USGS
science for a changing world

Prepared in cooperation with the Naval Facilities Engineering Command Southeast

Contaminant Movement Around a Permeable Reactive Barrier at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2009

Scientific Investigations Report 2010–5086

U.S. Department of the Interior
U.S. Geological Survey

Contaminant Movement Around a Permeable Reactive Barrier at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2009

By Don A. Vroblesky, Matthew D. Petkewich, and Kevin J. Conlon

Prepared in cooperation with the Naval Facilities Engineering Command Southeast

Scientific Investigations Report 2010–5086

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2010

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment, visit http://www.usgs.gov or call 1-888-ASK-USGS

For an overview of USGS information products, including maps, imagery, and publications, visit http://www.usgs.gov/pubprod

To order this and other USGS information products, visit http://store.usgs.gov

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this report is in the public domain, permission must be secured from the individual copyright owners to reproduce any copyrighted materials contained within this report.

Suggested citation:
Vroblesky, D.A., Petkewich, M.D., and Conlon, K.J., 2010, Contamination movement around a permeable reactive barrier at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2009: U.S. Geological Survey Scientific Investigations Report 2010–5086, 74 p.

Contents

Abstract 1
Introduction 1
Purpose and Scope 2
Description of the Permeable Reactive Barrier 5
Site History 5
Methods 6
Data Collection 6
Well Drilling 6
Conceptual Site Model 8
Movement of Contamination Around the Permeable Reactive Barrier 10
Potential Causes for Movement of Contamination Around the Southern End of the Permeable Reactive Barrier 20
Fate of Contamination Downgradient from the Permeable Reactive Barrier 25
Summary 29
References 29
Appendixes 31

Figures

1–5. Maps showing—
1. Locations of Naval Weapons Station Charleston and Solid Waste Management Unit 12 (SWMU12) and nearby surface-water features, North Charleston, South Carolina 2
2. Locations of permanent sampling points at Solid Waste Management Unit 12 (SWMU12), Naval Weapons Station Charleston, North Charleston, South Carolina 3
3. Groundwater trichloroethene (TCE) concentrations in wells sampled 2000–2001, prior to installation of the permeable reactive barrier, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina 4
4. Temporary-well and selected permanent-well locations and sampling dates, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina 7
5. Groundwater levels in the surficial aquifer, Solid Waste Management Unit 12 (SWMU12), Naval Weapons Station Charleston, North Charleston, South Carolina, August 28, 2009 9

6. Graph showing changes in concentrations of selected volatile organic compounds in groundwater at wells 12MW-26S, 12MW-23S, and 12MW-18S near the southern and northern ends of the permeable reactive barrier (PRB), Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2003–2009 11

7–14. Maps showing distribution of contaminants in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina—

7. 1,4-dioxane 12
8. 1,1-dichloroethane (1,1-DCA) 13
9. *cis*-1,2-dichloroethene (*c*DCE) 14
10. Tetrachloroethene (PCE) 15
11. Trichloroethene (TCE) 16
12. 1,1,1-trichloroethane (1,1,1-TCA) 17
13. 1,1-dichloroethene (1,1-DCE) 18
14. Vinyl chloride (VC) 19

15–21. Graphs showing—

15. Hydraulic gradients from the upgradient to the downgradient sides of the permeable reactive barrier (PRB) in the northern, central, and southern parts, with the horizontal lines representing average values, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2003–2009 20
16. Hydraulic gradients over time from wells 12MW-03S to 12MW-05S, 12MW-02S to 12MW-05S, 12MW-03S to 12MW-05I, and 12MW-10S to 12MW-05S, and a map showing the locations of the hydraulic-gradient comparisons, the collapsed trench, and the existing permeable reactive barrier (PRB), Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2000–2009 21
17. Changes in the total organic carbon content of groundwater in the northern, central, and southern parts of the permeable reactive barrier (PRB), Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2003–2009 23
18. Changes in concentrations of selected volatile organic compounds in groundwater at wells 12MW-22S and 12MW-28S near the permeable reactive barrier (PRB), and locations of wells and the PRB, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 2003–2009 24
19. Concentrations of tetrachloroethene (PCE) and trichloroethene (TCE) over time in groundwater at selected wells in the groundwater-contamination plume, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000–2009 26
20. Concentrations of *cis*-1,2-dichloroethene (*c*DCE) and vinyl chloride (VC) over time in groundwater at selected wells in the groundwater-contamination plume, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000–2009 27
21. Concentrations of 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), and 1,1-dichloroethene (1,1-DCE) over time in groundwater at selected wells in the groundwater-contamination plume, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000–2009 28

Appendixes

1. Well-construction data, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina 32
2. Monthly water-level data from wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 1998 to August 2009 33
3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 38
4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 55
5. Concentrations of selected volatile organic compounds detected in groundwater from temporary wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August to October 2009 70
6. Lithologic log and well-construction diagram of well 12PZ-07 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009. 71
7. Lithologic log and well-construction diagram of well 12PZ-08 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 72
8. Lithologic log and well-construction diagram of well 12PZ-09 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 73
9. Lithologic log and well-construction diagram of well 12PZ-10 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 74

Conversion Factors, Datums, and Abbreviated Water-Quality Units

Inch/Pound to SI

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Volume	
gallon (gal)	3.785	liter (L)
	Flow rate	
foot per day (ft/d)	0.3048	meter per day (m/d)
foot per year (ft/yr)	0.3048	meter per year (m/yr)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32$$

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C = (°F - 32) / 1.8$$

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Altitude, as used in this report, refers to distance above the vertical datum.

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L).

Abbreviations

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,1,1-TCA	1,1,1-trichloroethane
bls	below land surface
*c*DCE	*cis*-1,2-dichloroethene
CSM	conceptual site model
LEB-H	liquid enzyme breaker
mL/min	milliliter per minute
NAVFAC SE	Naval Facilities Engineering Command Southeast
NWS	Naval Weapons Station
PCE	tetrachloroethene
PCP	pentachlorophenol
PRB	permeable reactive barrier
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SWMU12	Solid Waste Management Unit 12
TCE	trichloroethene
TOC	total organic carbon
USGS	U.S. Geological Survey
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
ZVI	zero-valent iron

Contaminant Movement Around a Permeable Reactive Barrier at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2009

By Don A. Vroblesky, Matthew D. Petkewich, and Kevin J. Conlon

Abstract

The U.S. Geological Survey and the Naval Facilities Engineering Command Southeast investigated natural and engineered remediation of chlorinated volatile organic compound groundwater contamination at Solid Waste Management Unit 12 at the Naval Weapons Station Charleston, North Charleston, South Carolina, beginning in 2000. In early 2004, groundwater contaminants began moving around the southern end of a permeable reactive barrier (PRB) installed by a consultant in December 2002. The PRB is a 130-foot-long and 3-foot-wide barrier consisting of varying amounts of zero-valent iron with or without sand mixture. Contamination moving around the PRB probably has been transported at least 75 feet downgradient from the PRB at a rate of about 15 to 29 feet per year.

