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Final
Site Investigation Report
SWMU 6
Former Building V-28 Waste Pit

Naval Station Norfolk
Norfolk, Virginia



Prepared for
Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

Contract No. N62470-95-D-6007
CTO-0131

January 2003

Prepared by
CH2MHILL

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Contract Task Order 131

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Under the

**LANTDIV CLEAN II Program
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Virginia Beach, Virginia

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1 Introduction

This report presents the procedures and results of the Site Investigation (SI) of SWMU 6— Building V-28 Waste Disposal Pit at Naval Station Norfolk (NSN), Virginia. The scope of work for this investigation is documented in the NSN Final Work Plan SWMU Supplemental Investigation (CH2M HILL, August 1999), and Draft Work Plan for Supplemental Investigation at SWMU 6 (CH2M HILL, July 2001) submitted to Naval Facilities Engineering Command (NAVFACENGCOM) LANTDIV as part of Navy Contract N62470-95-D-6007, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN), District III, Contract Task Order 0131.

The location of SWMU 6 relative to the Base is presented in Figure 1-1. The facility and site background as well as a summary of previous investigations are presented in Section 1 of this report. Section 2 documents field investigation activities including sampling methodology and locations. Section 3 provides information on the physical characteristics of NSN and SWMU 6. Section 4 presents the SI results, including a characterization of environmental media contamination. Section 5 summarizes the SI results and provides recommendations for further action.

1.1 Facility and Site Background

NSN is located on 4,631 acres of land directly northwest of the City of Norfolk, Virginia. The facility is bounded on the north by Willoughby Bay, on the west by the Elizabeth River, and on the south and east by the City of Norfolk. Mason Creek forms a portion of the facility's eastern boundary (see Figure 1-1). NSN includes approximately 4,000 buildings and an airfield. The Base's western portion is a developed waterfront area that contains piers and facilities for loading, unloading, and servicing naval vessels.

Land use surrounding NSN is industrial and residential. The waterfront area south of the Base provides shipping facilities for several large industries. Residential land use is located to the south and east of the Base. Willoughby Spit, a low-density residential area located northeast of the Base, is also used for recreational activities.

NSN provides shore facilities and logistics support for U.S. military vessels and aircraft. In support of the Base's mission, NSN provides housing; hospital care; recreation, and training for military personnel; provides supplies to the fleet; serves as a repair site for aircraft, navy vessels, and associated equipment; and is used for the transport, disposal, and recycling of wastes generated at the Base and at other federal facilities within a 50-mile radius.

SWMU 6, the Building V-28 Waste Disposal Pit, is located in the north-central portion of NSN, as shown in Figure 1-1. The unit consisted of an in-ground tank, located outside the former building V-28 Plating Shop. The tank was reportedly 30 gallons, composed of fiberglass-reinforced plastic (FRP) or ceramics, and utilized to store rinse water from a vibratory finisher and adjacent rinse sink. According to the RCRA Facility Assessment (RFA), this rinse water was characterized as dirty water with some nontoxic metal shavings

(A. T. Kearney, Inc., March 1992). Additional information was gathered from a former facility wastewater handler with knowledge of the V-28 unit. The employee indicated that the tank had no outlet and was routinely pumped for wastewater treatment and offsite disposal.

During the Confirmatory Investigation (CH2M HILL, November 1996), the waste disposal pit was characterized as 3 ft in diameter and 5 ft deep with a metal cover and contained approximately 6 in. of clear water with a slight oily sheen. The unit is no longer active and the closure reportedly occurred during basewide UST closure activities.

1.2 Previous Site Investigations

This subsection summarizes previous efforts to characterize the site. The results and conclusions of previous investigations at SWMU 6 are documented below.

1.2.1 Radium Decontamination and Close-Out of Building V-28

As a result of the past manufacturing of luminescent dials, radium contamination was found to be present in several rooms and a sanitary sewer pipe in building V-28. In 1994, OHM conducted a remedial action at building V-28 (OHM Remediation Services Corp., 1994) that consisted of the removal of radium-contaminated floor, wall, and ceiling surfaces. In addition, the radium-contaminated sanitary sewer piping leading from the second floor to underneath the first-floor slab was removed. During the remedial action, radiation air monitoring and sampling were conducted until the measurements were below regulatory limits.

1.2.2 Relative Risk Ranking Study

In 1995, Baker Environmental, Inc., conducted a Relative Risk Ranking (RRR) study that included SWMU 6 (Baker Environmental, Inc., January 1996). During the investigation, one subsurface soil and one grab groundwater sample were collected utilizing a Geoprobe and analyzed for VOCs, SVOCs, metals, and cyanide. Groundwater samples were compared to the National Primary Drinking Water Maximum Contaminant Levels (MCLs), and USEPA Region III Risk Based Criteria (RBCs) for tapwater. Soil samples were screened against the residential soil RBCs.

Figure 1-2 details the sampling locations and exceedances from the RRR study. The soil analytical results showed that no metals or organic compounds were detected above the residential soil RBCs. However, the groundwater results indicated an RBC exceedance for trichloroethene and iron as well as an MCL exceedance for cadmium. In addition, the chromium concentration exceeded both the RBC and MCL.

1.2.3 RCRA Closure Investigation

A metal plating shop was formerly located in the northwest corner of Building V-28. O'Brien & Gere completed a RCRA Closure Investigation of the plating shop in March 1996. The investigation identified elevated levels of several metals, including chromium and cadmium. In addition, the demolition of the plating shop in 1998 identified elevated levels

of metals in the subsurface soils. As a result, the soils were excavated and removed from the site. Building V-28 was demolished in 1998.

1.2.4 Confirmatory Investigation

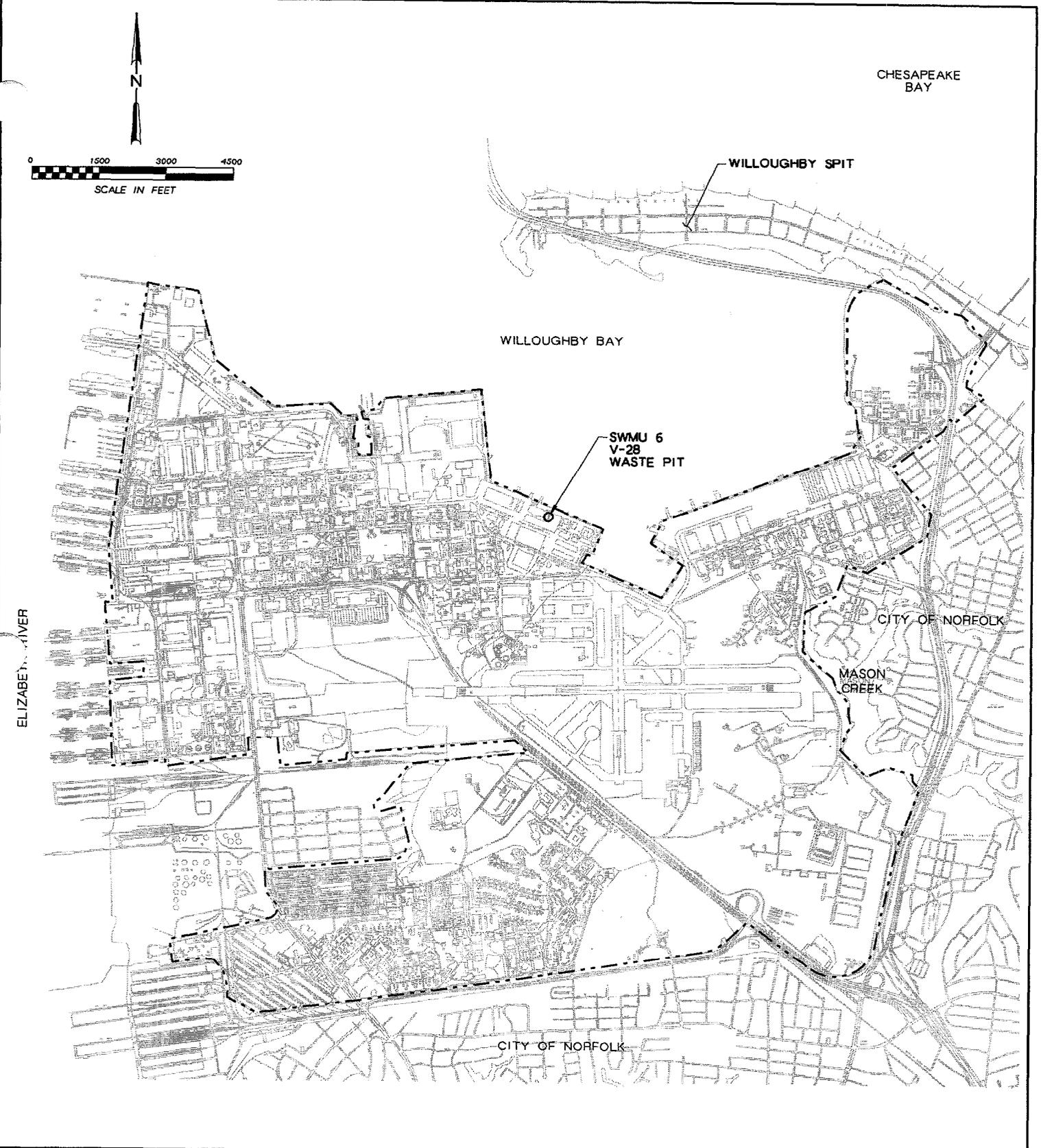
A Confirmatory Investigation (CH2M HILL, November 1996) was conducted in 1996 to confirm the presence of contamination and potential exposure pathways associated with SWMU 6. Groundwater samples were compared to the MCLs, and tapwater RBCs. Soil samples were screened against the residential soil RBCs. The sampling locations and exceedances of the screening criteria are shown on Figure 1-3.

1.2.4.1 Groundwater

Ten groundwater samples were collected utilizing a Geoprobe during the Confirmatory Investigation and analyzed for VOCs, SVOCs, pesticides/PCBs, and TAL metals and cyanide. The analytical results indicated that no pesticides/PCBs were detected in exceedance of the screening criteria. However, the organic constituents 1,1-dichloroethene, bis(2-ethylhexyl)phthalate, and naphthalene exceeded the RBCs. The concentrations of 1,1-dichloroethene and bis(2-ethylhexyl)phthalate also exceeded the MCLs. The metals analytical results showed that arsenic, chromium, and cadmium concentrations exceeded both the MCLs and RBCs. In addition, beryllium concentrations exceeded the MCLs at one location and iron concentrations exceeded the RBCs. However, the dissolved concentrations of both beryllium and chromium did not exceed the screening criteria. Furthermore, the concentrations of lead exceeded the Federal Action Level at the majority of the sample locations.

1.2.4.2 Soils

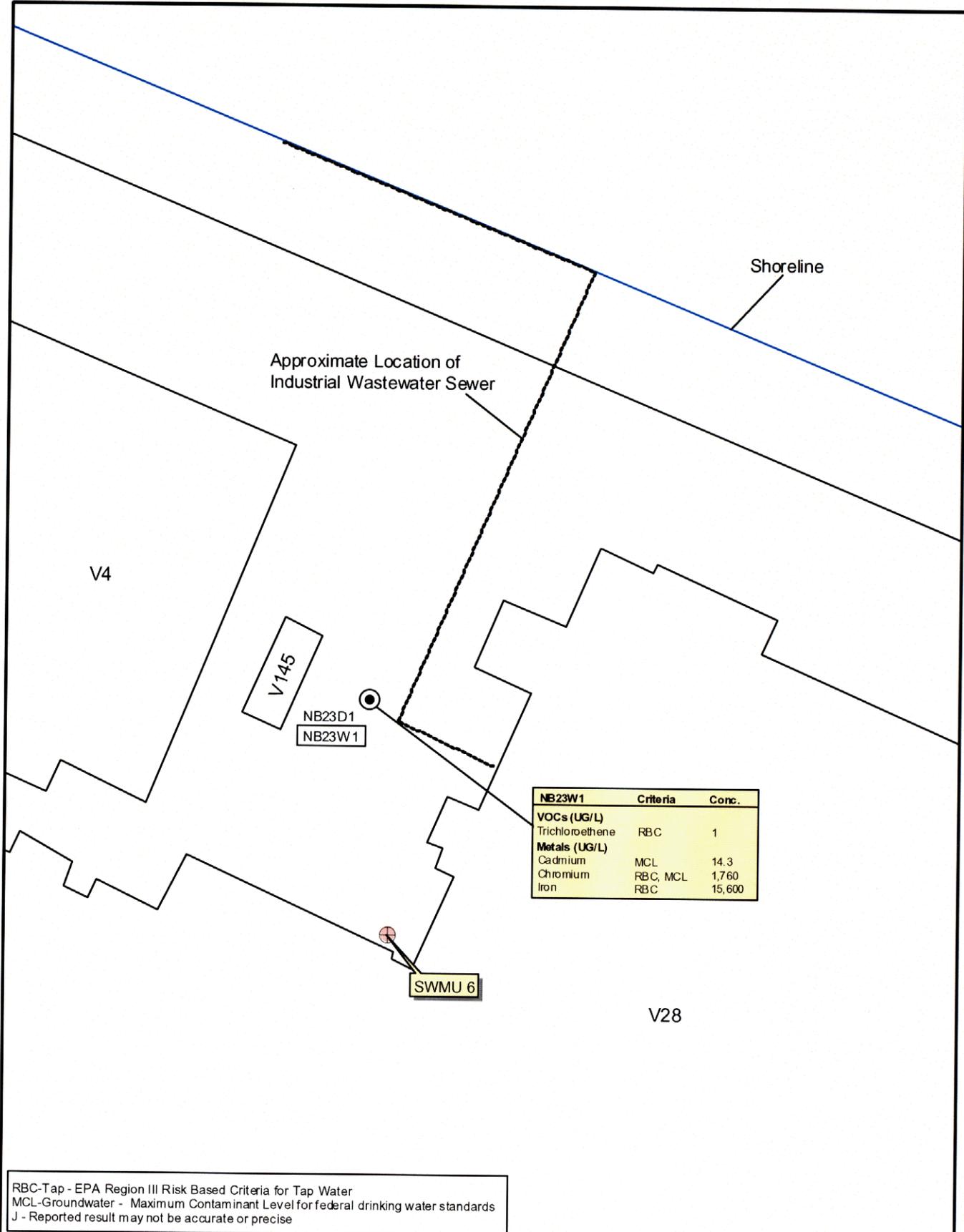
Two subsurface soil samples were collected from SWMU 06 during the Confirmatory Investigation. The samples were collected at 6 to 8 ft below ground surface (bgs) and approximately 3 ft downgradient of the waste pit. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. There were no exceedances of the residential soil RBCs for any of the analyses.



LEGEND

----- NAVAL STATION NORFOLK BOUNDARY

Figure 1-1
SITE LOCATION MAP
SWMU 06 - V28 WASTE DISPOSAL PIT
Naval Station Norfolk



Legend

- ⊕ Existing Waste Disposal Pit
- Soil Sampling Location
- Groundwater Sampling Location
- Approximate Location of Industrial Wastewater Sewer



0 50 100 Feet

Figure 1-2
Groundwater and Soil Sampling Locations
1996 Baker RRR Study
SWMU 06 - V28 Waste Disposal Pit (From Historical Baker Data)
Naval Station Norfolk

Approximate Location of Industrial Wastewater Sewer

Shoreline

V4

NB-U06-GW09	Criteria	Conc.
VOCs (UG/L)		
1,1 Dichloroethene	RBC, MCL	270D
Metals (UG/L)		
Cadmium	RBC, MCL	208
Chromium	RBC, MCL	9,670
Lead	Action Level	31.2

NB-U06-GW07	Criteria	Conc.
VOCs (UG/L)		
1,1 Dichloroethene	RBC, MCL	6J
Metals (UG/L)		
Cadmium	MCL	8.9
Chromium	RBC, MCL	2,170

NB-U06-GW06	Criteria	Conc.
VOCs (UG/L)		
1,1 Dichloroethene	RBC, MCL	8J
Dissolved Metals (UG/L)		
Chromium	RBC, MCL	2,700

NB-U06-GW08	Criteria	Conc.
VOCs (UG/L)		
1,1 Dichloroethene	RBC, MCL	10
Metals (UG/L)		
Arsenic	RBC, MCL	12.5
Cadmium	RBC, MCL	54.7
Chromium	RBC, MCL	2,260
Lead	Action Level	15.2
Dissolved Metals (UG/L)		
Cadmium	MCL	6.1
Lead	Action Level	138

NB-U06-GW05	Criteria	Conc.
Metals (UG/L)		
Chromium	RBC, MCL	314
Dissolved Metals (UG/L)		
Lead	Action Level	28

NB-U06-GW04	Criteria	Conc.
Metals (UG/L)		
Beryllium	MCL	25.8
Cadmium	RBC, MCL	467
Chromium	RBC, MCL	7,500
Iron	RBC	17,300
Lead	Action Level	41.9

NB-U06-GW02	Criteria	Conc.
SVOCs (UG/L)		
Naphthalene	RBC	11
Metals (UG/L)		
Chromium	RBC, MCL	191
Lead	Action Level	41.3

NBU6-SS01
NBU6-SS02

SWMU 6

NB-U06-GW03	Criteria	Conc.
SVOCs (UG/L)		
bis(2-Ethylhexyl)phthalate	RBC, MCL	300D
Dissolved Metals (UG/L)		
Lead	Action Level	98.4

NB-U06-GW10	Criteria	Conc.
Metals (UG/L)		
Cadmium	RBC, MCL	112
Dissolved Metals (UG/L)		
Lead	Action Level	80.3

NB-U06-GW01	Criteria	Conc.
Metals (UG/L)		
Arsenic	RBC, MCL	16.8
Chromium	RBC, MCL	260
Dissolved Metals (UG/L)		
Arsenic	RBC, MCL	11.8
Lead	Action Level	16.3

V28

RBC-Tap - EPA Region III Risk Based Criteria for Tap Water
MCL-Groundwater - Maximum Contaminant Level for federal drinking water standards
J - Reported result may not be accurate or precise

Legend

- ⊕ Existing Waste Disposal Pit
- ⊕ Geoprobe Groundwater Sampling Location
- Soil Sampling Location
- Approximate Location of Industrial Wastewater Sewer

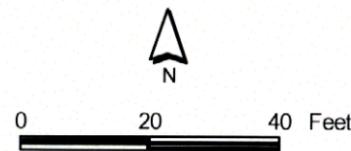


Figure 1-3
Groundwater and Soil Sampling Locations and Exceedances
1996 Confirmatory Investigation
SWMU 06 - V28 Waste Disposal Pit
Naval Station Norfolk

2 Site Investigation

This section outlines the scope and rationale for the field activities conducted in association with the SI at SWMU 6. CH2M HILL initiated the SI field activities described in this section during September 1999. The SI field activities included the collection and analysis of groundwater samples as well as the installation and the subsequent sampling of monitoring wells. This section also documents the approaches used during the investigation to characterize the site hydrogeology.

