed
	12/23/2002	not obtained	not obtained	not obtained	0.25 gallons bailed
	05/30/2003	not obtained	not obtained	not obtained	0.30 gallons bailed
	06/17/2003	not obtained	not obtained	not obtained	AFVR
	07/28/2003	4.51	4.61	0.1	No product removed
	10/03/2003	4.55	6.01	1.46	Installed absorbent sock
	12/12/2003	5.15	6.76	1.61	Replace absorbent sock
	01/12/2004	5.55	6.67	1.12	Replace absorbent sock
	02/12/2004	4.72	5.75	1.03	Replace absorbent sock
	05/28/2004	4.90	5.41	0.51	Replace absorbent sock
	10/25/2004	not present	3.9	N/A	Replace absorbent sock
U659GW004	09/24/2002	sheen	3.92	not obtained	No product removed
	10/01/2002	sheen	3.12	not obtained	No product removed
	10/09/2002	sheen	4.01	not obtained	No product removed
	10/21/2002	sheen	3.21	not obtained	No product removed
	10/29/2002	4	4.5	0.5	0.10 gallons bailed
	11/05/2002	3.82	3.85	0.03	0.30 gallons bailed
	11/14/2002	sheen	2.72	not obtained	No product removed
	11/22/2002	not measured	not measured	not obtained	0.20 gallons bailed
	12/09/2002	4.02	4.05	0.03	0.20 gallons bailed
	12/23/2002	not obtained	not obtained	not obtained	0.10 gallons bailed
	05/30/2003	not obtained	not obtained	not obtained	0.25 gallons bailed
	06/17/2004	not obtained	not obtained	not obtained	AFVR
	07/28/2003	3.26	3.41	0.15	No product removed
	10/03/2003	4.49	5.46	0.97	Installed absorbent sock
	12/12/2003	5.25	6.55	1.30	Replace absorbent sock
	01/12/2004	5.33	7.11	1.78	Replace absorbent sock
	02/12/2004	4.67	5.11	0.44	Replace absorbent sock
05/28/2004	4.82	5.38	0.56	Replace absorbent sock	
10/25/2004	3.95	4.67	0.72	Replace absorbent sock	

N/A - Not Applicable

Table 2

Monitoring Well Construction Details  
 AST NS 14 (Zone H, AOC 659)  
 Charleston Naval Complex  
 North Charleston, South Carolina  
 SCDHEC Site ID #01311

Well Identification	Well Diameter (Inner & Outer)	Method of Drilling	Screen Depth (ft bls)	Screen Length (ft)	Screen Mesh/Slot Size	Expected Total Depth of Well (ft bls)	Material of Well Construction	Analysis Parameters	Development (e.g., low flow, bailer, etc.)	Grout (Type, Mixture Ratio, etc.)	Finish Type	Purpose for Well
H659GW005	2-inch (inner)	Roto - Sonic	2 to 12	10-feet	0.010	12	Schedule 40 PVC	VOC/SVOC	Low Flow Pump with surge block	Portland Type II with 5% Bentonite	flush-mount	Groundwater monitoring
H659GW006	2-inch (inner)	Roto-Sonic	2 to 12	10-feet	0.010	12	Schedule 40 PVC	VOC/SVOC	Low Flow Pump with surge block	Portland Type II with 5% Bentonite	flush-mount	Groundwater monitoring
H659GW007	2-inch (inner)	Roto - Sonic	2 to 12	10-feet	0.010	12	Schedule 40 PVC	VOC/SVOC	Low Flow Pump with surge block	Portland Type II with 5% Bentonite	flush-mount	Groundwater monitoring
H659GW08D	2-inch (inner)	Roto - Sonic	15 to 20	5-feet	0.010	20	Schedule 40 PVC	VOC/SVOC	Low Flow Pump with surge block	Portland Type II with 5% Bentonite	flush-mount	Groundwater monitoring
H659GW009	8-inch (inner)	Roto - Sonic	2 to 12	10-feet	0.010	12	Schedule 40 PVC	None (product recovery)	Low Flow Pump with surge block	Portland Type II with 5% Bentonite	flush-mount	Groundwater monitoring