The diversion of contamination around the southern end of the PRB may be due to construction difficulties associated with the PRB installation or to reduced permeability in the PRB. An event that took place during installation of the PRB, which may have caused permeability loss, was the collapse and subsequent abandonment of a 110-foot-long trench originally designed to be the PRB on November 11, 2002, approximately 25 feet upgradient (west) from the final PRB. Guar gum with antimicrobial preservative in a polymer slurry had been used to stabilize the abandoned trench prior to collapse and was only partially recovered. Residual guar gum can cause permeability reduction in a PRB. It also is possible that permeability reduction took place within the PRB by slow degradation of the guar gum slurry or mineral precipitation. Despite the likely permeability reduction in and near the PRB immediately following installation, there is evidence that contaminants moved through the PRB and were degraded, consistent with the planned purpose of the PRB.

Volatile organic compound contamination in groundwater downgradient from the PRB is subject to attenuation by phytovolatilization, sorption, and biodegradation. Pulses of contamination increases have been observed in some monitoring wells downgradient from the PRB. The pulses may reflect downgradient transport of contaminant pulses; however, lateral shifting of the plume is a more likely explanation for the concentration changes at well 12MW-12S.

The ability to monitor the fate and behavior of the plume in the forest is severely limited because the present axis of maximum contamination in that area bypasses all but one of the existing monitoring wells (12MW-12S). Moreover, the 2009 data indicate that there are no optimally placed sentinel wells in the probable path of contaminant transport. Thus the monitoring network is no longer adequate to monitor the groundwater contamination downgradient from the PRB.

Introduction

Groundwater contamination by chlorinated volatile organic compounds (VOCs) is present at Solid Waste Management Unit 12 (SWMU12) at the Naval Weapons Station (NWS) Charleston, North Charleston, which is approximately 10 miles north of Charleston, South Carolina (figs. 1, 2). The primary VOCs of concern are tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), *cis*-1,2-dichloroethene (*c*DCE), vinyl chloride (VC), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), and 1,1-dichloroethane (1,1-DCA). Additional groundwater contaminants include 1,4-dioxane.

The U.S. Geological Survey (USGS) and the Naval Facilities Engineering Command Southeast (NAVFAC SE) began investigating and monitoring groundwater contamination at SWMU12 in 2000. Based in part on the distribution of groundwater contamination in August 2002 (fig. 3), a consultant installed a permeable reactive barrier (PRB) of zero-valent iron (ZVI) to intercept the contamination in December 2002. By early 2004, however, it became clear that part of the contamination plume had shifted and was moving around the southern end of the PRB.

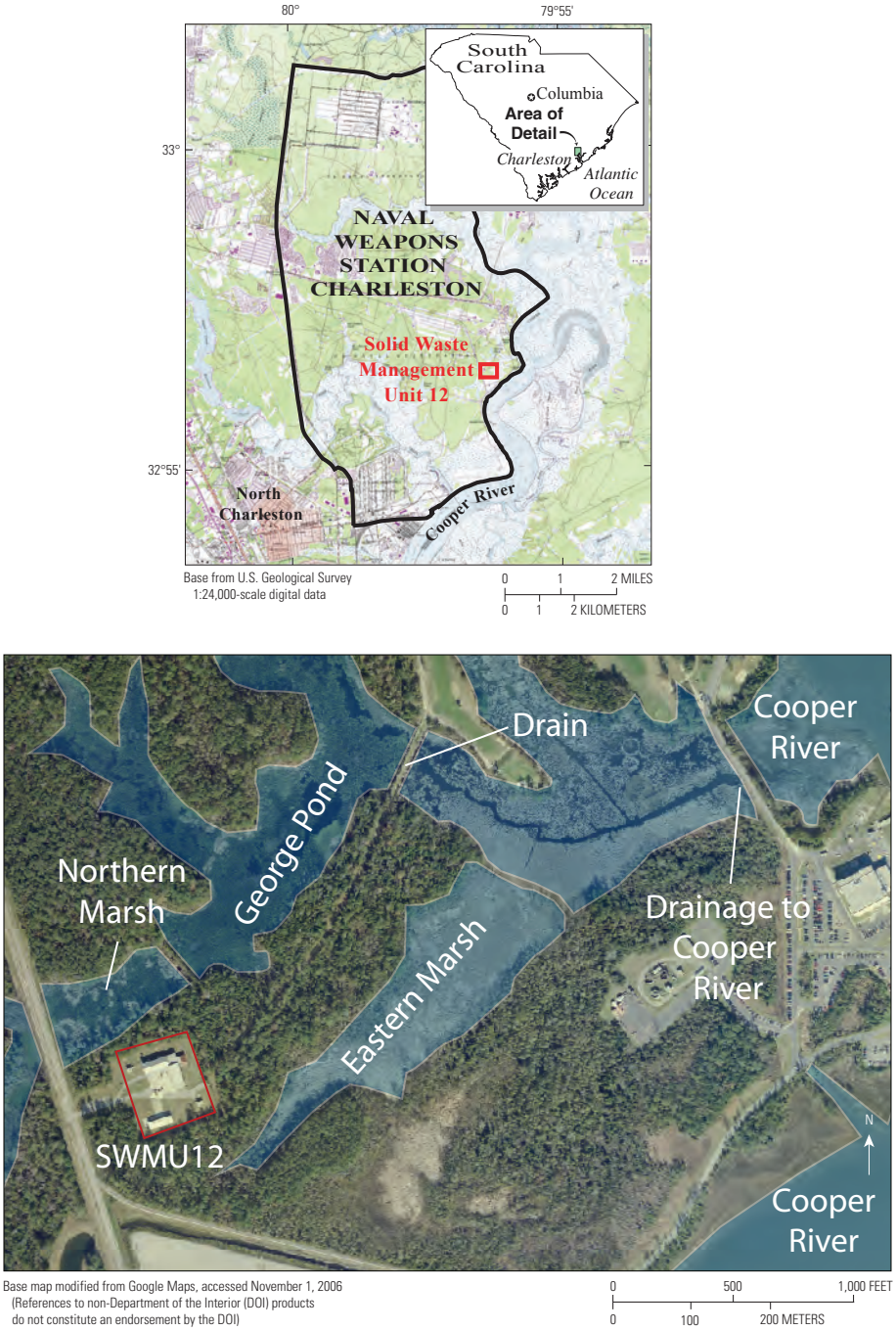


Figure 1. Locations of Naval Weapons Station Charleston and Solid Waste Management Unit 12 (SWMU12) and nearby surface-water features, North Charleston, South Carolina.