2.1 Investigation Methodology

Investigation methods implemented for the field investigations are documented below.

The work plans (CH2M HILL, August 1999, July 2001) document the general approaches and sampling rationale used for the investigation. The objectives of the additional investigations at SWMU 6 were to (1) characterize the source and downgradient extent of VOCs and metals previously detected in the groundwater, (2) evaluate if contaminants could reach ecological receptors in Willoughby Bay, (3) better define the groundwater flow conditions in the shallow aquifer including assessing the tidal influence on shallow groundwater flow, and (4) assess if the deep groundwater has been impacted.

2.1.1 Direct Push Technology (DPT)

In September 1999, 16 DPT borings were advanced to collect groundwater samples, which were analyzed for VOCs and dissolved TAL metals. The DPT data was intended for use as a screening tool to guide the placement of permanent monitoring wells. Figure 2-1 illustrates the DPT boring locations.

2.1.2 Monitoring Well Installation

Based on the DPT analytical results, six shallow monitoring wells and one deep monitoring well were installed at SWMU 6 to characterize the hydrogeology and extent of groundwater contamination at SWMU 6. The wells were also installed in order to assess any potential human health or ecological risk associated with groundwater at the site.

All monitoring wells were installed through 4 ¼-in. ID hollow-stem augers (HSAs). Split spoon samples were collected at approximately 5-ft intervals to characterize the lithology of the aquifer. All newly installed monitoring wells were constructed of 2-in. ID Schedule 40 PVC casing and 0.010-in.-slot 10-ft screens. The shallow monitoring wells extended from 5 to 15 ft bgs, and the deep monitoring well was screened from 59 to 69 ft bgs. Figure 2-2 illustrates the locations of the monitoring wells.

Monitoring wells were installed and developed in accordance with SOPs described in the Master Project Plan (CH2M HILL, October 1997). All monitoring wells were developed by a combination of surging and pumping to remove fine-grained material that could enter the well screen. The vertical elevations of the ground surface, the top of PVC casing, and the top

of well mount for all new and existing monitoring wells were surveyed using a global positioning system (GPS). Appendix A presents the soil boring logs and well construction diagrams for the monitoring wells at SWMU 6.

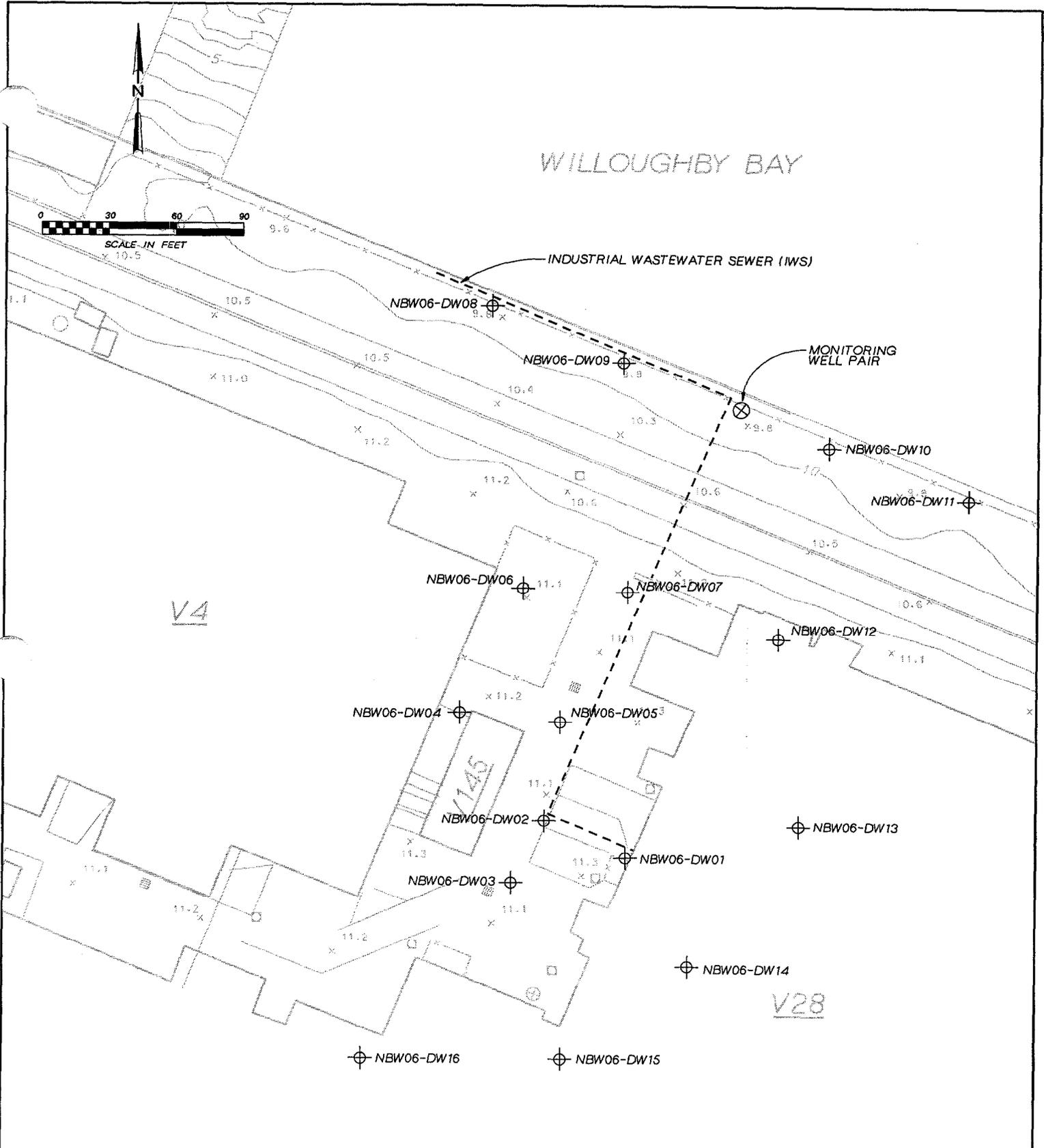
2.1.3 Monitoring Well Sampling

The initial round of groundwater sampling was performed in January 2000, and a second round was collected in June. Samples were analyzed for VOCs, TAL metals (total and dissolved), and cyanide.

During summer 2001, the Tier I Partnering Team became aware that the waste pit might have been used to dispose of radionuclides associated with the manufacture of luminescent dials. Additional sampling rounds were conducted in September 2001 and February 2002 to determine the presence and speciation of any radionuclides at the site. In addition, the Tier I Partnering Team joint scoped the collection of natural attenuation parameters to evaluate if the organic contaminants will decay under site conditions.

During each sampling event, water levels in the wells were recorded. This data, in conjunction with survey data, was used to develop groundwater-elevation contour maps. Section 3.2 presents a discussion of this data.

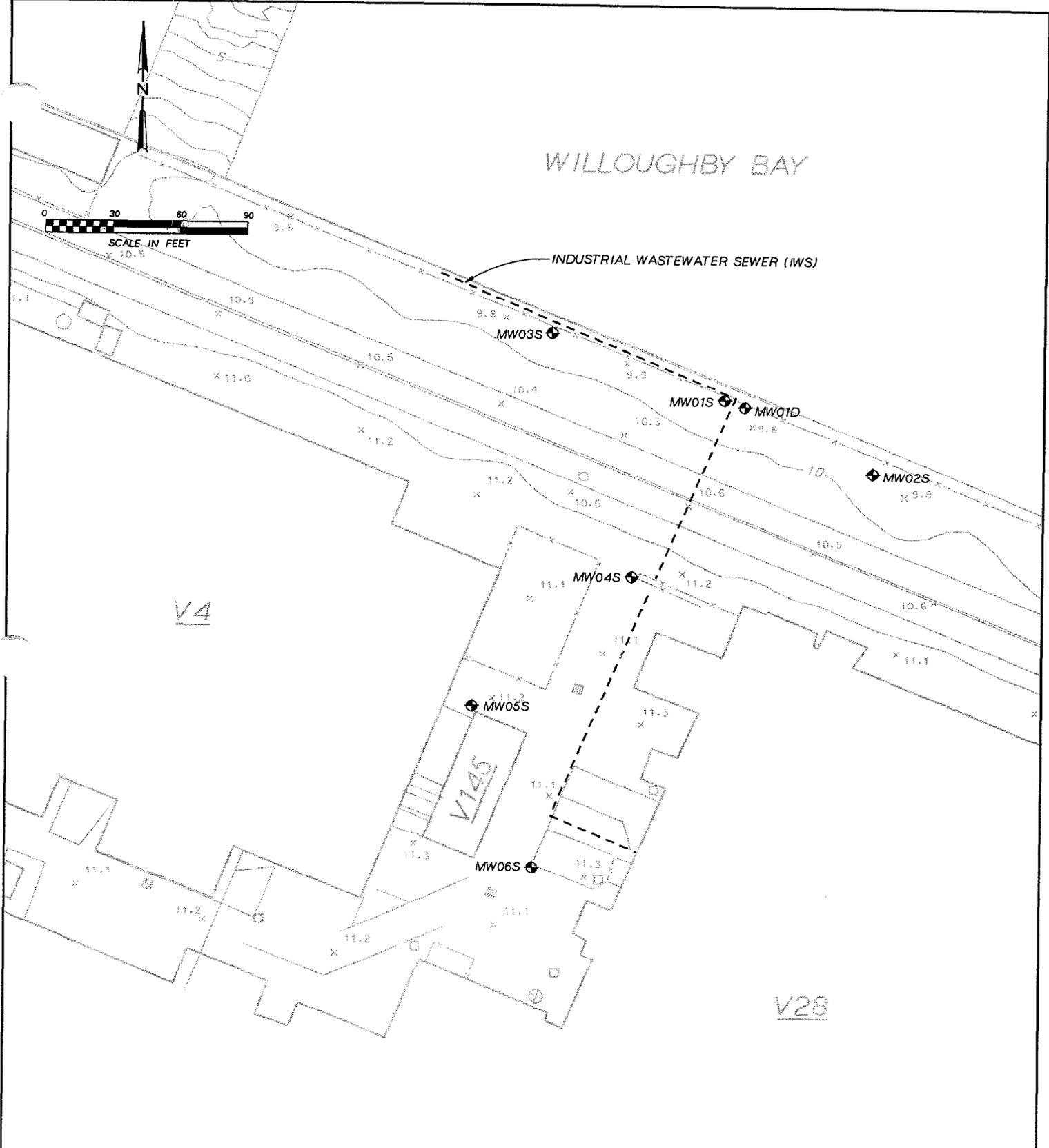
WILLOUGHBY BAY



LEGEND

- ⊗ WELL PAIR (SHALLOW & DEEP)
- ⊙ GEOPROBE
- APPROXIMATE LOCATION OF IWS

Figure 2-1
 DIRECT PUSH TECHNOLOGY DPT
 SAMPLING LOCATIONS
 SWMU 06 - V28 WASTE DISPOSAL PIT
 Naval Station Norfolk



LEGEND

MW03  GROUNDWATER MONITORING WEL LOCATION AND IDENTIFICATION (D = DEEP, S = SHALLOW)

----- APPROXIMATE LOCATION OF IWS

Figure 2-2
GROUNDWATER MONITORING WELL LOCATIONS
SWMU 06 - V28 WASTE DISPOSAL PIT
Naval Station Norfolk

3 Physical Characteristics

This section presents general information regarding the environmental setting of NSN, including information on climate and meteorology, topography, surface drainage, soils, geology, and hydrogeology.

3.1 Regional and Basewide Physiography, Surface Water Hydrology, and Climate

Four major surface water features surround the greater Norfolk area: the James and Elizabeth Rivers and Willoughby and Chesapeake Bays, all of which are tidal. The reported 100-year static water flood elevation throughout the Base is 8.5 ft above mean sea level. Portions of the Base adjacent to Willoughby Bay and the Elizabeth River are within the 100-year floodplain.

The upper layer of soils at the Base generally consists of fine sands and silts 20 to 40 ft thick, characterized by low-to-moderate permeability. This layer of soils is typically underlain by relatively impermeable sediments composed of silt, clay, and sandy clay. Together, these strata have a combined thickness of approximately 60 ft. The average permeability of soils in the City of Norfolk is less than 2.5 in. per hour.

The topography of NSN is nearly level. Surface elevations at the site range from sea level to heights of 15 ft, found in the central section of the Base. NSN is located in the outer Atlantic Coastal Plain Physiographic Province, which is characterized by low elevations and gently sloping relief. The Base is underlain by more than 2,000 ft of gently dipping sandy sediments, ranging in age from Recent to Lower Cretaceous.

The uppermost geologic unit is the Columbia Group, which is approximately 60 ft thick and composed of Holocene deposits and undifferentiated Pleistocene deposits. Below it lies the Chesapeake Group, the uppermost unit of which is the Yorktown Formation. It is capped by the Yorktown confining unit that separates the Columbia aquifer from underlying Yorktown aquifer. The Chesapeake Group is composed of several additional older formations that comprise deeper aquifers and confining units.

Two significant shallow aquifer systems in the area are the Columbia aquifer, located in the upper 20 to 40 ft of the Columbia Group, and the underlying Yorktown Aquifer.

The Hampton Roads Area has a maritime climate characterized by long temperate summers and mild winters. The average annual temperature is 60.7° Fahrenheit (F). July is the warmest month, with temperatures averaging 78.7°F, whereas January is the coolest, with temperatures averaging 43.1°F. Freezing temperatures are infrequent in the region. Precipitation averages 43 in. annually and is evenly distributed throughout the year. A slight increase in precipitation occurs between June and August due to the prevalence of convective thunderstorms. The average annual snowfall is 8.8 in. Winds are generally in the easterly direction and moderate, ranging from 6 to 11 knots.

3.2 Site Groundwater Flow

During each sampling event, water levels in the wells were recorded. These data (Table 3-1), in conjunction with survey data, were used in the development of groundwater elevation contour maps. Due to the site's proximity to the Bay, it was expected that groundwater flow would be to the northeast. The groundwater contour map for January 2000 (Figure 3-1) confirms that the groundwater flow direction is to the northeast towards Willoughby Bay. However, the May 2002 (Figure 3-2) groundwater contour map shows that the groundwater flow is to the northwest. In addition, the groundwater elevation data from the June 2000, September 2001, and March 2002 sampling events also indicate that groundwater flow is to the northwest. The difference in groundwater flow direction between the sampling events may be attributed to seasonal variations or an unknown influence that has affected the flow since January 2000. The gradient at the site is gentle, at 3.2×10^{-3} , and groundwater is encountered at 4 to 6 ft bgs. A comparison of the groundwater elevation at MW01D and MW01S indicates that vertical groundwater flow is down into the Yorktown aquifer.

3.3 Site Geology

The site's subsurface is comprised of fine- to medium-grained sands that grade into medium- to coarse-grained sands at approximately 5 ft bgs. The confining unit of the Yorktown aquifer was encountered at a depth of approximately 50 ft bgs and consisted of sandy silts with some shell fragments. Immediately beneath this confining layer, the material consisted of dense, silty fine sands. There was little debris observed in the site's soils and therefore, no evidence of the subsurface disposal of solid materials.

**Table 3-1
Groundwater Elevations
SWMU 6
Naval Station Norfolk**

Date	January 2000			June 2000		September 2001	
Well Number	TOC elevation (ft) ^{^^}	Depth to Water (ft)*	Groundwater Elevation (ft) ^{^^}	Depth to Water (ft)*	Groundwater Elevation (ft) ^{^^}	Depth to Water (ft)*	Groundwater Elevation (ft) ^{^^}
MW01S	6.95	4.63	2.32	4.56	2.39	4.63	2.32
MW01D	6.96	NM	NM	5.34	1.62	NM	NM
MW02S	6.92	4.64	2.28	4.23	2.69	4.5	2.42
MW03S	6.99	4.65	2.34	4.79	2.2	4.86	2.13
MW04S	8.36	5.82	2.54	5.9	2.46	6.08	2.28
MW05S	8.24	5.69	2.55	5.75	2.49	5.96	2.28
MW06S	8.28	5.7	2.58	5.58	2.7	5.96	2.32

Date	March 2002			May 2002	
Well Number	TOC elevation (ft) ^{^^}	Depth to Water (ft)*	Groundwater Elevation (ft) ^{^^}	Depth to Water (ft)*	Groundwater Elevation (ft) ^{^^}
MW01S	6.95	4.68	2.27	4.54	2.41
MW01D	6.96	NM	NM	5.79	1.17
MW02S	6.92	4.36	2.56	4.19	2.73
MW03S	6.99	4.9	2.09	4.72	2.27
MW04S	8.36	6.02	2.34	5.81	2.55
MW05S	8.24	5.97	2.27	5.73	2.51
MW06S	8.28	5.98	2.3	5.71	2.57