Purpose and Scope

The purpose of this report is to discuss data related to the movement of groundwater contamination around a PRB at SWMU12 and into the forest downgradient from the PRB, Naval Weapons Station Charleston, North Charleston, South Carolina. These findings are based on several years of monitoring at wells near and distant from the PRB and a one-time sampling of 47 temporary wells installed in the downgradient forest in 2009. Synoptic water-level measurements were made at wells across the site, and four piezometers were installed in 2009. Appendixes 1 to 4 summarize well-construction, water-level, and water-quality data for SWMU12 from 1998 to 2009. Appendix 5 summarizes VOC data specifically for the temporary wells installed and sampled in 2009 in the forest downgradient from the PRB. Appendixes 6 to 9 provide lithologic logs and well-construction diagrams for the four new piezometers installed at SWMU 12 during 2009.

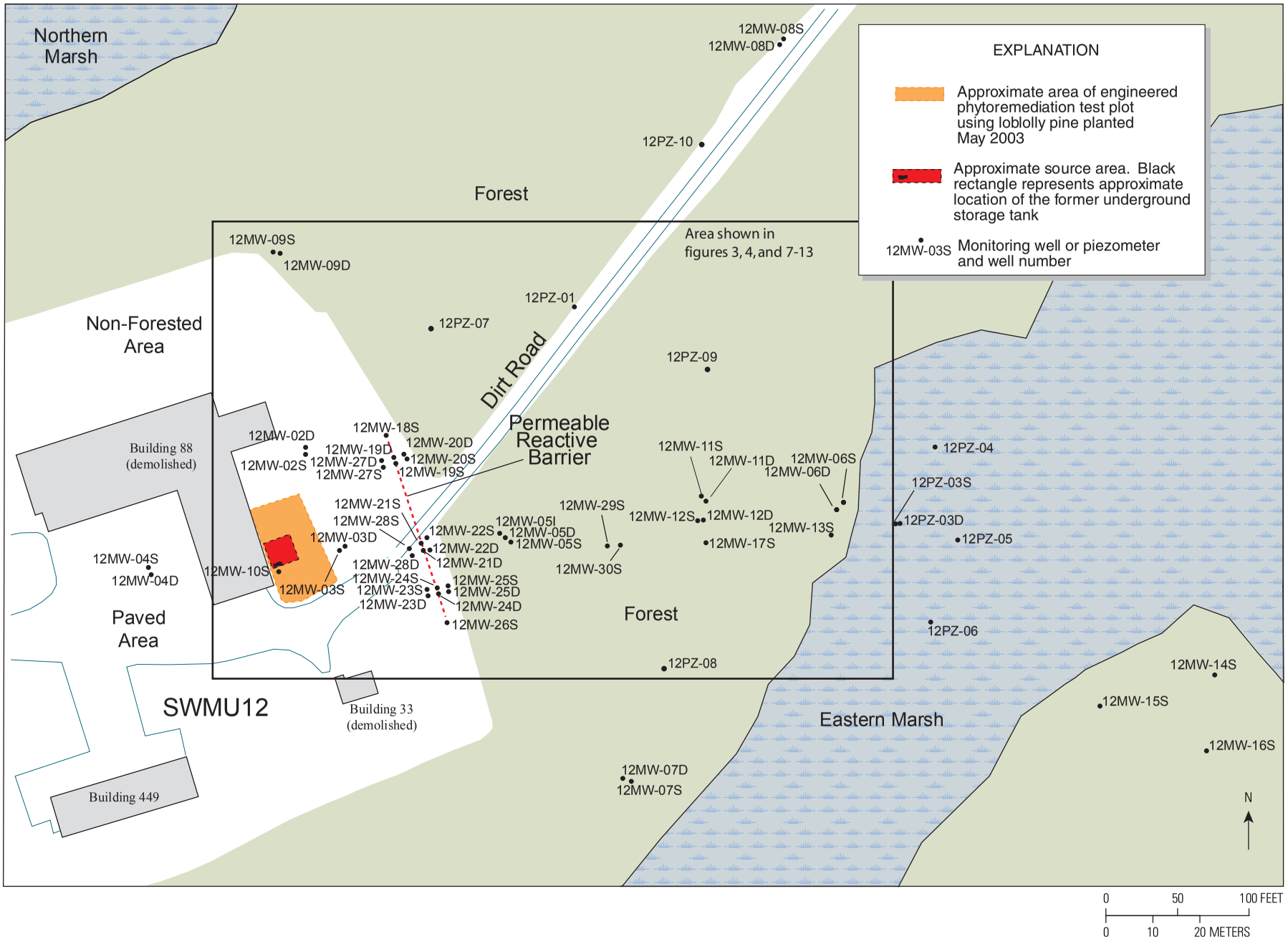


Figure 2. Locations of permanent sampling points at Solid Waste Management Unit 12 (SWMU12), Naval Weapons Station Charleston, North Charleston, South Carolina.

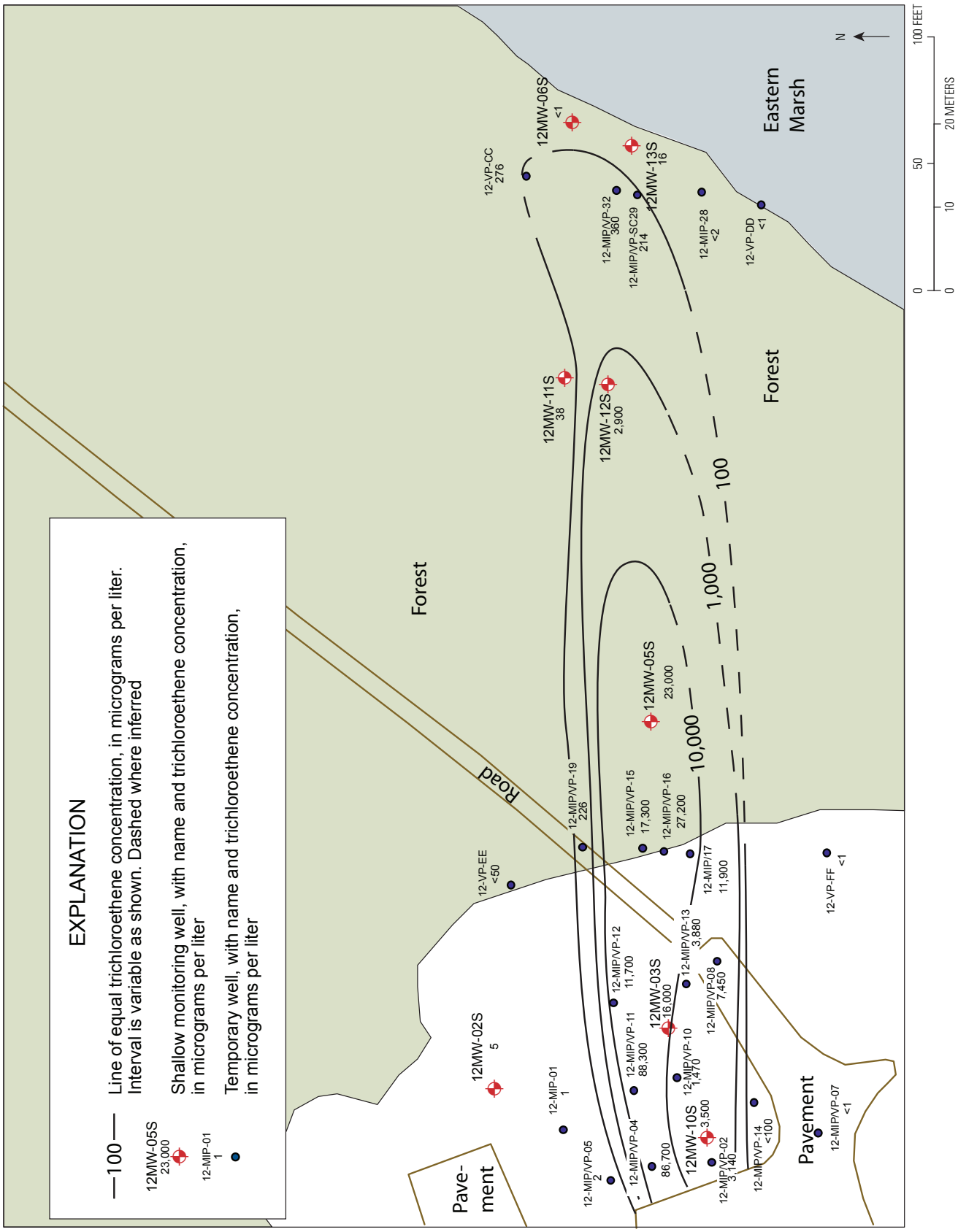


Figure 3. Groundwater trichloroethene (TCE) concentrations in wells sampled 2000–2001, prior to installation of the permeable reactive barrier, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina (temporary-well information is from CH2M Hill Constructors, Inc., 2002).

Description of the Permeable Reactive Barrier

The PRB at SWMU12 (fig. 2) installed in December 2002 consists of a 130-foot (ft)-long and 3-ft-wide permeable barrier oriented perpendicular to the main axis of the groundwater contamination measured in 2000–2001 and in 2002 (CH2M Hill Constructors, Inc., 2002, 2003) (fig. 3). The PRB consists of varying amounts of ZVI with or without sand mixture depending on the expected contaminant concentrations. The upper part of the PRB along the major axis of contamination, approximately 60 to 100 ft from the northern end of the PRB was expected to intercept the highest VOC concentrations and so that part of the PRB consists of 100 percent ZVI. In the deeper part of the PRB at that location and across the full vertical extent of the PRB adjacent to that location, the PRB consists of a mixture of 50 percent sand and 50 percent ZVI. The northernmost 40 ft of the PRB and the southernmost 10 ft of the PRB consist of a mixture of 80 percent sand and 20 percent ZVI. The top of the PRB is a few feet below land surface (ft bls). Approximately the bottom 1 ft of the PRB is seated into a clay layer at about 32–35 ft bls (CH2M Hill Constructors, Inc., 2003). Groundwater near the PRB is in a confined aquifer at a depth of about 10 ft, below a clay layer that extends approximately to land surface.

Monitoring wells were installed by the contractor at the time that the PRB was installed. The wells were installed as two-well clusters, with the shallow well (identified by an "S" suffix) screened at about the depth of the groundwater contamination (typically about 10 ft bls) and the deeper well (identified by a "D" suffix) screened near the bottom of the PRB. The well clusters were installed a few feet upgradient and a few feet downgradient from the PRB near the northern end, the southern end, and along the center of the PRB (fig. 2). In addition, clusters of 1-inch-diameter wells were installed in the PRB near the northern end, the southern end, and along the center of the PRB. Subsequent drilling to collect core samples, however, showed that the well (12MW-24S) formerly thought to be in the PRB near the southern end actually is along the downgradient edge of the PRB and probably is not intersecting the PRB. A single boring near well 12MW-21S in the PRB near the center of the PRB showed that the boring appeared to scrape the edge of the PRB at some depths and to contain sediment from the PRB at other depths. Thus, well 12MW-21S probably is at the edge of the PRB. Because the water levels in well 12MW-21S are more similar to those in the well upgradient from the PRB than to the water levels in the well downgradient from the PRB, well 12MW-21S probably is at the upgradient edge of the PRB.

Site History

Operations at SWMU12 from the early 1970s to 1981 consisted of preservation of wooden ammunition boxes by impregnation with pentachlorophenol (PCP) in dip tanks outside former building 88 (fig. 2). VOC contamination is present in the soil and groundwater, and appears to be related to former degreasing operations and a leaking underground storage tank (UST) located in the southeastern corner of former building 88. The VOCs primarily are chlorinated ethanes and ethenes.

The last known use of the UST was to store solvents for wood preservation in 1979. The tank was pumped dry in 1998 and was removed and inspected in September 1999. Water in the excavation hole contained concentrations of total VOCs greater than 100,000 micrograms per liter (µg/L) (Tetra Tech NUS, Inc., 2000a). The most concentrated constituents measured, listed in order of decreasing concentration, were 1,1-DCA at 84,300 µg/L; 1,1,1-TCA at 52,600 µg/L; 1,1-DCE at 9,950 µg/L; PCE at 7,630 µg/L; *c*DCE at 4,900 µg/L; 1,2-DCA at 830 µg/L; chloroethane at 500 µg/L; and TCE at an estimated value of 385 µg/L. The tank and associated pipes were corroded, and two holes were present near the bottom of the tank. The tank-fill pipe was not connected to the tank. The bottom of the tank extended to a depth of about 7 ft below ground surface (Tetra Tech NUS, Inc., 2000b).

Several site investigations have been conducted at SWMU12. Harmon Engineering and Testing (1984) completed an installation assessment study for NWS Charleston in January 1984. Although the study did not include an investigation of SWMU12, the report described ordnance-related activities that took place at building 88, which was located at SWMU12. A site-characterization study in 1987 (Environmental Science and Engineering, Inc., 1987) included collection of sediment and surface-water samples for PCP analysis. Because the study detected only low levels of PCP, the report did not recommend further investigation.

An interim Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was completed in 1988 because the NWS Charleston began operating under a RCRA interim status. During the assessment, building 88 and the vicinity were designated as SWMU12 (Kearney/Centaur, 1988).

As part of the RCRA Facility Investigation (RFI), Tetra Tech NUS, Inc. (2000a), conducted studies of groundwater contamination and hydrology between 1998 and 1999. These investigations included installation and sampling of 19 monitoring wells and 45 temporary well points. In addition, four separate tidal studies were conducted at the marshes east and north of SWMU12 and at monitoring wells 12MW-06S and 12MW-06D. The investigation also included collecting and analyzing 11 surface-water and sediment-sample pairs collected from drainage ditches and from the marshes, as well as soil samples from several locations. The investigations showed that groundwater contamination was moving eastward from a source area on the western side of building 88 and extended at least 400 ft toward the eastern marsh. Recommendations from the investigation included monitoring the groundwater for VOCs and PCP. Supplemental RFI work included installation and sampling of 3 monitoring wells and 12 temporary monitoring wells (Tetra Tech NUS, Inc., 2001).