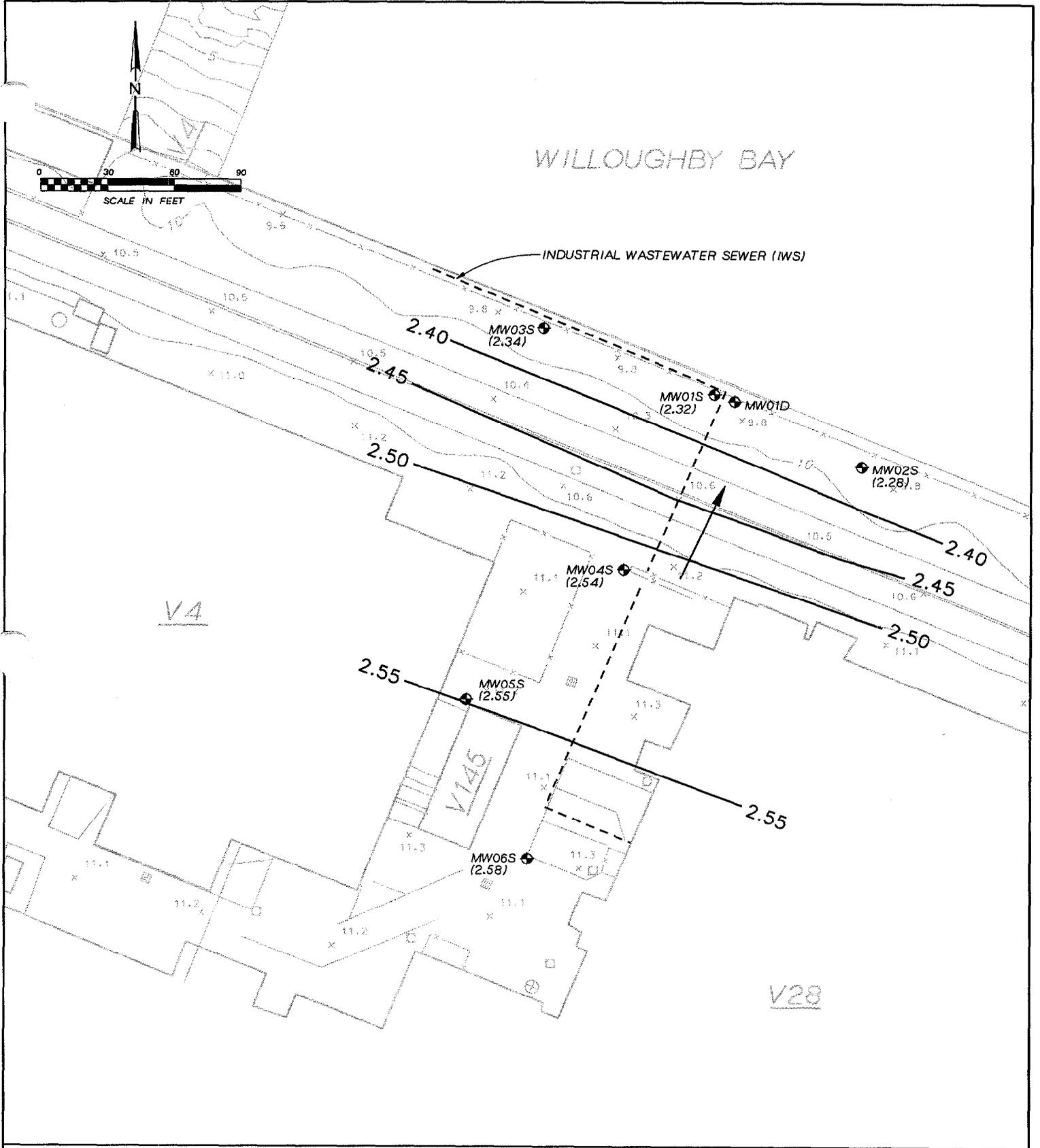
*Depth to water = feet below measuring point

^{^^}Feet Above Mean Sea Level

TOC - Top of Casing

NM - Not Measured

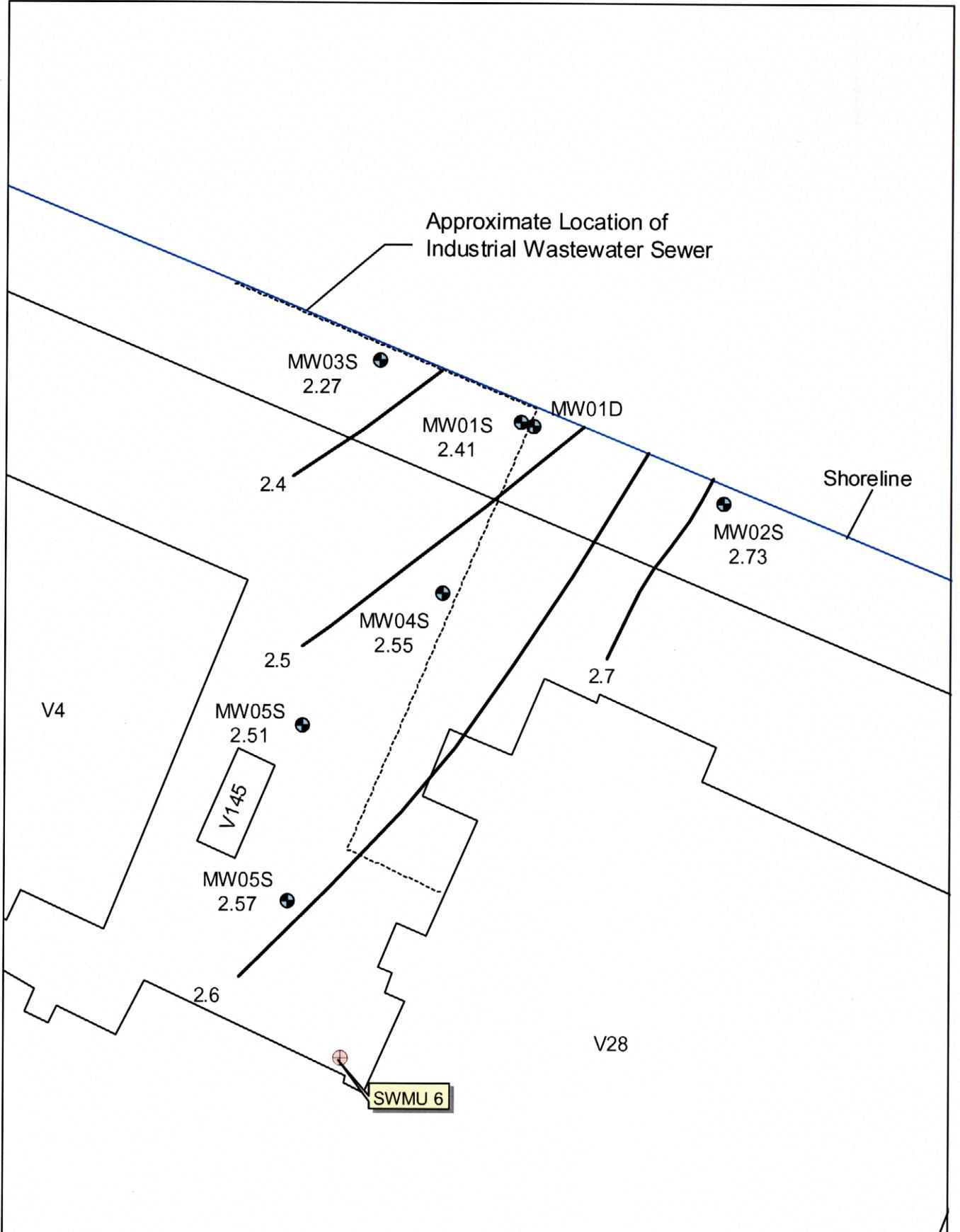
WILLOUGHBY BAY



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- +
 MW03 MONITORING WELL LOCATIONS (D = DEEP, S = SHALLOW)
 (2.34) GROUNDWATER ELEVATION (IN FEET)
- +
 GROUNDWATER FLOW DIRECTION
- 2.40 — GROUNDWATER CONTOUR (MSL)
 (ELEVATION IN FEET)
- - - - - APPROXIMATE LOCATION OF IWS

Figure 3-1
 GROUNDWATER ELEVATION MAP
 JANUARY 2000
 SWMU 06 - V28 WASTE DISPOSAL PIT
 Naval Station Norfolk



LEGEND

- ⊕ Groundwater Monitoring Well
- ⊕ Existing Waste Disposal Pit
- Approximate Location of IWS



Figure 3-2
SWMU 06 - V28 Waste Disposal Pit
Groundwater Elevation Map - May, 2002
Naval Station Norfolk
Norfolk, Virginia

4 Results from Site Investigation

This section discusses the analytical results of the groundwater samples collected during the SI. The results were compared to the MCLs, and tapwater RBCs. A summary of this screening is provided below.

4.1 Analytical Results

4.1.1 Direct Push Technology Data

In 1999, 16 grab groundwater samples were collected and analyzed for VOCs and dissolved metals. The exceedances of the screening criteria are shown in Figure 4-1 and Table 4-1. The raw analytical data is provided in Appendix B, Table B-1.

4.1.1.1 Volatile Organic Compounds

The groundwater analytical results for organic compounds indicate that there were RBC or MCL exceedances of 1,1 dichloroethene (1,1 DCE), trichloroethene (TCE), vinyl chloride, chloroethane, tetrachloroethene (PCE), and 1,4 dichlorobenzene. The results are summarized below:

- 1,1 DCE concentrations exceeded the RBC limit of 0.044 µg/L in the majority of the grab groundwater samples collected northwest of SWMU 6 (DW02, DW04, DW05, DW08, and DW09).
- TCE concentrations exceeded the RBC limit of 0.026 µg/L in all grab groundwater samples (with the exception of DW16 located slightly upgradient of SWMU 6). In addition, the TCE levels exceeded the MCL of 5 µg/L in the four downgradient samples collected closest to SWMU 6 (DW02, DW03, DW04, and DW05).
- Vinyl Chloride was detected in DW08 at 1.6 µg/L and DW09 at 11 µg/L exceeding the RBC of 0.015 µg/L for each sample and the MCL of 5 µg/L in DW09.
- PCE in DW07 and DW12 exceeded the RBC of 0.36 µg/L at levels of 1.1 µg/L and 0.85 µg/L, respectively.
- Isolated exceedances in grab groundwater samples collected at SWMU 6 include chloroethane and 1,4-dichlorobenzene. Chloroethane was detected at 4.8 µg/L in DW09 exceeding the RBC of 3.6 µg/L. 1,4-Dichlorobenzene exceeded the RBC of 0.47 µg/L in DW01 at 1.4 µg/L

4.1.1.2 TAL Dissolved Metals

The dissolved metals results showed that there were exceedances of the screening criteria for the following constituents: arsenic, antimony, cadmium, and chromium. The results are summarized below:

- The concentration of antimony exceeded the RBC (15 µg/L) and MCL (6 µg/L) with a range of 11 µg/L to 218 µg/L at four locations north and east of SWMU 6.
- The concentration of cadmium at location DW07 exceeded the RBC (18 µg/L) and MCL (5 µg/L) with a value of 31.4 µg/L.
- Chromium concentrations exceeded both the RBC (110 µg/L) and MCL (100 µg/L) at four locations with a range of 158 µg/L to 1440 µg/L. The exceedances occurred within one pocket located north of SWMU 6, proximal to the sewer line.
- Arsenic concentrations exceeded the RBC (0.045 µg/L) at seven locations throughout the site with a range of 2.8J µg/L to 10.1 µg/L. The arsenic concentration at DW16 also exceeded the MCL of 10 µg/L.

4.1.2 Monitoring Well Data

Two rounds of monitoring well data were collected in January 2000 (Round 1) and June 2000 (Round 2) and the groundwater samples were analyzed for VOCs, TAL metals (total and dissolved), and cyanide. Additional sampling rounds were conducted in September 2001 (Round 3) and March 2002 (Round 4) for natural attenuation parameters and radionuclides. The exceedances are summarized in Figure 4-2 and Table 4-2. The raw analytical data is provided in Appendix B, Table B-2.

4.1.2.1 Volatile Organic Compounds

The groundwater analytical results for organic compounds indicate that there were RBC or MCL exceedances of 1,1 dichloroethene (1,1 DCE), trichloroethene (TCE), bromodichloromethane, vinyl chloride, chloroethane, chloroform, tetrachloroethene (PCE), ethylbenzene, benzene, and 1,4 dichlorobenzene.

The most widespread VOC contamination was associated with three organic compounds: 1,1 DCE, TCE, and vinyl chloride. Each was detected above its respective RBC in at least five of the seven wells sampled. These constituents were also detected above their RBCs in two of the three farthest downgradient wells during at least one sampling round. However, the only organic compound that exceeded the MCL in the downgradient wells was vinyl chloride at MW03S.

A comparison between the rounds of sampling indicates that the overall levels of VOCs decreased over time in downgradient wells MW01S, MW02S, MW03S, and MW04S. However, the VOC concentrations at MW05S and MW06S (the monitoring wells located closest to SWMU 6) tended to remain relatively consistent between sampling rounds. A summary of the exceedances for each parameter is provided below:

- Rounds 1 and 2 indicate 1,1 DCE concentrations exceeding the RBC limit of 0.044 µg/L in each monitoring well sample with the exception of NBW06-MW01S located directly north of SWMU 6. Results from Round 4 indicate 1,1 DCE concentrations of 0.33 µg/L at MW05S and 7.2 µg/L at MW06S exceeding the RBC of 0.044 µg/L in each location and the MCL of 7 µg/L in MW06S.
- TCE concentrations exceeded the RBC of 0.026 µg/L or the MCL of 5 µg/L in MW03S, MW04S, MW05S, and MW06S during the first two rounds of sampling. The fourth

round of samplings indicated RBC exceedances in MW04S, MW05S, and MW06S at concentrations of 0.35 µg/L, 1.8 µg/L, and 2.2 µg/L, respectively.

- Vinyl chloride detections exceeded the RBC of 0.015 µg/L or the MCL of 2 µg/L in all groundwater samples with the exception of MW05S and MW01D. Vinyl chloride concentrations at MW01S and MW02S exceeded the RBC with levels of 0.15 µg/L and 0.46 µg/L during the first round of sampling only. Detections of vinyl chloride at MW03S, MW04S, and MW06S exceed both the RBC and MCL in one or more rounds of sampling.
- Chloroform was detected in MW01D (Round 1), MW05S (Round 2), and MW04S (Round 4) at concentrations of 9.9 µg/L, .21 µg/L, and 2.4 µg/L exceeding the RBC of 0.15 µg/L.
- PCE was detected during the second round of sampling in MW04S at 1 µg/L and in MW05S during the second and fourth rounds of sampling at 5.5 µg/L and 1.9 µg/L exceeding the RBC of 0.63 µg/L or the MCL of 5 µg/L.
- Isolated exceedances include chloroethane, bromodichloromethane, ethylbenzene, benzene, and dichlorobenzene. Chloroethane was detected at 11 µg/L and 3.8 µg/L in MW03S during the first and second rounds of sampling exceeding the RBC of 3.6 µg/L. Bromodichloromethane was detected at 0.6 µg/L in MW04S exceeding the RBC of 0.17 µg/L. Ethylbenzene was detected during the first round of sampling in MW03S at 13 µg/L exceeding the RBC of 3.3 µg/L. Round one sampling at MW03S also indicated detections of benzene (2 µg/L) exceeding the RBC of 0.32 µg/L and 1,4 dichlorobenzene (30 µg/L) exceeding the RBC of 0.47 µg/L.

4.1.2.2 TAL Dissolved Metals

The groundwater analytical results for dissolved metals showed exceedances of the screening criteria for antimony, cadmium, chromium, and thallium. A data comparison of Rounds 1 and 2 data indicates that the dissolved metals concentrations tended to increase at downgradient wells MW01S, MW04S, and MW05S. However, the dissolved metals concentrations at MW03S remained relatively consistent and those at MW02S tended to decrease between the sampling rounds. A summary of the dissolved metals data is provided below:

- Antimony exceeded the RBC (15 µg/L) and MCL (6 µg/L) at MW05S during both Round 1 and 2 with concentrations of 10.4 µg/L and 21.9 µg/L, respectively.
- Cadmium exceeded the MCL (5 µg/L) at one location (MW04S) in Round 1 and two locations (MW04S and MW05S) in Round 2. The cadmium concentrations ranged from 5.6 to 25.7 µg/L. The highest concentration of cadmium at MW04S also exceeded the RBC of 18 µg/L.
- Chromium exceeded the RBC (110 µg/L) and MCL (100 µg/L) at MW05S in Round 2 and MW01D in Round 1 with concentrations of 115 µg/L and 128 µg/L, respectively.
- Thallium exceeded the RBC (2.6 µg/L) and MCL (2 µg/L) at MW02S, MW03S, and MW05S with concentrations of 4.8 µg/L, 5.3 µg/L, and 5.5 µg/L, respectively. Thallium,

although detected above the screening criteria at three locations in Round 1, was not detected in any groundwater samples during Round 2.

4.1.2.3 TAL Total Metals

The groundwater analytical results for total metals indicated exceedances of the screening criteria for antimony, cadmium, chromium, lead, and thallium. A data comparison of Rounds 1 and 2 indicates that the total metals concentrations tended to increase at downgradient wells MW01S, MW04S, and MW05S. However, the total metals concentrations at MW06S remained relatively consistent and the concentrations at MW02S and MW03S tended to decrease between the sampling rounds. In addition, zinc and lead exceedances were observed in the total metals but not the dissolved metals analysis, indicating that these constituents may be the result of suspended solids and are not site related. A summary of the total metals data is provided below:

- Antimony exceeded the RBC (15 µg/L) and MCL (6 µg/L) at MW05S during both Round 1 and 2 with concentrations of 7.9J µg/L and 22.7 µg/L, respectively.
- Cadmium exceeded the MCL (5 µg/L) at MW04S in Round 1 and Round 2 with concentrations of 7.6 µg/L and 25.7 µg/L, respectively. The Round 2 concentration also exceeded the RBC of 18 µg/L.
- Chromium exceeded the RBC (110 µg/L) and MCL (100 µg/L) at MW05S in Round 2 with a concentration of 136 µg/L. An RBC exceedance was also observed at MW01D in Round 1 with a concentration of 128 µg/L. Hexavalent chromium samples were also collected during Round 1. Hexavalent chromium was only detected in MW05S with a concentration of 120 µg/L that slightly exceeded the RBC of 110 µg/L.
- Lead exceeded the Federal Action Level (15 µg/L) at MW02S (51.6 µg/L) in Round 1 but was nondetect in Round 2.
- Thallium exceeded the RBC (2.6 µg/L) and MCL (2 µg/L) at MW03S with a concentration of 4.9J µg/L. However, thallium was not detected in any groundwater samples during Round 2.

4.1.2.4 Natural Attenuation

Natural attenuation parameters (methane/ethane/ethene, Total Organic Carbon (TOC), ferrous iron, nitrate, sulfate, sulfide, chloride, and alkalinity) were collected during Rounds 3 and 4 of the SI in an effort to determine if biodegradation of the organic chemicals is occurring at the site.

The natural attenuation parameters are shown in Table 4-3 and discussed below:

- During the biodegradation of chlorinated hydrocarbons chloride is released into the groundwater. The concentration of chloride progressively increases downgradient of SWMU 6. The wells closest to SWMU 6 (MW05 and MW06) showed a chloride concentration range of 15.9 to 21.4 mg/L; however, the wells furthest downgradient of the waste pit (MW01, MW02, MW03) had a chloride concentration range of 832 to 288 mg/L. In addition, the downgradient wells demonstrated a significant increase in chloride between the sampling rounds. However, due to the location of the high

chloride levels proximal to the bay, any increase in chloride from biodegradation cannot be differentiated from the potential impact of saltwater intrusion.

- The pH of groundwater has an effect on the presence and activity of microbes in the groundwater. The pH at the site ranges from 7.01 to 8.82 and is within the optimal range for biodegradation.
- The Oxidation-Reduction Potential (ORP) indicates the tendency of a solution to accept or transfer electrons (a necessary process in the biodegradation of organic compounds). The ORP at the site is relatively low with measurements ranging from -264 to 178 mV, indicating that the reductive potential favors biodegradation.
- Dissolved oxygen (DO) is used by microbes for the biodegradation of organic carbon. DO fluctuates across the site and between sampling rounds indicating that no clear trend can be established with regard to the DO levels impacting biodegradation.
- Once the DO has been depleted by microbial activity, nitrate may be used for biodegradation. For reductive biodegradation the nitrate levels must be less than 1 mg/L. Nitrate levels are consistently below this level indicating that conditions are favorable for biodegradation.
- Ferrous iron, sulfate, and organic carbon are fuel sources for the biodegradation process. The concentrations of organic carbon and ferrous iron are too low and the concentration of sulfate is too high to support the microbial breakdown of organics at the site.
- Ethane, ethene, and carbon dioxide are the end daughter products of the breakdown of chlorinated organic compounds. The relatively low levels of these parameters indicate little biodegradation of the organic constituents at the site.
- The presence of methane in groundwater indicates the biodegradation of hydrocarbons. The methane levels fluctuate across the site and no clear trend can be established.

There is some evidence that natural attenuation is occurring at the site. The pH, ORP, and nitrate measurements indicate that conditions may be favorable for biodegradation. In addition, the concentrations of daughter products such as vinyl chloride and chloroethane are elevated in the downgradient samples. It is likely that natural attenuation is occurring at the site from a combination of biodegradation, dilution, and dispersion of the VOC contaminant plume.

4.1.2.5 Radionuclides

Radionuclide samples were collected in Round 3 and 4 of the SI. Based upon the previous information, the radionuclides at the site may have originated from the manufacture of luminescent dials. The most prevalent radioactive materials used in this process are radium and tritium. The Round 3 sampling consisted of tritium and gross alpha-beta testing. The gross alpha-beta testing was used to determine the bulk presence of radioactive material but not the speciation. However, tritium is not detected by the gross alpha beta screening; therefore, specific tests were conducted for tritium. The Round 3 testing results showed that no tritium or gross alpha radiation was present at the site. However, gross beta levels were detected in all of the shallow monitoring wells (with the exception of MW01S) with a range

of 2.8 pCi/L to 16.1 pCi/L. These levels are below the MCL level of 50 pCi/L for beta activity.

As a result of the Round 3 testing it was concluded that tritium was not present at the site. However, the gross beta detects indicated that some radionuclides were present. Therefore, in Round 4 gross alpha-beta tests were again conducted to determine the consistency of the activity at the site. Because tritium was not detected at the site, it is likely that any radioactive material disposed as a result of the manufacture of luminescent dials would consist of radium. Therefore, total radium and radium 228 were analyzed to evaluate the presence and speciation of any radium at the site. The analytical results for Round 4 again show no detections for gross alpha activity. In addition, no radium 228 was detected at the site. Total radium was detected at 0.59J pCi/L at well MW02S and gross beta levels were detected in all of the shallow monitoring wells with a range of 6.2 pCi/L to 20.4 pCi/L. However, the gross beta activity levels were below the MCL of 50 pCi/L. Currently, there is no RBC or MCL standard for total radium; therefore, the results were compared to the Virginia Groundwater Standard (VAGS). The total radium detect was well below the VAGS of 5pCi/L.

Table 4-1
Direct Push Exceedances
SWMU 6
Naval Station Norfolk

Station ID	RBC-Tap (1)	MCL- Groundwater (2)	NBW06-DW01	NBW06-DW02	NBW06-DW03	NBW06-DW04	NBW06-DW05	NBW06-DW06	NBW06-DW07	NBW06-DW08	NBW06-DW09	NBW06-DW10	NBW06-DW11		NBW06-DW12
Sample ID			NBW06-DW01	NBW06-DW02	NBW06-DW03	NBW06-DW04	NBW06-DW05	NBW06-DW06	NBW06-DW07	NBW06-DW08	NBW06-DW09	NBW06-DW10	NBW06-DW11	NBW06-DW11P	NBW06-DW12
Sample Date			09/29/99	09/29/99	09/29/99	09/29/99	09/29/99	09/30/99	09/30/99	09/30/99	09/30/99	09/30/99	10/01/99	10/01/99	10/01/99
Chemical Name															
Volatile Organic Compounds (UG/L)															
1,1-Dichloroethene	0.044	7	0.25 J	0.24 J	1 U	1.9	0.32 J	1 U	1 U	0.15 J	0.74 J	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	0.47	75	1.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	3.6	-	2 J	1 UJ	0.79 J	4.8 J	1 UJ	1 UJ	1 UJ	1 UJ					
Tetrachloroethene	0.63	5	0.15 J	1 U	1 U	0.25 J	0.33 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.85 J
Trichloroethene	0.026	5	0.89 J	6.1	20	15	5.9	0.2 J	0.8 J	0.87 J	1.2	2	0.18 J	0.21 J	0.55 J
Vinyl chloride	0.015	2	0.5 J	1 U	1 U	1 U	1 U	1 U	1 U	1.6	1.2	1 U	1 U	1 U	1 U
Dissolved Metals (UG/L)															
Antimony	15	6	1.1	1.8 B	4.2 B	6.8 B	6.1 B	5.7 B	2.2 J	3.2 B	2.9 B	4.8 B	5.7 B	2.1 B	2.8
Arsenic	0.045	10	3.6 J	2.4 U	2.4 U	2.8 J	3.1	2.4 U	2.4 U	3.3	2.4 U	2.4 U	3.3 J	2.4 U	3.3
Cadmium	18	5	3.2 U	6.4 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U						
Chromium	110	100	4.8 B	2.274	15	1.2	1.440	1.2	1.58	2.3 U	1.2	2.63	2.3 U	2.3 U	5.7 B

Notes:

- B - Possible blank contamination.
- J - Analyte Present. Reported value may not be accurate or precise.
- U - Not detected
- R - Unreliable result
- Reported value may be biased low.

Shaded cells represent exceedances of one or more of the screening criteria.
Each screening criterion has been assigned a reference number listed in parantheses in the column header. The reference number is used to identify specific criteria exceeded in a particular sample.

00945CB3Z

Table 4-1
Direct Push Exceedances
SWMU 6
Naval Station Norfolk

Station ID		MCL-	NBW06-DW13	NBW06-DW14		NBW06-DW15	NBW06-DW16
Sample ID	RBC-Tap (1)	Groundwater (2)	NBW06-DW13	NBW06-DW14	NBW06-DW14P	NBW06-DW15	NBW06-DW16
Sample Date			10/01/99	10/01/99	10/01/99	10/01/99	10/01/99
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1-Dichloroethene	0.044	7	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	0.47	75	1 U	1 U	1 U	1 U	1 U
Chloroethane	3.6	--	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Tetrachloroethene	0.63	5	0.61 J	0.43 J	0.46 J	1 U	1 U
Trichloroethene	0.026	5	1 U	1 U	1 U	1 U	1 U
Vinyl chloride	0.015	2	1 U	1 U	1 U	1 U	0.26 B
Dissolved Metals (UG/L)							
Antimony	15	6	4.2 B	3.7 B	5.3 B	2.4 J	3.2 B
Arsenic	0.045	10	2.4 U	2.4 U	2.4 U	2.4 U	10 J
Cadmium	18	5	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U
Chromium	110	100	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U

Notes:

B - Possible blank contamination.

J - Analyte Present. Reported value may not be accurate or precise.

U - Not detected

R - Unreliable result

Reported value may be biased low.

Shaded cells represent exceedances of one or more of the screening criteria.

Each screening criterion has been assigned a reference number listed in parantheses in the column header. The reference number is used to identify specific criteria exceeded in a particular sample.

Table 4-2
Monitoring Well Exceedances
SWMU 6
Naval Station Norfolk

Station ID	RBC-Tap (1)	MCL-Groundwater (2)	NBW06-MW01D		NBW06-MW01S		NBW06-MW02S		NBW06-MW03S			
			NBW06-MW01D-R01	NBW06-MW01D-R02	NBW06-MW01S-R01	NBW06-MW01S-R02	NBW06-MW02S-R01	NBW06-MW02S-R02	NBW06-MW03S-P-R01	NBW06-MW03S-R01	NBW06-MW03S-P-R02	NBW06-MW03S-R02
Sample ID			01/07/00	06/19/00	01/07/00	06/19/00	01/07/00	06/19/00	01/07/00	01/07/00	06/19/00	06/19/00
Sample Date												
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1-Dichloroethene	0.044	7	1 U	0.3 J	1 U	1 U	0.44 J	1 U	0.17 J	0.11 J	1 U	1 U
1,4-Dichlorobenzene	0.47	75	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.90 J	1 U	1 U
Benzene	0.32	5	1 U	1 U	0.1 J	1 U	1 U	1 U	1 U	0.04 J	0.14 J	1 U
Bromodichloromethane	0.17	80	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	3.6	--	1 U	1 U	1 U	3.3 J	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	0.15	80	0.9 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	3.3	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	0.63	5	0.23 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	0.026	5	1 U	1 U	1 U	1 U	0.29 J	0.14 J	0.23 J	1 U	1 U	1 U
Vinyl chloride	0.015	2	1 U	1 U	0.5 J	1 U	0.46 J	1 U	0.11 J	1 U	0.12 J	0.43 J
Total Metals (UG/L)												
Antimony	15	6	1.4 U	2.4 U	1.4 U	2.4 U	1.4 U	2.4 U	1.4 U	1.4 U	2.4 U	2.4 U
Arsenic	0.045	10	2.9 U	2.8 B	2.9 U	1.5 U	7.8 J	2.5 B	2.9 U	2.9 U	1.5 U	1.6 B
Cadmium	18	5	3.4 U	3.8 U	3.4 U	3.8 U	3.4 U	3.8 U	3.4 U	3.4 U	3.8 U	3.8 U
Chromium	110	100	12 J	3.9 U	2.2 U	3.9 U	51.1	3.9 U	3.4 B	3 B	3.9 U	3.9 U
Chromium (hexavalent)	0.11	--	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	0.01 U	NA	NA
Lead	--	15	2.4 B	1.3 U	1.6 U	1.3 U	5.16 J	6.6 B	1.6 U	1.6 U	1.3 U	1.3 U
Thallium	2.6	2	3.8 U	4.6 B	3.8 U	5.9 B	3.8 U	5.7 B	4.9 J	3.8 U	4.5 U	4.5 U
Dissolved Metals (UG/L)												
Antimony	15	6	1.6 J	2.4 U	1.4 U	2.4 U	1.9 J	2.4 U	2.3 J	1.9 J	2.4 U	2.4 U
Arsenic	0.045	10	2.9 U	1.5 U	2.9 U	1.5 U	4.6 J	1.8 B	2.9 U	2.9 U	1.9 B	1.5 U
Cadmium	18	5	3.4 U	3.8 U	3.4 U	3.8 U	3.4 U	3.8 U	3.4 U	3.4 U	3.8 U	3.8 U
Chromium	110	100	12 J	3.9 U	2.2 U	3.9 U	4.5 B	3.9 U	2.2 U	2.2 U	3.9 U	3.9 U
Thallium	2.6	2	3.8 U	7 B	3.8 U	4.5 U	3.8 U	4.5 U	3.8 U	3.8 U	7.5 B	5.5 B

Notes:

NA - Not Analyzed
 J - Analyte Present. Reported value may not be accurate or precise.
 L - Reported value may be biased low. Actual value expected to be higher.
 U - Not Detected.
 B - Possible blank contamination
 R - Unreliable result.

Shaded cells represent exceedances of one or more of the screening criteria.
 Each screening criterion has been assigned a reference number listed in parentheses in the column header. The reference number is used to identify specific criteria exceeded in a particular sample.

Table 4-2
Monitoring Well Exceedances
SWMU 6
Naval Station Norfolk

Station ID	RBC-Tap (1)	MCL-Groundwater (2)	NBW06-MW04S			NBW06-MW05S				
			NBW06-MW03S-P-R04	NBW06-MW03S-R04	NBW06-MW04S-R01	NBW06-MW04S-R02	NBW06-MW04S-R04	NBW06-MW05S-R01	NBW06-MW05S-R02	NBW06-MW05S-R04
Sample ID			03/11/02	03/11/02	01/07/00	06/19/00	03/11/02	01/07/00	06/19/00	03/11/02
Sample Date										
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1-Dichloroethene	0.044	7	1 U	1 U	0.76 J	1.13	1 U	0.72	5	0.33 J
1,4-Dichlorobenzene	0.47	75	NA	NA	1 U	1 U	NA	1 U	1 U	NA
Benzene	0.32	5	0.21 J	0.21 J	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	0.17	80	1 U	1 U	1 U	1 U	0.63 J	1 U	1 U	1 U
Chloroethane	3.6	--	1.9	2	1 U	1 UJ	1 U	1 U	1 UJ	1 U
Chloroform	0.15	80	1 U	1 U	1 U	1 U	2.4	1 U	0.21 J	1 U
Ethylbenzene	3.3	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	0.63	5	1 U	1 U	0.55 J		1 U	1 U	5.5	1.9
Trichloroethene	0.026	5	1 U	1 U	1.14	1.22	0.35 J	1.14	1.22	1.8
Vinyl chloride	0.015	2	20	12.20	12.71	12.75	3.77	1 U	1 U	1 U
Total Metals (UG/L)										
Antimony	15	6	NA	NA	2.6 J	2.4 U	NA	2.79 J	2.77	NA
Arsenic	0.045	10	NA	NA	2.9 U	3.5 B	NA	2.9 U	1.8 B	NA
Cadmium	18	5	NA	NA	2.75	1.25 B	NA	3.4 U	3.8 U	NA
Chromium	110	100	NA	NA	2.2 U	3.9 U	NA	68.9	12.39	NA
Chromium (hexavalent)	0.11	--	NA	NA	0.01 U	NA	NA	0.12	NA	NA
Lead	--	15	NA	NA	1.6 U	1.3 U	NA	1.6 U	1.3 U	NA
Thallium	2.6	2	NA	NA	3.8 U	6.6 B	NA	3.8 U	4.5 U	NA
Dissolved Metals (UG/L)										
Antimony	15	6	NA	NA	4.3 J	2.4 U	NA	2.79 J	2.77	NA
Arsenic	0.045	10	NA	NA	2.9 U	2.6 B	NA	2.9 U	1.5 U	NA
Cadmium	18	5	NA	NA	2.75	2.17	NA	3.4 U		NA
Chromium	110	100	NA	NA	2.2 U	3.9 U	NA	78		NA
Thallium	2.6	2	NA	NA	3.8 U	5.6 B	NA		6.3 B	NA

Notes:

- NA - Not Analyzed
- J - Analyte Present. Reported value may not be accurate or precise.
- L - Reported value may be biased low. Actual value expected to be higher.
- U - Not Detected.
- B - Possible blank contamination
- R - Unreliable result.

Shaded cells represent exceedances of one or more of the screening criteria. Each screening criterion has been assigned a reference number listed in parentheses in the column header. The reference number is used to identify specific criteria exceeded in a particular sample.

Table 4-2
Monitoring Well Exceedances
SWMU 6
Naval Station Norfolk

Station ID	RBC-Tap (1)	MCL-Groundwater (2)	NBW06-MW06S		
			NBW06-MW06S-R01	NBW06-MW06S-R02	NBW06-MW06S-R04
Sample ID			01/07/00	06/20/00	03/11/02
Sample Date					
Chemical Name					
Volatile Organic Compounds (UG/L)					
1,1-Dichloroethene	0.044	7	0.31	1.01	1.2
1,4-Dichlorobenzene	0.47	75	1 U	1 U	NA
Benzene	0.32	5	1 U	1 U	1 U
Bromodichloromethane	0.17	80	1 U	1 U	1 U
Chloroethane	3.6	--	1 U	1 UJ	1 U
Chloroform	0.15	80	1 U	1 U	1 U
Ethylbenzene	3.3	700	1 U	1 U	1 U
Tetrachloroethene	0.63	5	1 U	0.19 J	1 U
Trichloroethene	0.026	5	2.3	1.2	1.5
Vinyl chloride	0.015	2	0.26	0.26	1.2
Total Metals (UG/L)					
Antimony	15	6	1.4 U	2.4 U	NA
Arsenic	0.045	10	2.9 U	1.5 U	NA
Cadmium	18	5	3.4 U	3.8 U	NA
Chromium	110	100	2.2 U	9.3	NA
Chromium (hexavalent)	0.11	--	0.01 U	NA	NA
Lead	--	15	1.6 U	1.3 U	NA
Thallium	2.6	2	3.8 U	5.9 B	NA
Dissolved Metals (UG/L)					
Antimony	15	6	1.4 U	2.4 U	NA
Arsenic	0.045	10	2.9 U	2.7 B	NA
Cadmium	18	5	3.4 U	3.8 U	NA
Chromium	110	100	3 B	3.9 U	NA
Thallium	2.6	2	3.8 U	5 B	NA

Notes:

NA - Not Analyzed
 J - Analyte Present. Reported value may not be accurate or precise.
 L - Reported value may be biased low. Actual value expected to be higher.
 U - Not Detected.
 B - Possible blank contamination
 R - Unreliable result.