The USGS and the NAVFAC SE began investigations of the groundwater contamination in 2000 following completion of a series of site-evaluation investigations by consulting firms. The purpose of the USGS/NAVFAC SE investigations was to evaluate effects of natural and engineered remediation at the site. One engineered remediation approach being used at the site is a PRB consisting of ZVI installed in December 2002 (fig. 2). The PRB is hydraulically downgradient from the source area and is used to intercept and control concentrations of chlorinated solvents moving downgradient into a lowland forest and toward a freshwater wetland. A second engineered remediation approach is a grove of loblolly pine (*Pinus taeda*) saplings in the source area that were planted in May 2003 (fig. 2). The USGS also planted hybrid poplar trees above the plume in the forest and near well 12MW-26S in March 2005 as a phytoremediation evaluation, but the hybrid poplars did not survive. In February 2008, the USGS planted 35 "fast-grow" loblolly pine trees on the southwestern side of the PRB, but they died, possibly as a result of being mowed down multiple times. Summaries of investigative activities at the site are available for the periods October 2003 to October 2004 (Vroblesky and others, 2004), October 2004 to July 2006 (Vroblesky and others, 2007b), October 2006 to November 2007 (Vroblesky and others, 2008), and February to August 2008 (Vroblesky and Petkewich, 2009).

Methods

This investigation used standard methods for data collection. The following sections discuss specifics associated with the data collection and well drilling.

Data Collection

Multiple types of sampling points were used during this investigation to collect data at SWMU12 (fig. 2). Wells designated by a prefix of "12MW-" primarily are 2-inch-diameter wells used for monitoring groundwater chemistry and water levels. Exceptions are wells 12MW-14S, 12MW-15S, and 12MW-16S, which are 0.5-inch-diameter wells installed to monitor water levels; these wells typically are not included on water-level maps because of questionable reliability. Additional exceptions are wells 12MW-19S,D; 12MW-21S,D; and 12MW-24S,D, which are 1-inch-diameter wells that the original contractor attempted to place within the PRB, but were later determined to be outside of the PRB (Vroblesky and others, 2007b). The nomenclature suffixes "S," "I," and "D" designate shallow, intermediate, and deep depths, respectively. The "S" wells have 2.5- to 11-ft screens generally to total depths below ground surface of about 11.5 to 18 ft. The single "I" well has a 10-ft screen open at a depth of 19 to 29 ft. The "D" wells typically have 10-ft-long screens with total depths ranging from about 31 to 45 ft. With the exception of well 12PZ-01 (a 2-inch-diameter well), wells designated with the prefix "12PZ-" indicate 1-inch-diameter wells. The "12PZ-" wells have 2.5- to 5-ft screen lengths and are used primarily for monitoring water levels, although VOC data have been collected from all of them, and well 12PZ-03D is routinely monitored for VOC content.

This investigation used low-flow sampling methods (Barcelona and others, 1994; Shanklin and others, 1995; Sevee and others, 2000) to collect groundwater samples from all of the wells near the PRB. In other wells, three or more casing volumes of water were purged prior to sampling because previous investigations at this site have shown that stabilization of dissolved-oxygen concentrations to environmentally realistic values during the low-flow sampling in some wells could not be achieved during the winter because of in-well convection (Vroblesky and others, 2007a). Three casing volumes of water also were purged routinely in some wells where previous sampling has shown that continued pumping produces continuously increasing VOC concentrations, possibly because the highest VOC concentrations in the aquifer are slightly offset from the well screen.

During low-flow sampling, the wells were purged at a rate of approximately 100–300 milliliters per minute (mL/min) from approximately the center of the screened interval using a peristaltic pump, until the water temperature, pH, dissolved-oxygen concentration, and specific conductance values stabilized and no additional water-level drawdowns were observed. Monitoring the stabilization of temperature, pH, dissolved oxygen, and specific conductance took place by passing the water through a flow-through cell containing sensors. Field properties were considered to be stable during pumping when the observed changes over three 3-minute intervals were within ±3 percent for water temperature and specific conductance, within ±0.1 unit for pH, and within ±10 percent for dissolved oxygen.

The USGS synoptically measured water levels by using an electric water-level sensor and using the top of the well casing as the reference point for determining depths to water. Water-level measurements were to the nearest 0.01 ft. Subtracting the depth to water from the previously surveyed altitudes of the top of the well casing provided water-level altitudes. Piezometric maps generated from the data provided general directions of groundwater flow. One well (12MW-05S) contained a Solinst Levelogger®, which measured continuous water level to monitor short-term and long-term water-table fluctuations, and compensated for barometric pressure changes. Piezometers 12PZ-07, 12PZ-08, 12PZ-09, and 12PZ-10 became part of the water-level network in September 2009 (fig. 4).

Well Drilling

Piezometers 12PZ-07, 12PZ-08, 12PZ-09, and 12PZ-10 were installed on August 20, 2009, and developed on August 25, 2009. The wells were installed by Terry Environmental Services, Inc., using a 4.25-inch inside-diameter

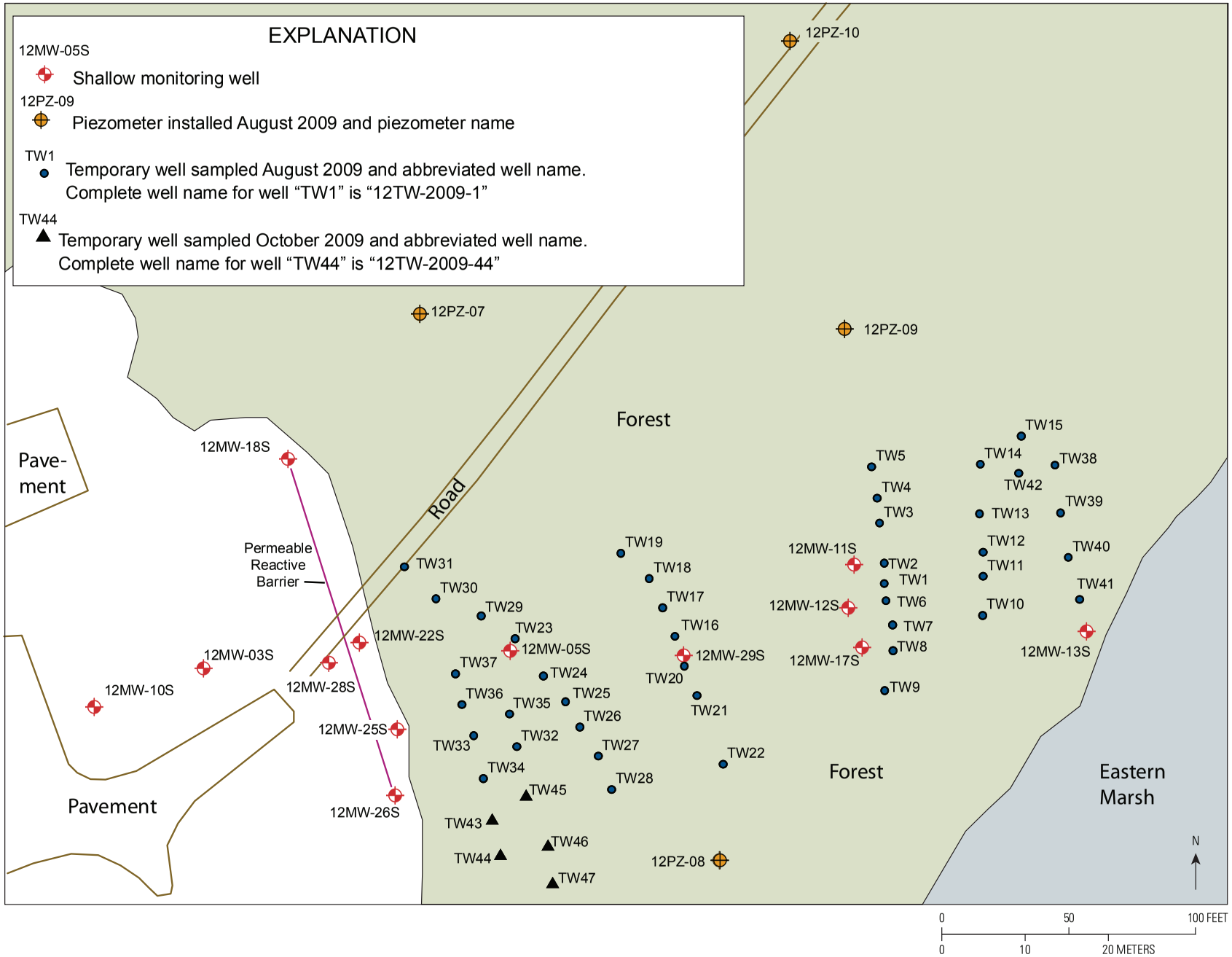


Figure 4. Temporary-well and selected permanent-well locations and sampling dates, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

hollow-stem auger. The wells consisted of 2-inch outside-diameter schedule 40 polyvinyl chloride (PVC) pipe with 5-ft screens having a 0.01-inch slot size. Filter sand was added outside of the screen from the bottom of the boring from 1 to 2 ft above the top of the screen. At least 1 ft of bentonite seal was added above the sandpack. Portland cement was used to grout the pipe from the top of the bentonite to land surface. A 2-ft by 2-ft concrete pad was added at land surface, along with a steel protective riser. In three out of the four piezometers, the bottom of the well screens extended to 15 or 16 ft bls. In well 12PZ-09, however, the surficial clay extended to a depth of 16 ft bls. Because the bottom of the 5-ft-long well screen of 12PZ-09 extended to 18 ft bls, only the lowermost 2 ft of screen is open to a sandy horizon. This placement of the well screen should not adversely affect the usefulness of the well for its intended use as a piezometer. If piezometer 12PZ-09 is slug tested to determine hydraulic conductivity, however, the reduction in screen opening should be taken into account.

Forty-two temporary wells were installed and sampled during August 18–19, 2009, and five temporary wells were installed and sampled on October 30, 2009, in the forest east of the PRB (fig. 4). The temporary wells were installed and abandoned by Terry Environmental Services, Inc., and were sampled by the USGS. The temporary wells were installed by using push technology to advance a stainless-steel well screen with a retractable cover to the target depth. At the target depth, the cover was retracted, exposing 4 ft of screen. The target depth was chosen to approximate the screened interval of the nearest monitoring well. Samples were collected from the wells by using a peristaltic pump after purging for several minutes until the turbidity decreased.

Conceptual Site Model

Based on the data gathered from this and previous investigations at SWMU12, a conceptual site model (CSM) has been developed. The following paragraphs of this section include a discussion of the physical setting, the basic site hydrology and hydrogeology, probable contaminant sources, transport and fate of the contamination, and remediation scenarios used to date.

SWMU12 is located on a topographically low area. Surface-water features nearly surround the site (fig. 1). The surface-water features are a series of ponds and marshes separated from each other by berms, further limiting water exchange among the surface-water features. George Pond connects to a tidally influenced area farther southeast by a conduit through the berm. Average annual rainfall is about 50 to 52 inches (South Carolina State Climatology Office, 2009). Rainfall runoff is the dominant influence on water levels in the marshes (Tetra Tech NUS, Inc., 2000a).

In general, the hydrogeologic framework of SWMU12 consists of a surficial aquifer composed of sand to clayey sand. The surficial aquifer is confined over most of its extent. It is overlain by dense clay that extends from about land surface to a depth of about 10 to 11 ft in the source area and 8 to 10 ft in the forest. The surficial aquifer is about 13 to 20 ft thick in much of the study area (Tetra Tech NUS, Inc., 2001) with possible localized zones where it may be less than 5 ft thick (Vroblesky and others, 2007b). Hydraulic conductivity values from the aquifer range from about 1 to 20 feet per day (Vroblesky and others, 2007b).

A series of borings in the eastern marsh in 2003 showed that the clay was continuous beneath the marsh out to at least about 30 ft from the shore near well 12MW-13S (Vroblesky and others, 2007b). Beneath the surficial aquifer, clay layers with localized sand lenses extend to a depth of about 36 to 48.5 ft, where a dense olive-green clay encountered in the borings for wells 12MW-03D, 12MW-04D, and 12MW-05D (Tetra Tech NUS, Inc., 2000b) precludes potential for further downward transport of contamination.

Groundwater moves from recharge areas near former building 88 in an approximately eastward direction toward areas of lower groundwater levels (fig. 5). Prior to Hurricane Gaston in August 2004, water levels at well 12MW-08S were usually higher than in nearby wells, resulting in a trough-like configuration of the potentiometric surface in the surficial aquifer, oriented approximately along the axis of groundwater contamination between wells 12MW-05S and 12MW-13S (Vroblesky and others, 2007b). Following Hurricane Gaston in August 2004, the ponds north and northeast of SWMU12 partly drained, and thereafter, well 12MW-08S typically had the lowest head at the site (Vroblesky and others, 2007b). The change may have resulted in a shift to a more northeasterly direction of groundwater flow.

The primary VOCs of concern in groundwater at SWMU12 are chlorinated aliphatic solvents. Chlorinated parent compounds, such as PCE and 1,1,1-TCA, are suspected to have been released through several operationally related activities, including surface spills, drainage from floor drains at former building 88, and a leaking UST (Tetra Tech NUS, Inc., 2000a). The suspected source area is in the vicinity of the former UST and along the southeastern side of former building 88 (fig. 2). TCE probably is an original contaminant as well as a dechlorination or transformation product of PCE. Other VOCs present in groundwater at SWMU12 as probable breakdown products include *c*DCE, VC, 1,1-DCE, 1,1-DCA, and 1,4-dioxane.