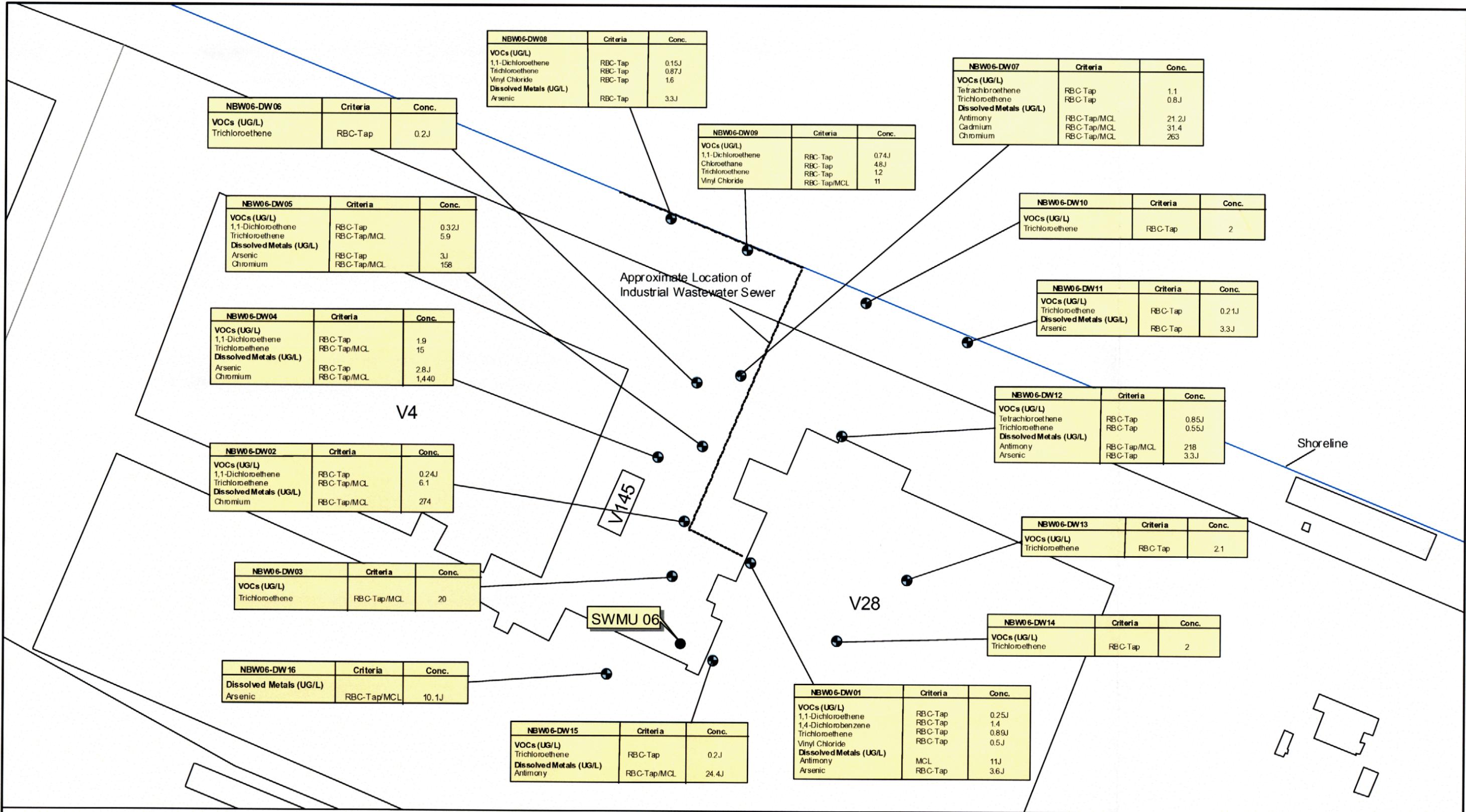
Shaded cells represent exceedances of one or more of the screening criteria.
 Each screening criterion has been assigned a reference number listed in parentheses in the column header.
 The reference number is used to identify specific criteria exceeded in a particular sample.

CTO 131
Table 4-3
Natural Attenuation Parameters
SWMU 6
Naval Station Norfolk

Station ID	NBW06-MW01S		NBW06-MW02S		NBW06-MW03S		NBW06-MW04S		NBW06-MW05S		NBW06-MW06S			
Sample ID	NBW06-MW01S-R03	NBW06-MW01S-R04	NBW06-MW02S-R03	NBW06-MW02S-R04	NBW06-MW03S-R03	NBW06-MW03S-P-R04	NBW06-MW03S-R04	NBW06-MW04S-P-R03	NBW06-MW04S-R03	NBW06-MW04S-R04	NBW06-MW05S-R03	NBW06-MW05S-R04	NBW06-MW06S-R03	NBW06-MW06S-R04
Sample Date	09/19/01	03/11/02	09/19/01	03/11/02	09/19/01	03/11/02	03/11/02	09/19/01	09/19/01	03/11/02	09/19/01	03/11/02	09/19/01	03/11/02
Chemical Name														
Wet Chemistry (MGL)														
Alkalinity	200	160 U	46	38 J	160	140	140	130	130	130	80	93	120	100
Carbon dioxide	79	15 B	0.72 B	15 B			14 B			6.9 B		11 B		2 B
Chloride	251	832	511	291	175	266	266	266	266	177	212	214	159	159
Ethane	0.002	0.003	0.002 U	0.002	0.0017 J	0.0017	0.0017	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Ethene	1.00E-03 U	1.00E-03 U	1.00E-03 U	1.00E-03 U	1.00E-03 U	1.00E-03 U	1.00E-03 U	1.00E-03 U	1.00E-03 U					
Ferrous iron	0.04	0.02 U	0.23	0.13 J	0.033	0.025	0.12	0.05 U	0.002 U	0.05 U	0.05 U	0.05 U	0.013	0.009
Methane	24	27	0.07	0.055	0.11	0.11	0.11	0.021	0.022	0.057	9.30E-04 B	1.9 B	0.05	0.009
Nitrate	NA	0.03 U	NA	0.29	NA	0.1 U	0.1 U	NA	NA	0.19	NA	NA	NA	NA
Nitrite	0.5 U	0.1 U	0.055	0.1 U	0.1 U	0.1 U	0.1 U	0.042	0.021	0.1 U				
Sulfate	46	36.5	7.24	39	66.6	64.5	64.5	57	57	74.9	25.5	44.1	44.1	44.1
Sulfide		1 U	1 U	1 U	0.9 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total organic carbon (TOC)	3 B		0.5 B	1 B	3 B			2 B	2 B	2 B	0.7 B	2 B	2 B	3 B

Notes:
 Indicates Detection
 NA - Not Analyzed
 J - Analyte Present. Reported value may not be accurate or precise.
 L - Reported value may be biased low. Actual value expected to be higher.
 U - Not Detected.
 B - Possible blank contamination
 R - Unreliable result.

Field Parameter	Units	NBW06-MW01S		NBW06-MW02S		NBW06-MW03S		NBW06-MW04S		NBW06-MW05S		NBW06-MW06S	
		NBW06-MW01S-R03 09/19/2001	NBW06-MW01S-R04 03/11/2002	NBW06-MW02S-R03 09/19/2001	NBW06-MW02S-R04 03/11/2002	NBW06-MW03S-R03 09/19/2001	NBW06-MW03S-R04 03/11/2002	NBW06-MW04S-R03 09/19/2001	NBW06-MW04S-R04 03/11/2002	NBW06-MW05S-R03 09/19/2001	NBW06-MW05S-R04 03/11/2002	NBW06-MW06S-R03 09/19/2001	NBW06-MW06S-R04 03/11/2002
PH	PH	8.11	7.33	8.82	7.73	7.92	7.18	7.96	7.24	8.02	7.01	8.7	8.07
Dissolved Oxygen	MGL	2.17	0.6	1.99	2.5	2.25	0.2	2.42	1	3.26	3	1.9	0.66
Oxidation Reduction Potential	MV	-197	-264	178	-65	-162	-182	-64	34	-48	79	-102	-89



LEGEND

- Grab Groundwater Locations
- Buildings

RBC-Tap: EPA Region III Risk Based Criteria for tap water.
 MCL-Groundwater: Maximum Contaminant Level for federal drinking water standards.
 J - Reported result may not be accurate or precise

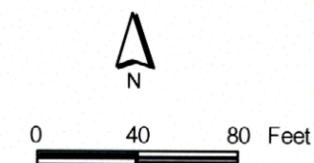


Figure 4-1
 SWMU06
 Grab Groundwater Sampling
 Locations and Exceedances
 Naval Station Norfolk
 Norfolk, Virginia

NEW06-MW03S	Criteria	Conc.
VOCs (UG/L)		
1,1-Dichloroethene	RBC-Tap	0.17J, ND, NA, ND
1,4-Dichlorobenzene	RBC-Tap	30, ND, NA, ND
Benzene	RBC-Tap	2, NE, NA, NE
Chloroethane	RBC-Tap	11J, 3.8J, NA, NE
Ethylbenzene	RBC-Tap	13, ND, NA, ND
Trichloroethene	RBC-Tap	0.23J, ND, NA, ND
Vinyl Chloride	RBC-Tap/MCL	18, 18, NA, 20
Total Metals (UG/L)		
Thallium	RBC-Tap/MCL	4.9J, ND, NA, NA
Dissolved Metals (UG/L)		
Thallium	RBC-Tap/MCL	5.3J, ND, NA, NA

NEW06-MW01S	Criteria	Conc.
VOCs (UG/L)		
Vinyl Chloride	RBC-Tap	0.15J, ND, NA, ND

NEW06-MW01D	Criteria	Conc.
VOCs (UG/L)		
1,1-Dichloroethene	RBC-Tap	ND, .3J, NS, NS
Chloroform	RBC-Tap	9.9, ND, NS, NS
Total Metals (UG/L)		
Chromium	RBC-Tap	128, ND, NS, NS
Dissolved Metals (UG/L)		
Chromium	RBC-Tap	128, ND, NS, NS

NEW06-MW04S	Criteria	Conc.
VOCs (UG/L)		
1,1-Dichloroethene	RBC-Tap	0.76J, 1.3, NA, ND
Bromodichloromethane	RBC-Tap	ND, ND, NA, 0.6J
Chloroform	RBC-Tap	ND, ND, NA, 2.4J
Tetrachloroethene	RBC-Tap	NE, 1, NA, ND
Trichloroethene	RBC-Tap	1.4, 2.2, NA, .35J
Vinyl Chloride	RBC-Tap/MCL	7.1, 7.3, NA, 3.7
Total Metals (UG/L)		
Cadmium	RBC-Tap/MCL	7.6, 25.7, NA, NA
Dissolved Metals (UG/L)		
Cadmium	RBC-Tap/MCL	7.6, 21.7, NA, NA

Approximate Location of Industrial Wastewater Sewer

NEW06-MW02S	Criteria	Conc.
VOCs (UG/L)		
1,1-Dichloroethene	RBC-Tap	0.44J, ND, NA, ND
Trichloroethene	RBC-Tap	0.29J, .14J, NA, ND
Vinyl Chloride	RBC-Tap	0.46J, ND, NA, ND
Total Metals (UG/L)		
Arsenic	RBC-Tap	7.8J, ND, NA, NA
Lead	Action Level	51.6, ND, NA, NA
Dissolved Metals (UG/L)		
Arsenic	RBC-Tap	4.6J, ND, NA, NA
Thallium	RBC-Tap/MCL	4.8J, ND, NA, NA

NEW06-MW05S	Criteria	Conc.
VOCs (UG/L)		
1,1-Dichloroethene	RBC-Tap	0.7J, 1.5, NA, .33J
Chloroform	RBC-Tap	ND, .21J, NA, ND
Tetrachloroethene	RBC-Tap/MCL	ND, 5.5, NA, 1.9
Trichloroethene	RBC-Tap/MCL	1.2, 5.2, NA, 1.8
Total Metals (UG/L)		
Antimony	RBC-Tap/MCL	7.9J, 22.7, NA, NA
Chromium	RBC-Tap/MCL	NE, 136, NA, NA
Chromium (hexavalent)	RBC-Tap	120, NA, NA, NA
Dissolved Metals (UG/L)		
Antimony	RBC-Tap/MCL	10.4J, 21.9, NA, NA
Cadmium	MCL	ND, 5.6, NA, NA
Chromium	RBC-Tap/MCL	NE, 115, NA, NA
Thallium	RBC-Tap/MCL	5.5J, ND, NA, NA

V145

NEW06-MW06S	Criteria	Conc.
VOCs (UG/L)		
1,1-Dichloroethene	RBC-Tap/MCL	0.31J, 0.1J, NA, 7.2
Trichloroethene	RBC-Tap/MCL	2.3, 8, NA, 3.5
Vinyl Chloride	RBC-Tap/MCL	0.26J, 0.28J, NA, 2.2

V28

Shoreline

SWMU 06

LEGEND

-  Monitoring Well Locations
-  Buildings

RBC-Tap: EPA Region III Risk Based Criteria for tap water.
 MCL-Groundwater: Maximum Contaminant Level for federal drinking water standards.
 NA - Not Analyzed
 NS - Not Sampled
 ND - Not Detected
 NE - Sample concentration did not exceed screening criteria
 J - Reported result may not be accurate or precise
 Note:
 Sample exceedances for both RBC-Tap and MCL Groundwater are noted in figure however, it may not have exceeded all of the screening criteria.

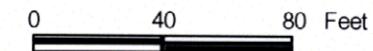


Figure 4-2
 SWMU 6
 Monitoring Well Sampling
 Locations and Exceedances
 Naval Station Norfolk
 Norfolk, Virginia

5 Conclusions and Recommendations

This section presents the SI conclusions and provides recommendations. The results of the SI are summarized below:

- The monitoring well analytical results for organic compounds indicate that there were RBC or MCL exceedances of 1,1 DCE, TCE, bromodichloromethane, vinyl chloride, chloroethane, chloroform, PCE, ethylbenzene, benzene, and 1,4 dichlorobenzene. The most widespread VOC contamination was associated with three organic compounds; 1,1 DCE, TCE, and vinyl chloride. Each of these constituents was detected above its respective RBCs in at least five of the seven wells sampled. These constituents were also detected above their RBCs in two of the three furthest downgradient wells during at least one sampling round. However, the only organic compound that exceeded the MCL in the downgradient wells was vinyl chloride at MW03S.
- A comparison between the rounds of sampling indicates that the overall levels of VOCs decreased over time in downgradient wells MW01S, MW02S, MW03S, and MW04S. However, the VOC concentrations at MW05S and MW06S (the monitoring wells located closest to SWMU 6) tended to remain relatively consistent between sampling rounds.
- The monitoring well analytical results for metals showed exceedances of the screening criteria for antimony, cadmium, chromium, lead, and thallium. In addition, hexavalent chromium samples were collected in Round 1 and a slight RBC exceedance was observed at MW05S. A data comparison of Rounds 1 and 2 indicates that the total metals concentrations tended to increase at downgradient wells MW01S, MW04S, and MW05S. However, the total metals concentrations at MW06S remained relatively consistent and the concentrations at MW02S and MW03S tended to decrease between the sampling rounds. In addition, lead exceedances were observed in the total metals but not the dissolved metals analysis, indicating that this constituent may be the result of suspended solids and is not site related.
- Exceedances of the screening criteria for 1,1 DCE, chloroform, and chromium were observed in deep well MW01D, indicating the possible transport of contaminants from the shallow to the deep aquifer.
- There is some evidence that natural attenuation is occurring at the site. The pH, ORP, and nitrate measurements indicate that conditions may be favorable for biodegradation. In addition, the concentrations of daughter products such as vinyl chloride and chloroethane are elevated in the downgradient samples. It is likely that natural attenuation is occurring at the site from a combination of biodegradation, dilution, and dispersion of the VOC contaminant plume.
- Groundwater samples were analyzed for tritium, total radium, radium 228, and gross alpha-beta activity. The analytical results showed that there were no detects of radium 228, gross alpha activity, or tritium. Total radium was detected at well MW02S and gross beta levels were detected in all of the shallow monitoring wells. However, the gross beta

activity levels were below the MCL. Currently, there is no RBC or MCL standard for total radium, therefore, the results were compared to the Virginia Groundwater Standard (VAGS). The total radium detect was well below the VAGS. Based on the analytical results, there is no evidence of the disposal of radionuclides at the site.

The analytical data indicates that the concentrations of several metals and organic compounds exceed the screening criteria. However, based upon the historical knowledge and interview with the former waste handler, it is unlikely that the SWMU 6 waste tank is the source of the organic contaminants observed at the site. Furthermore, the metals concentrations exhibit a random pattern not indicative of a common source. Finally, there is no evidence of soil contamination proximal to the tank and no indication that radionuclides were disposed at the site. Therefore, SWMU 6 is recommended for no further action and it is proposed that a Close-Out report be generated for the site.

6 References

A. T. Kearney, *Revised Phase II RCRA Facility Assessment of the Norfolk Naval Base - Sewells Point, Norfolk, Virginia*. March 1992.

Baker Environmental, Inc. *Final Relative Risk Ranking System Data Collection Sampling and Analysis Report, Naval Base, Norfolk, Norfolk, Virginia*. January 1996

CH2M HILL. *Draft Report for the Solid Waste Management Unit Confirmatory Investigation-SWMU 01, SWMU 04, SWMU 06, and SWMU 08, Norfolk Naval Base, Norfolk, Virginia*. November 1996.

CH2M HILL. *Final Master Project Plans for Naval Base, Norfolk, Norfolk, Virginia*. October 1997.

CH2M HILL. *Final Work Plan for Supplemental Field Investigations for SWMUs 6, 9, 10, 14, and 39*. August 1999

CH2M HILL. *Draft Work Plan for Supplemental Investigation at SWMU 6, Building V-28 Waste Pit, Naval Station Norfolk, Norfolk, Virginia*. July 2001

OHM Remediation Services Corp. *Contractor's Closeout Report for Radium Decontamination, Buildings V-28 & LF-18, Naval Aviation Depot Norfolk, VA*. June 1994.

Appendix A
Soil Boring Logs and Well Construction Details



PROJECT NUMBER
154408.FI.FI

WELL NUMBER
NBW06-MW01S

SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : CTO-131

LOCATION : V-28

DRILLING CONTRACTOR : Parratt Wolff

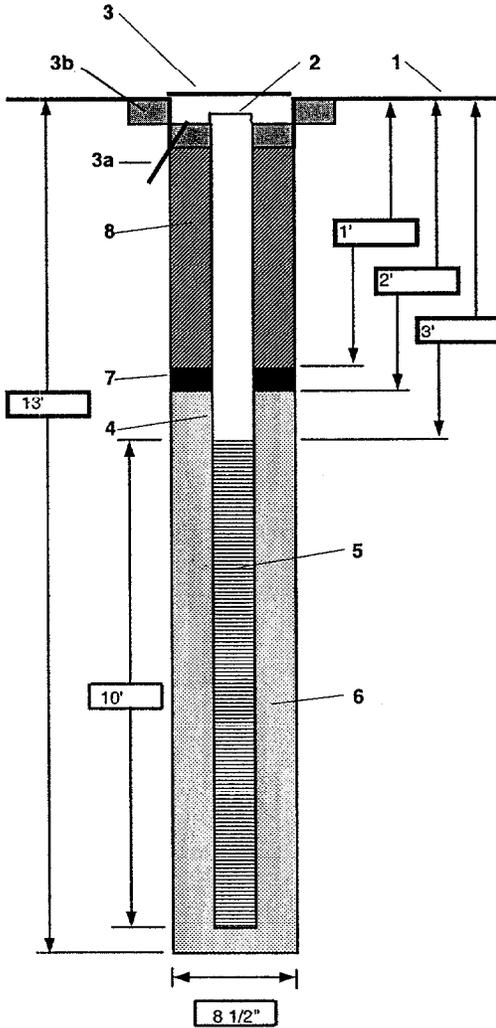
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger

WATER LEVELS :

START : 11/23/99

END : 11/23/99

LOGGER : M. Louth



1- Ground elevation at well	_____
2- Top of casing elevation	_____
3- Wellhead protection cover type	Flushmount
a) drain tube?	_____
b) concrete pad dimensions	2' Diameter
4- Dia./type of well casing	2" PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40/10 Slot
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	5 bags
7- Type of seal	DSI 3/8" Bentonite Chips
a) Quantity used	1/2 bag
8- Grout	_____
a) Grout mix used	Portland Cement
b) Method of placement	_____
c) Vol. of well casing grout	_____
Development method	Surge/Pump
Development time	45 min.
Estimated purge volume	55 gal
Comments	Clear
_____	_____
_____	_____
_____	_____
_____	_____



PROJECT NUMBER
154408.FI.FI

WELL NUMBER
NBW06-MW02S

SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : CTO-131

LOCATION : V-28

DRILLING CONTRACTOR : Parratt Wolff

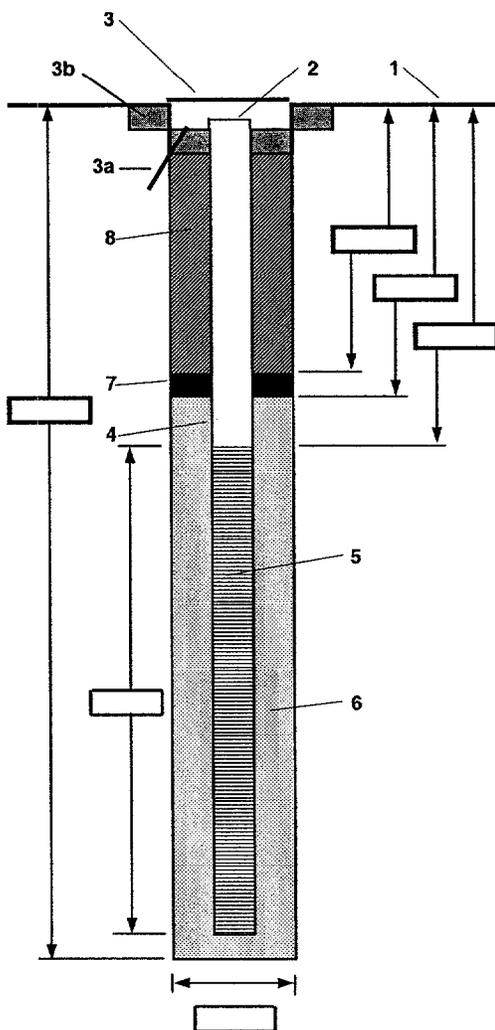
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger

WATER LEVELS :

START : 11/20/99

END : 11/23/99

LOGGER : M. Louth



1- Ground elevation at well	_____
2- Top of casing elevation	_____
3- Wellhead protection cover type	Flushmount
a) drain tube?	_____
b) concrete pad dimensions	2' Diameter
4- Dia./type of well casing	2" PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40/10 Slot
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	5 bags
7- Type of seal	DSI 3/8" Bentonite Chips
a) Quantity used	1/2 bag
8- Grout	_____
a) Grout mix used	Portland Cement
b) Method of placement	_____
c) Vol. of well casing grout	_____
Development method	Surge/Pump
Development time	45 min.
Estimated purge volume	55 gal
Comments	_____



PROJECT NUMBER 154408.FI.FI	BORING NUMBER NBW06-MW02S
SHEET 1 OF 1	
<h2 style="margin: 0;">SOIL BORING LOG</h2>	

PROJECT : CTO-131	LOCATION : V-28
ELEVATION :	DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger	
WATER LEVELS :	START : 11/20/99 END : 11/23/99 LOGGER : M. Louth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)			STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION	COMMENTS
	RECOVERY (IN)	#/TYPE				
		TEST RESULTS				
		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.				
					0-1' concrete	OVM (ppm): Breathing Zone Above Hole
					1-2' gravel	
2-4'	24/14	1	7-8-9-11 (17)	fine to medium sand (SW); tan; well sorted; moist at tip	PID 0 ppm (1420)	
5				Could not get auger through concrete: will jackhammer		
5-7'	24/	2	4-4-5-7 (9)	medium to coarse sand (SW); trace silt; tan loose; moist to wet	PID 0 ppm (1115)	
10						
10-12'	24/	3	4-5-5-6 (10)	medium to coarse sand (SW); trace silt; tan-gray loose; saturated; gray clay at tip	PID 0 ppm (1130)	
15				End of boring		
20				Well set at 13' bgs with screen from 3-13' bgs		
25						



PROJECT NUMBER
154408.FI.FI

WELL NUMBER
NBW06-MW03S

SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : CTO-131

LOCATION : V-28

DRILLING CONTRACTOR : Parratt Wolff

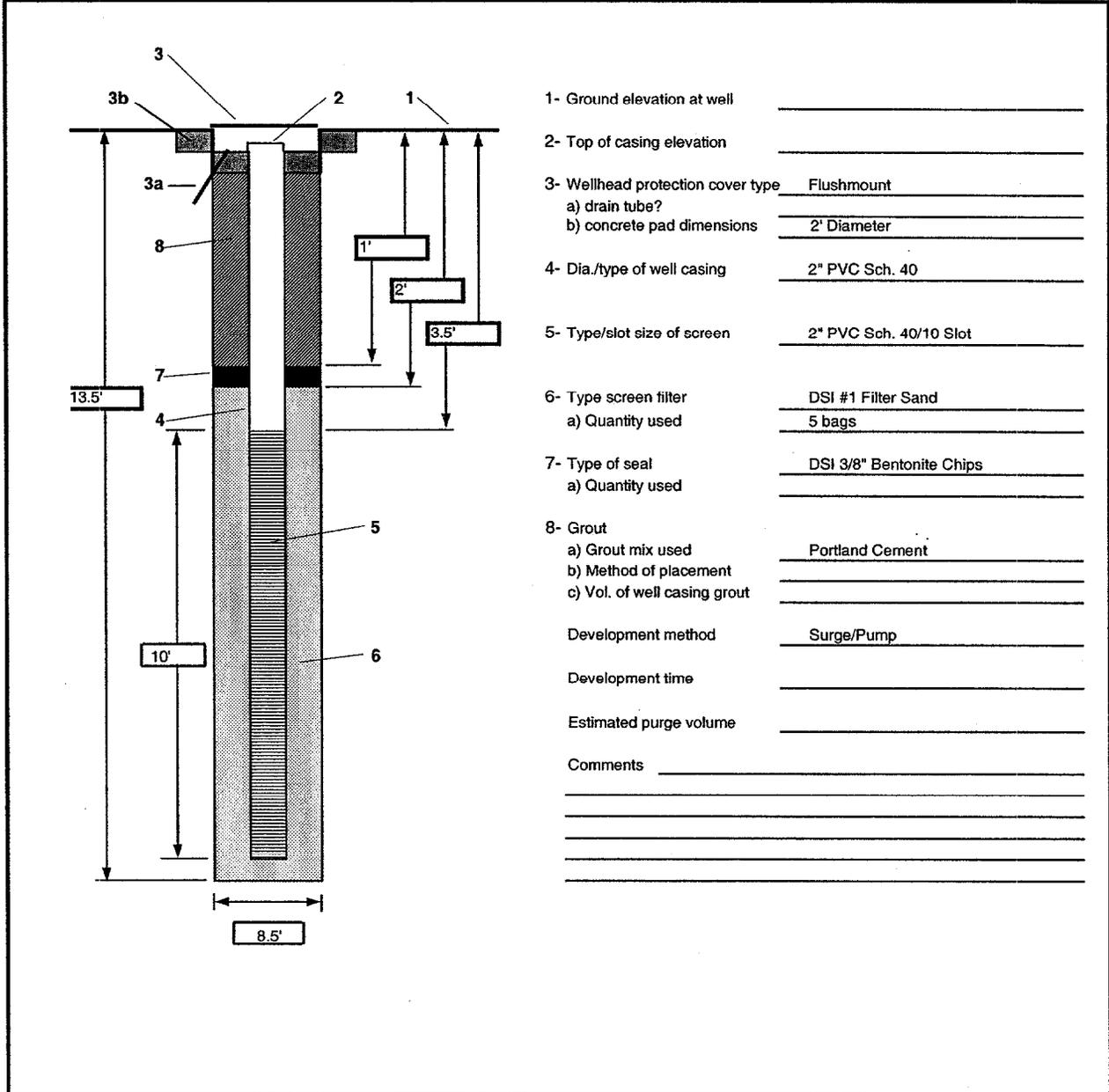
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger

WATER LEVELS :

START : 11/22/99

END : 11/22/99

LOGGER : M. Louth





PROJECT NUMBER 154408.FI.FI	BORING NUMBER NBW06-MW03S	SHEET 1 OF 1
---------------------------------------	-------------------------------------	--------------

SOIL BORING LOG

PROJECT : CTO-131

LOCATION : V-28

ELEVATION :

DRILLING CONTRACTOR : Parratt Wolf

DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger

WATER LEVELS :

START : 11/22/99

END : 11/22/99

LOGGER : M. Louth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)		STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION	COMMENTS
	RECOVERY (IN)	#/TYPE			
				Concrete to 10"	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
1-3'	24/16	1	5-7-11-13 (18)	silty-medium sand (SM); tan; loose; dry	PID 0 ppm (0825)
5-7'	24/6	2	23-34-21-11 (55)	medium sand (SW) with some silt; tan-brown loose; moist to wet Could not get auger through concrete: will jackhammer	PID 0 ppm (0840) Water table at 5.5' bgs
10-12'	24/18	3	5-5-5-6 (10)	medium sand (SW) with some silt; gray; loose saturated End of boring Well set at 13' bgs with screen from 3-13' bgs	PID 0 ppm (0855)



PROJECT NUMBER 154408.FI.FI	BORING NUMBER NBW06-MW04S
SHEET 1 OF 1	
<h2 style="margin: 0;">SOIL BORING LOG</h2>	

PROJECT : CTO-131	LOCATION : V-28
ELEVATION :	DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger	
WATER LEVELS :	START : 11/99 END : 11/99 LOGGER : M. Louth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)			STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION	COMMENTS
	RECOVERY (IN)	#/TYPE				
5	0.5-2.5	24/12	1	5-6-6-10 (12)	fine sandy silt (SM); tan-brown; loose; odor; dry	PID - 3.1 ppm/0.5 ppm (1015)
	5-7'	24/18	2	5-6-7-7 (13)	medium to coarse sand (SW); trace silt; tan loose; moist to wet at tip	PID 2.2 ppm/0.5 ppm (1035)
10	10-12'	24/20	3	2-3-4-12 (7)	medium to coarse sand (SW); tan-gray; loose saturated	PID 0.9 ppm/0.2 ppm (1049)
15	15-17	24/16	4	4-3-4-6 (7)	medium to coarse sand (SW); tan-gray; loose; saturated End of boring Well set at 15' bgs with screen 5-15' bgs	PID 0.5 ppm/0.0 ppm (1058)
20						
25						



PROJECT NUMBER 154408.FI.FI	WELL NUMBER NBW06-MW05S	SHEET 1	OF 1
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WELL COMPLETION DIAGRAM

PROJECT : CTO-131

LOCATION : V-28

DRILLING CONTRACTOR : Parratt Wolf

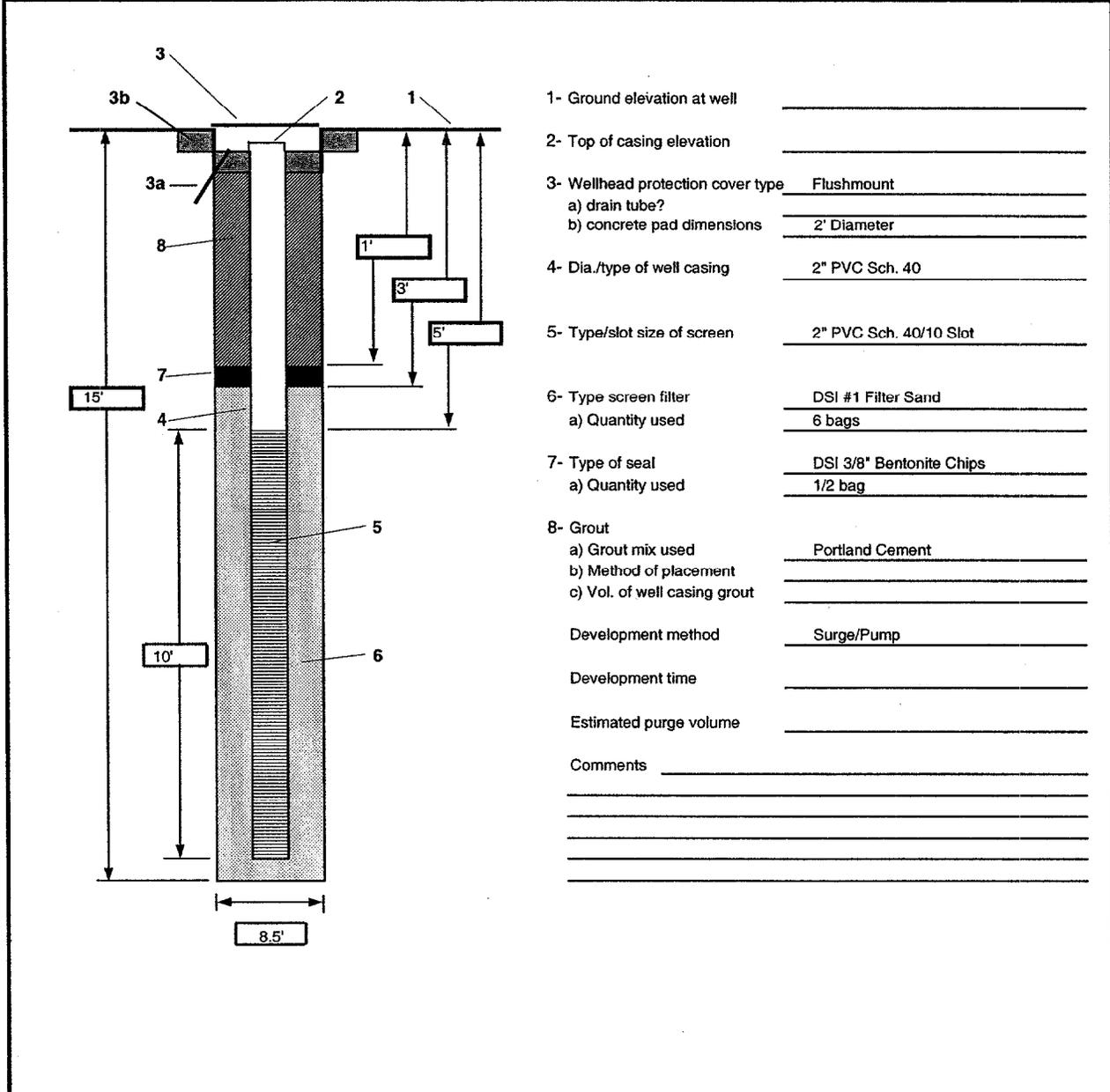
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger

WATER LEVELS :

START : 11/22/99

END : 11/22/99

LOGGER : M. Louth



1- Ground elevation at well	_____
2- Top of casing elevation	_____
3- Wellhead protection cover type	Flushmount
a) drain tube?	_____
b) concrete pad dimensions	2' Diameter
4- Dia./type of well casing	2" PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40/10 Slot
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	6 bags
7- Type of seal	DSI 3/8" Bentonite Chips
a) Quantity used	1/2 bag
8- Grout	_____
a) Grout mix used	Portland Cement
b) Method of placement	_____
c) Vol. of well casing grout	_____
Development method	Surge/Pump
Development time	_____
Estimated purge volume	_____
Comments	_____



PROJECT NUMBER 154408.FI.FI	BORING NUMBER NBW06-MW05S
SHEET 1 OF 1	
SOIL BORING LOG	

PROJECT : CTO-131	LOCATION : V-28
ELEVATION :	DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger	
WATER LEVELS :	START : 11/22/99 END : 11/22/99 LOGGER : M. Louth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)			STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	RECOVERY (IN)	#	/TYPE			
	#	/TYPE	/TYPE			
5	0.5-2.5	24/20	1	2-3-4-7 (7)	clayey silt (ML); tan brown gray; firm; dry	PID - 0.8 ppm/0.3 ppm (1315)
	5-7'	24/20	2	3-3-2-5 (5)	medium sand (SW); some silt; tan loose; moist to wet at tip	PID 0.0 ppm/0.0 ppm (1340) Water table at 6.8'bgs
10	10-12'	24/22	3	3-10-13-16 (23)	medium to coarse sand (SW); tan; loose saturated	PID 0.0 ppm/0.0 ppm (1355)
15	15-17	24/20	4	6-10-12-11 (22)	medium to coarse sand (SW); tan-gray; loose; saturated End of boring Well set at 15' bgs with screen 5-15' bgs	PID 0.0 ppm/0.0 ppm (1406)
20						
25						



PROJECT NUMBER 154408.FI.FI	BORING NUMBER NBW06-MW06S
SHEET 1 OF 1	
SOIL BORING LOG	

PROJECT : CTO-131	LOCATION : V-28
ELEVATION :	DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow-Stem Auger	
WATER LEVELS :	START : 11/22/99 END : 11/29/99 LOGGER : M. Louth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)			STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION	COMMENTS	
	RECOVERY (IN)		#/TYPE				TEST RESULTS
	24/12	24/16					
	24/24	24/					
5	0.5-2.5	24/12	1	5-6-11-23 (17)	concrete silty medium sand (SM); tan-brown; medium loose dry	PID - 0 ppm (1510)	
					concrete refusal; need to jackhammer another hole; moved over 5 ft west		
	5-7'	24/16	2	4-4-4-3 (8)	fine to medium sand (SW); tan; loose; moist to wet at tip	PID 0.0 ppm (1015) Water table at 6.8' bgs	
10	10-12'	24/24	3	4-7-12-12 (19)	medium to coarse sand (SW); gray-tan; loose saturated	PID 0.0 ppm (1035)	
15	15-17	24/	4	3-2-5-4 (7)	medium sand with trace fines (SW); gray-tan; loose; saturated	PID 0.0 ppm (1055)	
20					End of boring Well set at 15' bgs with screen 5-15' bgs		
25							