Because most of the soil zone consists of a clay layer that extends from about land surface to a depth of about 10–11 ft in the source area, much of the contamination released onto the soil may have been sorbed onto clay surfaces. The presence of chlorinated solvents in the groundwater beneath the clay, however, clearly indicates that contamination continued to migrate vertically downward past the clay. Although the movement may have been through local discontinuities in the clay, studies have shown that hydrophobic organic solvents can cause clays to shrink, producing vertical cracks and allowing movement of the solvents through the clay (Abdul and others, 1990). Because the UST was about 7 ft bls (Tetra Tech

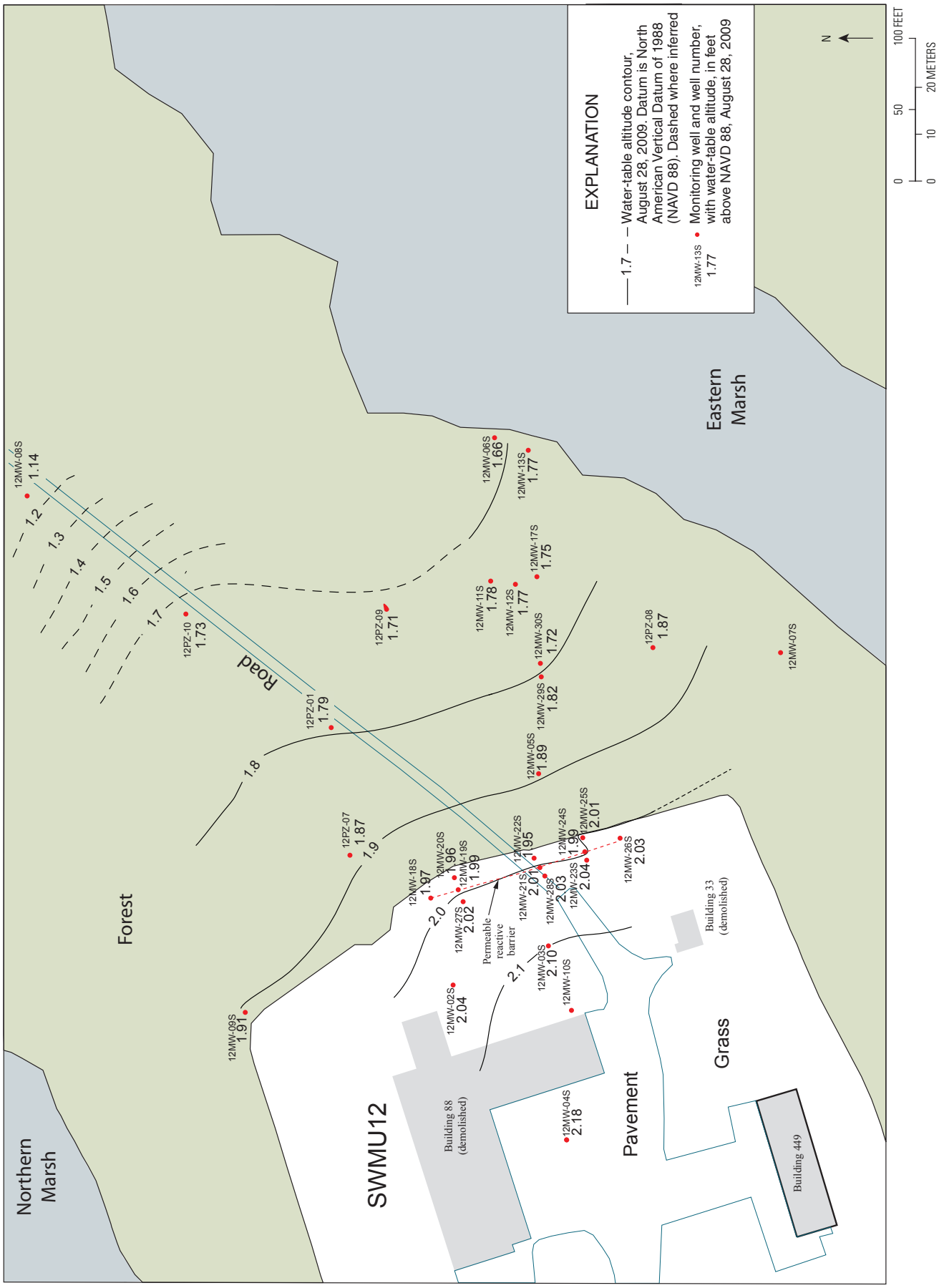


Figure 5. Groundwater levels in the surficial aquifer, Solid Waste Management Unit 12 (SWMU12), Naval Weapons Station Charleston, North Charleston, South Carolina, August 28, 2009.

NUS, Inc., 2000a), leakage from the UST probably provided a more direct input of chlorinated solvents into the groundwater than did solvents spilled onto land surface. The tank was removed in 1999. Remaining contaminant sources consist of releases from solvents sorbed onto clays and aquifer material. Once contamination entered the aquifer, it was transported approximately eastward, in the direction of groundwater flow, toward surface-water bodies east of the site.

Dechlorination activity takes place in the upgradient part of the groundwater contamination (Vroblesky and others, 2007b). Once beneath the forest in the downgradient part of the plume, the chlorinated solvent concentrations substantially decrease. Although biodegradation is present in the aquifer beneath the forest, the decrease in contaminant concentration probably is due primarily to transpirative removal of groundwater VOCs by trees and by sorption (Vroblesky and others, 2007a).

The pronounced eastward movement of the plume indicates that there is a groundwater-discharge point in that direction. The point of groundwater discharge in the surface-water features has not yet been determined. The clay layer underlying the eastern marsh limits nearshore discharge of groundwater to surface water near well 12MW-13S. If there is a groundwater-discharge point in the eastern marsh, it is likely offshore and localized as a discontinuity or an erosional channel through the clay. It also is possible that the groundwater-discharge point for water at SWMU12 is the Cooper River or the tidally influenced marsh between the Cooper River and the eastern marsh (fig. 1).

Multiple engineered remediation approaches have been used at SWMU12. A PRB was installed in December 2002 to intercept and remediate groundwater along the main axis of the plume (CH2M Hill Constructors, Inc., 2003), but groundwater contamination began moving around the southern end of the PRB within 2 years of the PRB's installation. Engineered phytoremediation also has been used as a remediation activity at SWMU12. A grove of loblolly pines was planted in the source area on May 14, 2003. The loblolly pines have grown into a small stand with a low incidence of tree death, despite the complete absence of artificial watering and maintenance (with the exception of occasional weed control). In contrast, hybrid poplar trees planted between wells 12MW-30S and 12MW-12S and near well 12MW-26S all failed to survive.