Appendix B
Analytical Data

Table B-1
Direct Push Analytical Results
SWMU 6
Naval Station Norfolk

Station ID	NBW06-DW01	NBW06-DW02	NBW06-DW03	NBW06-DW04	NBW06-DW05	NBW06-DW06	NBW06-DW07	NBW06-DW08	NBW06-DW09	NBW06-DW10	NBW06-DW11	NBW06-DW12	NBW06-DW13	NBW06-DW14	NBW06-DW15	NBW06-DW16
Sample ID	NBW06-DW01	NBW06-DW02	NBW06-DW03	NBW06-DW04	NBW06-DW05	NBW06-DW06	NBW06-DW07	NBW06-DW08	NBW06-DW09	NBW06-DW10	NBW06-DW11	NBW06-DW12	NBW06-DW13	NBW06-DW14	NBW06-DW15	NBW06-DW16
Sample Date	09/29/99	09/29/99	09/29/99	09/29/99	09/29/99	09/30/99	09/30/99	09/30/99	09/30/99	09/30/99	10/01/99	10/01/99	10/01/99	10/01/99	10/01/99	10/01/99
Chemical Name																
Volatile Organic Compounds (UGL)																
1,1,1-Trichloroethane			1 U	0.3	0.44 U	0.21 U	0.23 U	1 U	0.33 U	1 U	1 U	1 U	1 U			1 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane			0.29 U	1.0	0.81 U	0.58 U	0.19 U	1 U	0.15 U	0.74 U	1 U	1 U	1 U	1 U	1 U	0.48 U
1,1-Dichlorobenzene		0.24 U	1 U	1.0	0.32 U	1 U	1 U	1 U	0.15 U	0.74 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	1 UR															
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene		0.88 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Hexanone	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	7.5 B	2.4 B	1.7 B	5.8 B	3.6 B	2.2 B	5.4 B	2.3 B	1.3 B	5 U	2.6 B	3.7 B	1.7 B	6.4 B	2.5 B	4.8 B
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon disulfide		1 U	1 U	1 U	1 U	0.31 U	1 U	0.2 U	2.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon tetrachloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	1 U	0.14 B	0.21 B	0.38 B	1 U	1 U	1 U	1 U	0.23 B	1 U	1 U	1 U	0.2 B	1 U	0.14 B	1 U
Chloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Styrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene		1 U	1 U			1 U		1 U	1 U	1 U	1 U				1 U	1 U
Toluene		1 U	1 U	1 U		1 U		1 U	1 U	1 U	1 U	1 U		1 U	1 U	1 U
Trichloroethene																1 U
Vinyl chloride		1 U	1 U	1 U	1 U	1 U	1 U			1 U	1 U	1 U	1 U	1 U	1 U	0.26 B
Xylene, total		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene								1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U			1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dissolved Metals (UGL)																
Aluminum	18.2 B	16.2 U	24.4 B	37.1 B	18.3 B	17.2 B	43.1 B	35.9 B	16.2 U	20.5 B	16.2 U	16.3 B				
Antimony		1.8 B	4.2 B	6.8 B	6.1 B	5.7 B		3.2 B	2.9 B	4.8 B	5.7 B	2.1 B	4.2 B	3.7 B	5.3 B	3.2 B
Arsenic		2.4 U	2.4 U			2.4 U	2.4 U		2.4 U	2.4 U		2.4 U				
Barium	5.7 B	6.7 B	4.6 B	13.7 B	1.1 B		10.2 B		12.7 B		7.9 B	7.2 B	4.8 B	12.4 B	5.5 B	6.6 B
Beryllium	0.1 U	0.1 B	0.1 U	0.1 U	0.1 U	0.1 U	0.1 B	0.1 U	0.1 B							
Cadmium	3.2 U		6.4 U	3.2 U												
Calcium	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
Chromium	4.8 B					2.3 U		2.3 U								
Cobalt	2.6 UL															
Copper	0.96 U	0.96 U	2.4 B	3.6 B	2.9 B	1.1 B	1.3 B		2.4 B	3.6 B	4 B	7.8 B	2.2 B	3.7 B	2.4 B	3.3 B
Iron	210 B	10.7 B	27.5 B	22.8 B	12.4 B	473 B	20.2 B	101 B	306 B	7.6 U	28.6 B	59.8 B	8.6 B	255 B	7.6 U	13.9 B
Lead	1.3 UL															
Magnesium						3.37 U		13.0 U	2.3 U	4.2 U	4.2 U	4.2 U	3,830 B	4.2 U	4.2 U	4.2 U
Manganese	21.2 B	0.82 U	25.4 B	5.5 B	1.6 B	15 B	11.6 B		30.4 B	3.5 B	2.9 B	1.8 B	7.7 B	13.3 B	6.9 B	9.4 B
Mercury	0.072 U															
Nickel	6.6 U															
Potassium						133,000		133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000
Selenium	2.4 U															
Silver	2.2 U															
Sodium	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500
Thallium	7.5 B	5 U	5 U	5 U	5 U	5.1 B	5 U	7.9 B	5 U	7 B	5 U	5 U	5 U	5 U	5 U	5 U
Vanadium	2.9 U															
Zinc	10.7 B	4.4 B	6.8 B	9.6 B	6.4 B	9 B	8.2 B	6.1 B	6.2 B	6.4 B	41.3 B	21.7 B	5 B	14.9 B	12.2 B	7.3 B

Notes:
B - Possible blank contamination.

NOV 5 1999

Table B-1
 Direct Push Analytical Results
 SWMU 6
 Naval Station Norfolk

Station ID	NBW06-DW01	NBW06-DW02	NBW06-DW03	NBW06-DW04	NBW06-DW05	NBW06-DW06	NBW06-DW07	NBW06-DW08	NBW06-DW09	NBW06-DW10	NBW06-DW11	NBW06-DW12	NBW06-DW13	NBW06-DW14	NBW06-DW15	NBW06-DW16
Sample ID	NBW06-DW01	NBW06-DW02	NBW06-DW03	NBW06-DW04	NBW06-DW05	NBW06-DW06	NBW06-DW07	NBW06-DW08	NBW06-DW09	NBW06-DW10	NBW06-DW11	NBW06-DW12	NBW06-DW13	NBW06-DW14	NBW06-DW15	NBW06-DW16
Sample Date	09/29/99	09/29/99	09/29/99	09/29/99	09/29/99	09/30/99	09/30/99	09/30/99	09/30/99	09/30/99	10/01/99	10/01/99	10/01/99	10/01/99	10/01/99	10/01/99
Chemical Name																

J - Analyte Present. Reported value may not be accurate or precise.

U - Not detected

R - Unreliable result

Reported value may be biased low.

Shaded cells represent detected constituents.

Table B-2
Monitoring Well Analytical Results
SWMU 6
Naval Station Norfolk

Station ID	NBW06-MW01D		NBW06-MW01S				NBW06-MW02S				NBW06-MW03S						
	NBW06-MW01D-R01	NBW06-MW01D-R02	NBW06-MW01S-R01	NBW06-MW01S-R02	NBW06-MW01S-R03	NBW06-MW01S-R04	NBW06-MW02S-R01	NBW06-MW02S-R02	NBW06-MW02S-R03	NBW06-MW02S-R04	NBW06-MW03S-P-R01	NBW06-MW03S-R01	NBW06-MW03S-P-R02	NBW06-MW03S-R02	NBW06-MW03S-R03	NBW06-MW03S-P-R04	NBW06-MW03S-R04
Sample Date	01/07/00	06/19/00	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	01/07/00	06/19/00	06/19/00	09/19/01	03/11/02	03/11/02
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
1,1-Dichloroethane	1 U	0.28 U	0.28 U	0.51 U	NA	0.99 U	0.53 U	1 U	NA	1 U	0.77 U	0.98 U	0.32 U	NA	6.4 U	5.4 U	5.4 U
1,1-Dichloroethene	1 U	0.3 U	1 U	1 U	NA	1 U	0.44 U	1 U	NA	1 U	0.12 U	0.13 U	1 U	NA	1 U	1 U	1 U
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	1 UR	1 UR	1 UR	1 UR	NA	NA	1 UR	1 UR	NA	NA	1 UR	1 UR	1 UR	NA	NA	NA	NA
1,2-Dibromoethane	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	NA
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	NA
1,2-Dichloroethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	0.38 U	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	NA
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	NA
2-Butanone	5 UR	5 UR	5 UR	5 UR	NA	10 U	5 UR	5 UR	NA	10 U	5 UR	5 UR	5 UR	NA	10 U	5 UR	5 UR
2-Hexanone	0.54 U	5 UR	5 U	5 UR	NA	10 U	5 U	5 UR	NA	10 U	5 U	5 U	5 UR	NA	10 U	5 UR	5 UR
4-Methyl-2-pentanone	5 U	5 UR	5 U	5 UR	NA	10 U	5 U	5 UR	NA	10 U	5 U	5 U	5 UR	NA	10 U	5 UR	5 UR
Acetone	5 UR	5 UR	5 UR	3.5 B	NA	5 UR	5 UR	3.4 B	NA	0.8 U	5 UR	2 B	2.5 B	NA	10 U	10 U	10 U
Benzene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	0.74 U	2 U	1 U	NA	1 U	1 U	1 U
Bromochloromethane	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	NA
Bromodichloromethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Bromoform	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Bromomethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA										
Carbon disulfide	1 U	0.11 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Carbon tetrachloride	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Chlorobenzene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Chloroethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Chloroform	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Chloromethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Dibromochloromethane	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Ethane	NA	2 U	NA	NA	NA	NA	NA	NA	NA								
Ethene	NA	NA	NA	NA	NA	1 U	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Methane	NA	NA	NA	NA	NA	NA	NA										
Methylene chloride	2.9 U	0.73 U	2 U	2 U	NA	1 B	2 U	2 U	NA	1 B	2 U	2 U	2 U	NA	1 B	1 B	1 B
Styrene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Tetrachloroethene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Toluene	1 U	0.38 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Trichloroethene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	0.23 U	1 U	1 U	NA	1 U	1 U	1 U
Vinyl chloride	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Xylene, total	0.34 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	NA
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	NA
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U
Total Metals (UG/L)																	
Aluminum	33.4 B	122 B	32.3 B	25.2 B	NA	NA	366 B	379 B	NA	NA	72.3 B	67.5 B	15.1 U	30.3 B	NA	NA	NA
Antimony	1.4 U	2.4 U	1.4 U	2.4 U	NA	NA	1.4 U	2.4 U	NA	NA	1.4 U	1.4 U	2.4 U	2.4 U	NA	NA	NA
Arsenic	2.9 U	2.8 B	2.9 U	1.5 U	NA	NA	2.5 B	2.5 B	NA	NA	2.9 U	2.9 U	1.5 U	1.6 B	NA	NA	NA
Barium	65.2 U	207 U	23 U	8.5 B	NA	NA	2.15 U	2.15 U	NA	NA	3.1 U	3.1 U	3.5 B	5.5 B	NA	NA	NA
Beryllium	0.15 U	0.13 U	0.15 U	0.13 U	NA	NA	0.27 B	0.13 U	NA	NA	0.15 U	0.15 U	0.13 U	0.13 U	NA	NA	NA
Cadmium	3.4 U	3.8 U	3.4 U	3.8 U	NA	NA	3.4 U	3.8 U	NA	NA	3.4 U	3.4 U	3.8 U	3.8 U	NA	NA	NA
Calcium	128,000	137,000	16,800	170,000	NA	NA	135,000	135,000	NA	NA	58,900	59,000	53,200	53,200	NA	NA	NA
Chromium	0.24 U	3.9 U	2.2 U	3.9 U	NA	NA	3.9 U	3.9 U	NA	NA	3.4 B	3 B	3.9 U	3.9 U	NA	NA	NA
Chromium (hexavalent)	0.01 U	NA	0.01 U	NA	NA	NA	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA
Cobalt	2.9 U	3 U	2.9 U	3 U	NA	NA	2.9 U	3 U	NA	NA	2.9 U	2.9 U	3 U	3 U	NA	NA	NA
Copper	9.2 U	1.9 U	1.9 U	1.9 U	NA	NA	9 B	9 B	NA	NA	0.8 UL	0.8 UL	1.9 U	1.9 U	NA	NA	NA
Cyanide	10 U	NA	10 U	NA	NA	NA	10 U	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	NA
Iron	15 U	2.3 U	2.3 U	2.3 U	NA	NA	2.3 U	2.3 U	NA	NA	482 U	471 U	252 B	284 U	NA	NA	NA
Lead	2.4 B	1.3 U	1.6 U	1.3 U	NA	NA	6.6 B	6.6 B	NA	NA	1.6 U	1.6 U	1.3 U	1.3 U	NA	NA	NA
Magnesium	204 B	810 B	11,700	66,500	NA	NA	2,400	2,400	NA	NA	5,270	5,260	10,400	10,700	NA	NA	NA
Manganese	2.4 B	24.2 B	2.4 B	2.4 B	NA	NA	24.4 B	24.4 B	NA	NA	66.8 U	67.1 U	62.4 U	62.4 U	NA	NA	NA
Mercury	0.038 B	0.072 U	0.034 B	0.072 U	NA	NA	0.034 B	0.072 B	NA	NA	0.029 B	0.033 B	0.072 U	0.072 U	NA	NA	NA
Nickel	6.9 U	9.8 B	6.9 U	8.2 U	NA	NA	6.9 U	8.2 U	NA	NA	6.9 U	6.9 U	8.2 U	8.2 U	NA	NA	NA
Potassium	52,900	67,600	11,100	22,100	NA	NA	27,700	107,000	NA	NA	5,110	5,260	7,730	7,730	NA	NA	NA

Table B-2
Monitoring Well Analytical Results
SWMU 6
Naval Station Norfolk

Station ID	NBW06-MW01D		NBW06-MW01S				NBW06-MW02S				NBW06-MW03S						
	NBW06-MW01D-R01	NBW06-MW01D-R02	NBW06-MW01S-R01	NBW06-MW01S-R02	NBW06-MW01S-R03	NBW06-MW01S-R04	NBW06-MW02S-R01	NBW06-MW02S-R02	NBW06-MW02S-R03	NBW06-MW02S-R04	NBW06-MW03S-P-R01	NBW06-MW03S-R01	NBW06-MW03S-P-R02	NBW06-MW03S-R02	NBW06-MW03S-R03	NBW06-MW03S-P-R04	NBW06-MW03S-R04
Sample ID	01/07/00	06/19/00	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	01/07/00	06/19/00	06/19/00	09/19/01	03/11/02	03/11/02
Sample Date	01/07/00	06/19/00	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	01/07/00	06/19/00	06/19/00	09/19/01	03/11/02	03/11/02
Chemical Name																	
Selenium	3 U	2.2 U	3 U	2.2 U	NA	NA	3 U	2.2 U	NA	NA	3 U	3 U	2.2 U	2.2 U	NA	NA	NA
Silver	2.4 U	2.8 U	2.4 U	2.8 U	NA	NA	2.4 U	2.8 U	NA	NA	2.4 U	2.6 B	2.8 U	2.8 U	NA	NA	NA
Sodium	55,900	271,000	79,300	497,000	NA	NA	710,000	2,490,000	NA	NA	24,100	38,000	63,300	65,100	NA	NA	NA
Thallium	3.8 U	4.6 B	3.8 U	5.9 B	NA	NA	3.8 U	5.7 B	NA	NA	3.8 U	3.8 U	4.5 U	4.5 U	NA	NA	NA
Vanadium	5.5 B	5.6 B	2.1 U	6.3 B	NA	NA	2.1 U	8.7 B	NA	NA	2.1 U	2.9 B	2.6 B	3.5 B	NA	NA	NA
Zinc	8.8 B	3.2 B	4.9 B	3.9 B	NA	NA	1.9	52.3 B	NA	NA	3.3 B	8.9 B	6.1 B	9.5 B	NA	NA	NA
Dissolved Metals (UG/L)																	
Aluminum	28.1	20.1 B	14.8 U	23.8 B	NA	NA	22.5 B	24.3 B	NA	NA	16.9 B	14.8 U	36.8 B	20.7 B	NA	NA	NA
Antimony	1.8 U	2.4 U	1.4 U	2.4 U	NA	NA	1.9	2.4 U	NA	NA	2.3 U	1.9 U	2.4 U	2.4 U	NA	NA	NA
Arsenic	2.9 U	1.5 U	2.9 U	1.5 U	NA	NA	2.9 U	1.8 B	NA	NA	2.9 U	2.9 U	1.9 B	1.5 U	NA	NA	NA
Barium	86.6 U	2.8	2.5	10.4 B	NA	NA	2.5	2.5	NA	NA	2.5	2.5	3.2 B	3.1 B	NA	NA	NA
Beryllium	0.15 U	0.13 U	0.15 U	0.13 U	NA	NA	0.2 B	0.13 U	NA	NA	0.15 U	0.15 U	0.13 U	0.13 U	NA	NA	NA
Cadmium	3.4 U	3.8 U	3.4 U	3.8 U	NA	NA	3.4 U	3.8 U	NA	NA	3.4 U	3.4 U	3.8 U	3.8 U	NA	NA	NA
Calcium	126,000	142,000	49,300	265,000	NA	NA	79,900	138,000	NA	NA	39,100	38,900	62,100	65,900	NA	NA	NA
Chromium	12.9	3.9 U	2.2 U	3.9 U	NA	NA	4.5 B	3.9 U	NA	NA	2.2 U	2.2 U	3.9 U	3.9 U	NA	NA	NA
Cobalt	2.9 U	3 U	2.9 U	3 U	NA	NA	2.9 U	3 U	NA	NA	2.9 U	2.9 U	3 U	3 U	NA	NA	NA
Copper	0.8 UL	2.5 B	0.8 UL	3 B	NA	NA	0.8 UL	2.8 B	NA	NA	0.8 UL	0.8 UL	6 B	1.9 U	NA	NA	NA
Iron	9.4 B	4.6 U	5.0	238 B	NA	NA	238 B	238 B	NA	NA	238 B	238 B	238 B	238 B	NA	NA	NA
Lead	1.6 U	1.3 U	1.6 U	1.3 U	NA	NA	1.6 U	1.3 U	NA	NA	1.6 U	1.6 U	1.3 U	1.3 U	NA	NA	NA
Magnesium	31.4 B	5.0	2.3	81.400	NA	NA	6.0	24.000	NA	NA	5.0	6.500	10.400	10.400	NA	NA	NA
Manganese	0.72 B	1.9 B	2.3	32.3	NA	NA	32.3	18.9 B	NA	NA	18.9 B	18.9 B	18.9 B	18.9 B	NA	NA	NA
Mercury	0.031 B	0.072 U	0.024 U	0.072 U	NA	NA	0.058 B	0.072 U	NA	NA	0.024 B	0.033 B	0.072 U	0.072 U	NA	NA	NA
Nickel	6.9 U	8.2 U	6.9 U	8.2 U	NA	NA	6.9 U	8.2 U	NA	NA	6.9 U	6.9 U	8.2 U	8.2 U	NA	NA	NA
Potassium	52,200	58,100	11,300	23,900	NA	NA	106,000	106,000	NA	NA	5,120	4,800	7,210	7,500	NA	NA	NA
Selenium	3 U	2.2 U	3 U	2.2 U	NA	NA	3 U	2.2 U	NA	NA	3 U	3 U	2.2 U	2.2 U	NA	NA	NA
Silver	2.4 U	2.8 U	2.4 U	2.8 U	NA	NA	2.4 U	2.8 U	NA	NA	2.4 U	2.4 U	2.8 U	2.8 U	NA	NA	NA
Sodium	57,400	273,000	79,300	608,000	NA	NA	210,000	210,000	NA	NA	35,300	35,300	59,100	59,100	NA	NA	NA
Thallium	3.8 U	7 B	3.8 U	4.5 U	NA	NA	4.5 U	4.5 U	NA	NA	3.8 U	3.8 U	7.5 B	5.5 B	NA	NA	NA
Vanadium	6.6 B	2.4 U	4.3 B	5.1 B	NA	NA	6.7 B	5.1 B	NA	NA	2.1 U	2.3 B	2.7 B	2.4 U	NA	NA	NA
Zinc	2.3 U	8.2 B	2.3 U	5.8 B	NA	NA	3.9 B	16.6 B	NA	NA	13.4 B	2.6 B	22.6 B	5.3 B	NA	NA	NA
Radiation (PCIA)																	
Gross alpha	NA	NA	NA	NA	2.20E+01 U	1.4 U	NA	NA	0.7 U	1.6 U	NA	NA	NA	NA	0.07 U	0.5 U	0.1 U
Gross beta	NA	NA	NA	NA	8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Radium (total)	NA	NA	NA	NA	NA	0.28 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.27 UJ	0.33 UJ
Radium 228	NA	NA	NA	NA	NA	0.48 UJ	NA	NA	NA	0.26 UJ	NA	NA	NA	NA	NA	0.42 UJ	0.3 UJ
Tritium	NA	NA	NA	NA	20 U	NA	NA	NA	100 U	NA	NA	NA	NA	NA	20 U	NA	NA
Wet Chemistry (MG/L)																	
Acid Volatile Sulfide	NA	NA	NA	NA	NA	1 U	NA	NA	NA	1 U	NA	NA	NA	NA	NA	1 U	1 U
Alkalinity	NA	NA	NA	NA	NA	180 U	NA	NA	38.9	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide	NA	0.72 B	NA	NA	NA	NA	NA	NA	NA	NA							
Chloride	NA	NA	NA	NA	NA	NA	NA										
Cyanide	NA	0.01 U	NA	0.01 U	NA	NA	NA	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA
Ethane	NA	0.002 U	NA	NA	NA	NA	NA	NA	NA	NA							
Ethene	NA	NA	NA	NA	1.00E-03 U	NA	NA	NA	1.00E-03 U	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous iron	NA	NA	NA	NA	NA	NA	NA										
Methane	NA	0.07	NA	NA	NA	NA	NA	NA	NA	NA							
Nitrate	NA	0.29	NA	NA	NA	NA	NA	0.1 U	0.1 U								
Nitrate/Nitrite	NA	NA	NA	NA	0.5 U	NA	NA	NA	0.1 U	NA	NA	NA	NA	NA	0.1 U	NA	NA
Nitrite	NA	NA	NA	NA	0.5 U	0.1 U	NA	NA	0.08 U	0.1 U	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U
Sulfate	NA	NA	NA	NA	NA	NA	NA										
Sulfide	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA							
Total organic carbon (TOC)	NA	NA	NA	NA	3 B	4 U	NA	NA	0.5 B	1 B	NA	NA	NA	NA	3 B	NA	NA

Notes:
NA - Not Analyzed
J - Analyte Present. Reported value may not be accurate or precise.
L - Reported value may be biased low. Actual value expected to be higher.
U - Not Detected.
B - Possible blank contamination
R - Unreliable result.
Shaded cells represent detected constituents.

Table B-2
Monitoring Well Analytical Results
SWMU 6
Naval Station Norfolk

Station ID	NBW06-MW04S					NBW06-MW05S				NBW06-MW06S			
	NBW06-MW04S-R01	NBW06-MW04S-R02	NBW06-MW04S-P-R03	NBW06-MW04S-R03	NBW06-MW04S-R04	NBW06-MW05S-R01	NBW06-MW05S-R02	NBW06-MW05S-R03	NBW06-MW05S-R04	NBW06-MW06S-R01	NBW06-MW06S-R02	NBW06-MW06S-R03	NBW06-MW06S-R04
Sample Date	01/07/00	06/19/00	09/19/01	09/19/01	03/11/02	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	06/20/00	09/19/01	03/11/02
Chemical Name													
Volatile Organic Compounds (UGL)													
1,1,1-Trichloroethane	1 U	1 U	NA	NA	1 U	NA	NA	NA	0.01 U	1 U	0.15 U	NA	3.7
1,1,2,2-Tetrachloroethane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
1,1,2-Trichloroethane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
1,1-Dichloroethane	NA	NA	NA	NA	1.6	0.32 U	NA	NA	0.72 U	0.3	0.3	NA	2.5
1,1-Dichloroethene	0.76	1.3	NA	NA	1 U	0.7	NA	NA	0.33 U	0.31 U	0.1 U	NA	7.2
1,2,4-Trichlorobenzene	1 U	1 U	NA	NA	NA	1 U	1 U	NA	NA	1 U	1 U	NA	NA
1,2-Dibromo-3-chloropropane	1 UR	1 UR	NA	NA	NA	1 UR	1 UR	NA	NA	1 UR	1 UR	NA	NA
1,2-Dibromoethane	1 U	1 U	NA	NA	NA	1 U	1 U	NA	NA	1 U	1 U	NA	NA
1,2-Dichlorobenzene	1 U	1 U	NA	NA	NA	1 U	1 U	NA	NA	1 U	1 U	NA	NA
1,2-Dichloroethane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
1,2-Dichloroethane (total)	NA	NA	NA	NA	1	NA	NA	NA	1 U	NA	NA	NA	0.55 U
1,2-Dichloropropane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
1,3-Dichlorobenzene	1 U	1 U	NA	NA	NA	1 U	1 U	NA	NA	1 U	1 U	NA	NA
1,4-Dichlorobenzene	1 U	1 U	NA	NA	NA	1 U	1 U	NA	NA	1 U	1 U	NA	NA
2-Butanone	5 UR	5 UR	NA	NA	10 U	5 UR	5 UR	NA	10 U	5 UR	5 UR	NA	10 U
2-Hexanone	5 U	5 UR	NA	NA	10 U	5 U	5 UR	NA	10 U	5 U	5 UR	NA	10 U
4-Methyl-2-pentanone	5 UR	5 UR	NA	NA	10 U	5 U	5 UR	NA	10 U	5 U	5 UR	NA	10 U
Acetone	5 UR	1.7 B	NA	NA	0.95 U	3.9 B	NA	NA	11.000	5 UR	4 B	NA	5.9
Benzene	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Bromochloromethane	1 U	1 U	NA	NA	NA	1 U	1 U	NA	NA	1 U	1 U	NA	NA
Bromodichloromethane	1 U	1 U	NA	NA	0.5 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Bromoform	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Bromomethane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Carbon dioxide	NA	NA	NA	NA	6.900	NA	NA	NA	11.000	NA	NA	NA	2.000
Carbon disulfide	1 U	0.77 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	0.17 U	NA	1 U
Carbon tetrachloride	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Chlorobenzene	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Chloroethane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Chloroform	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Chloromethane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Dibromochloromethane	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Ethane	NA	NA	NA	NA	2 U	NA	NA	NA	2 U	NA	NA	NA	2 U
Ethene	NA	NA	NA	NA	1 U	NA	NA	NA	1 U	NA	NA	NA	1 U
Ethylbenzene	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Methane	NA	NA	NA	NA	NA	NA	NA	NA	1.9 B	NA	NA	NA	NA
Methylene chloride	NA	2 U	NA	NA	1 B	2 U	2 U	NA	1 U	2 U	2 U	NA	1 B
Styrene	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Tetrachloroethene	NA	NA	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Toluene	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Xylene, total	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	1 U	1 U	NA	NA	0.52 U	0.7 U	NA	NA
cis-1,3-Dichloropropene	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
trans-1,2-Dichloroethene	0.76	1 U	NA	NA	NA	1 U	1 U	NA	NA	1 U	1 U	NA	NA
trans-1,3-Dichloropropene	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U
Total Metals (UGL)													
Aluminum	27.5 B	30.7 B	NA	NA	NA	41.1 B	114 B	NA	NA	31 B	33.5 B	NA	NA
Antimony	NA	2.4 U	NA	NA	NA	NA	NA	NA	NA	1.4 U	2.4 U	NA	NA
Arsenic	2.9 U	3.5 B	NA	NA	NA	2.9 U	1.8 B	NA	NA	2.9 U	1.5 U	NA	NA
Barium	NA	12.3 B	NA	NA	NA	NA	14 B	NA	NA	6.5 U	6.3 B	NA	NA
Beryllium	0.15 U	0.13 U	NA	NA	NA	0.15 U	0.13 U	NA	NA	0.15 U	0.13 U	NA	NA
Cadmium	NA	25	NA	NA	NA	3.4 U	3.8 U	NA	NA	3.4 U	3.8 U	NA	NA
Calcium	72.500	132.000	NA	NA	NA	22.0	39.000	NA	NA	33.800	55.000	NA	NA
Chromium	2.2 U	3.9 U	NA	NA	NA	NA	NA	NA	NA	2.2 U	3.9 U	NA	NA
Chromium (hexavalent)	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA
Cobalt	2.9 U	3 U	NA	NA	NA	2.9 U	3 U	NA	NA	2.9 U	3 U	NA	NA
Copper	1.6 B	3.2 B	NA	NA	NA	NA	7.3 B	NA	NA	1.6 B	1.9 U	NA	NA
Cyanide	10 U	NA	NA	NA	NA	10 U	NA	NA	NA	10 U	NA	NA	NA
Iron	74.9 B	179 B	NA	NA	NA	NA	132 B	NA	NA	122	191	NA	NA
Lead	1.6 U	1.3 U	NA	NA	NA	1.6 U	1.3 U	NA	NA	1.6 U	1.3 U	NA	NA
Magnesium	4.0 U	9.200	NA	NA	NA	2.0 U	2.700	NA	NA	2.700	3.300	NA	NA
Manganese	3.7	7.9	NA	NA	NA	NA	4.4 B	NA	NA	25.5	18.5 B	NA	NA
Mercury	0.039 B	0.072 U	NA	NA	NA	0.039 B	0.072 U	NA	NA	0.042 B	0.072 U	NA	NA
Nickel	6.9 U	8.2 U	NA	NA	NA	6.9 U	8.2 U	NA	NA	6.9 U	8.2 U	NA	NA
Potassium	19.300	12.600	NA	NA	NA	76	21.000	NA	NA	36.400	14.700	NA	NA

Table B-2
Monitoring Well Analytical Results
SWMU 6
Naval Station Norfolk

Station ID	NBW06-MW04S					NBW06-MW05S				NBW06-MW06S			
	NBW06-MW04S-R01	NBW06-MW04S-R02	NBW06-MW04S-P-R03	NBW06-MW04S-R03	NBW06-MW04S-R04	NBW06-MW05S-R01	NBW06-MW05S-R02	NBW06-MW05S-R03	NBW06-MW05S-R04	NBW06-MW06S-R01	NBW06-MW06S-R02	NBW06-MW06S-R03	NBW06-MW06S-R04
Sample Date	01/07/00	06/19/00	09/19/01	09/19/01	03/11/02	01/07/00	06/19/00	09/19/01	03/11/02	01/07/00	06/20/00	09/19/01	03/11/02
Chemical Name													
Selenium	3 U	2.2 U	NA	NA	NA	3 U	2.2 U	NA	NA	3 U	2.2 U	NA	NA
Silver	2.4 U	2.8 U	NA	NA	NA	2.4 U	2.8 U	NA	NA	2.4 U	2.8 U	NA	NA
Sodium	55,000	149,000	NA	NA	NA	2,000	61,500	NA	NA	55,000	42,900	NA	NA
Thallium	3.8 U	6.6 B	NA	NA	NA	3.8 U	4.5 U	NA	NA	3.8 U	5.9 B	NA	NA
Vanadium	2.1 U	2.8 B	NA	NA	NA	2.1 U	5.7 B	NA	NA	2.1 U	2.8 B	NA	NA
Zinc	6 B	4.6 B	NA	NA	NA	13 B	8.6 B	NA	NA	9.1 B	5.8 B	NA	NA
Dissolved Metals (UG/L)													
Aluminum	21.4 B	29.4 B	NA	NA	NA	14.8 U	28 B	NA	NA	19.3 B	27.5 B	NA	NA
Antimony	NA	2.4 U	NA	NA	NA	NA	NA	NA	NA	1.4 U	2.4 U	NA	NA
Arsenic	2.9 U	2.6 B	NA	NA	NA	2.9 U	1.5 U	NA	NA	2.9 U	2.7 B	NA	NA
Barium	1.6 U	10.2 B	NA	NA	NA	NA	13 B	NA	NA	NA	4.7 B	NA	NA
Beryllium	0.15 U	0.13 U	NA	NA	NA	0.15 U	0.13 U	NA	NA	0.15 U	0.13 U	NA	NA
Cadmium	NA	21.7	NA	NA	NA	3.4 U	NA	NA	NA	3.4 U	3.8 U	NA	NA
Calcium	75,000	120,000	NA	NA	NA	2,000	9,000	NA	NA	75,000	63,200	NA	NA
Chromium	2.2 U	3.9 U	NA	NA	NA	NA	1.5 U	NA	NA	3 B	3.9 U	NA	NA
Cobalt	2.9 U	3 U	NA	NA	NA	2.9 U	3 U	NA	NA	2.9 U	3 U	NA	NA
Copper	0.8 UL	3.4 B	NA	NA	NA	0.8 UL	5.7 B	NA	NA	NA	1.9 U	NA	NA
Iron	31.6 B	157 B	NA	NA	NA	94.7 B	13.9 B	NA	NA	93.4 B	4.6 U	NA	NA
Lead	1.6 U	1.3 U	NA	NA	NA	1.6 U	1.3 U	NA	NA	1.6 U	1.3 U	NA	NA
Magnesium	43.0	8.870	NA	NA	NA	2.0	4.000	NA	NA	43.0	1.600	NA	NA
Manganese	3.5	7.2	NA	NA	NA	NA	4.1 B	NA	NA	NA	15 B	NA	NA
Mercury	0.043 B	0.072 U	NA	NA	NA	0.039 B	0.072 U	NA	NA	0.024 U	0.072 U	NA	NA
Nickel	6.9 U	8.2 U	NA	NA	NA	6.9 U	8.2 U	NA	NA	6.9 U	8.2 U	NA	NA
Potassium	10,000	12,400	NA	NA	NA	6,000	19,200	NA	NA	10,000	14,500	NA	NA
Selenium	3 U	2.2 U	NA	NA	NA	3 U	2.2 U	NA	NA	3 U	2.2 U	NA	NA
Silver	2.4 U	2.8 U	NA	NA	NA	2.4 U	2.8 U	NA	NA	2.4 U	2.8 U	NA	NA
Sodium	55,000	149,000	NA	NA	NA	2,000	60,000	NA	NA	55,000	45,400	NA	NA
Thallium	3.8 U	5.6 B	NA	NA	NA	3.8 U	6.3 B	NA	NA	3.8 U	5 B	NA	NA
Vanadium	2.1 U	2.7 B	NA	NA	NA	3.5 B	3.9 B	NA	NA	2.9 B	2.4 U	NA	NA
Zinc	7.4 B	7 B	NA	NA	NA	8.9 B	6.5 B	NA	NA	5.7 B	11.3 B	NA	NA
Radiation (PCIA)													
Gross alpha	NA	NA	0.8 U	2 U	0.00E+00 U	NA	NA	0.76 U	0.7 U	NA	NA	-6.00E-01 U	1.2 U
Gross beta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Radium (total)	NA	NA	NA	NA	0.14 UJ	NA	NA	NA	0.19 UJ	NA	NA	NA	0.14 UJ
Radium 226	NA	NA	NA	NA	0.32 UJ	NA	NA	NA	-9.00E-02 UJ	NA	NA	NA	0.28 UJ
Tritium	NA	NA	NA	-1.00E+01 U	NA	NA	NA	-4.00E+00 U	NA	NA	NA	60 U	NA
Wet Chemistry (MG/L)													
Acid Volatile Sulfide	NA	NA	NA	NA	1 U	NA	NA	NA	1 U	NA	NA	NA	1 U
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	0.05 B	NA	NA	NA	NA	0.01 U	NA	NA	NA	0.01 U	NA	NA
Ethane	NA	NA	0.002 U	0.002 U	NA	NA	NA	0.002 U	NA	NA	NA	0.002 U	NA
Ethene	NA	NA	1.00E-03 U	1.00E-03 U	NA	NA	NA	1.00E-03 U	NA	NA	NA	1.00E-03 U	NA
Ferrous iron	NA	NA	0.05 U	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
Methane	NA	NA	0.02 U	0.02 U	NA	NA	NA	9.30E-04 B	NA	NA	NA	0.02 U	NA
Nitrate	NA	NA	NA	NA	0.1 U	NA	0.1 U						
Nitrate/Nitrite	NA	NA	0.1 U	0.1 U	NA	NA	NA	0.094 B	NA	NA	NA	0.1 U	NA
Nitrite	NA	NA	0.04 U	0.04 U	0.1 U	NA	NA	NA	0.1 U	NA	NA	0.04 U	0.1 U
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	1 U	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	2 B	2 B	2 B	NA	NA	0.7 B	2 B	NA	NA	2 B	3 B

Notes:
 NA - Not Analyzed
 J - Analyte Present. Reported value may not
 L - Reported value may be biased low. Actual
 U - Not Detected.
 B - Possible blank contamination
 R - Unreliable result.
 Shaded cells represent detected constituents