Movement of Contamination Around the Permeable Reactive Barrier

Groundwater contaminated by VOCs began moving around the southern end of the PRB in early 2004. In groundwater at well 12MW-26S prior to January 2004, 1,1-DCE was present at 140–150 µg/L, toluene ranged from undetectable to 42 µg/L, and the other contaminant VOCs were less than the detectable limit of 5 µg/L. By April 2004, however, concentrations began rising, and by late 2004 to early 2005, VOC concentrations were in the milligrams-per-liter range (fig. 6A). Because VOC concentrations at nearby well 12MW-23S substantially declined at about the same time they were rising in well 12MW-26S, the data indicate a southward shift in the plume (fig. 6B). No corresponding shift was observed at the north end of the PRB in well 12MW-18S, indicating no substantial change in contaminant concentrations around the north end of the PRB (fig. 6C).

Figures 7–14 show the generalized distribution of selected VOCs in groundwater during a 4-month period (July–October 2009) at SWMU12, with emphasis on the area downgradient from the southern end of the PRB. The maps show several important features of the contamination that are discussed in the following paragraphs.

An obvious feature shown by the maps is the fact that groundwater contamination now is bypassing the PRB by moving around the southern end of the PRB. The contamination moves around the PRB at well 12MW-26S and then moves northeastward to intersect the remnants of the original plume, located approximately east of the center of the PRB. Thus, contamination downgradient from the PRB is a mixture of contamination that was present prior to installation of the PRB, contamination that moved around the PRB, and probably contamination breakdown products from interaction with the PRB. Groundwater that likely moved through the central part of the PRB is characterized by sharply lowered VOC concentrations downgradient from the PRB relative to upgradient (for example, figs. 8–11).

The extent of the contamination that moved around the PRB cannot be determined with certainty, but it is likely that it coincides with the 1,4-dioxane plume because 1,4-dioxane is highly soluble in groundwater, does not readily bind to soils, is resistant to biodegradation (Mallinckrodt Baker, Inc., 2008), and appears to form a distinct plume emanating from the southern end of the PRB (fig. 7). That extent also approximately corresponds to the 1,000-µg/L contour for 1,1-DCA, *c*DCE, and PCE and to the 10,000-µg/L contour for 1,1-DCE (figs. 8–10, 13). The approximate coincidence of these contours and the sharp contrast between the concentrations within and outside of these contours provide supporting evidence that the contours represent the approximate extent of contamination that moved around the southern end of the PRB. Thus, the downgradient extent of contamination that has moved around the southern end of the PRB probably is between wells 12TW-2009-24 and 12TW-2009-16 (fig. 4). Considering that the plume traveled at least 75 ft from the PRB to well 12TW-2009-24 after first arriving at the PRB (well 12MW-26S), about 4.5 to 5 years prior to installation of the temporary wells, the calculated travel rate is at least 15 feet per year (ft/yr) during that interval. Because 1,4-dioxane was not detected at the next downgradient well (12TW-2009-16), approximately 130 ft downgradient from the PRB, the travel rate probably is less than about 29 ft/yr.

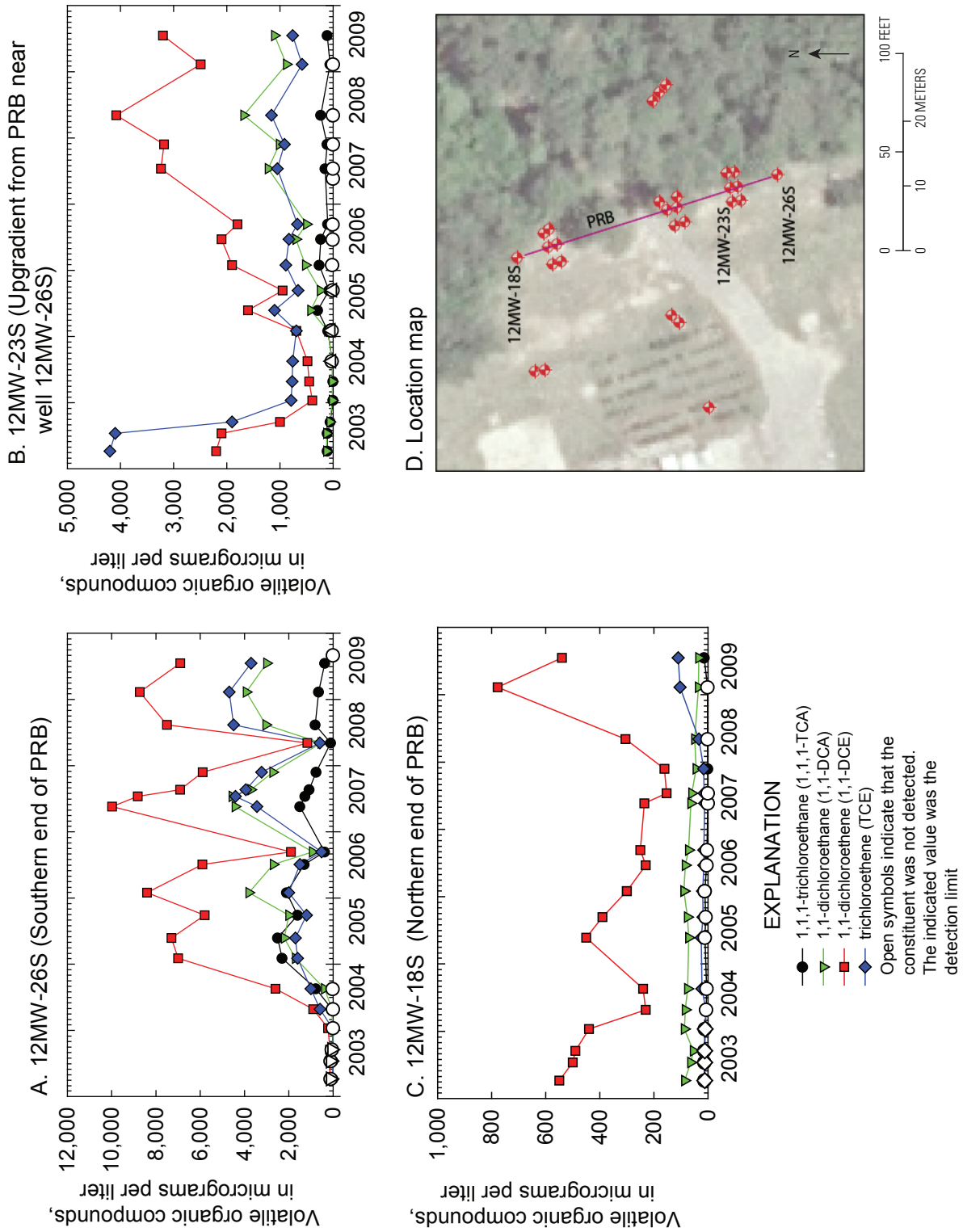


Figure 6. Changes in concentrations of selected volatile organic compounds in groundwater at wells (A)12MW-26S, (B) 12MW-23S, and (C) 12MW-18S near the southern and northern ends of the (D) permeable reactive barrier (PRB), Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2003–2009.

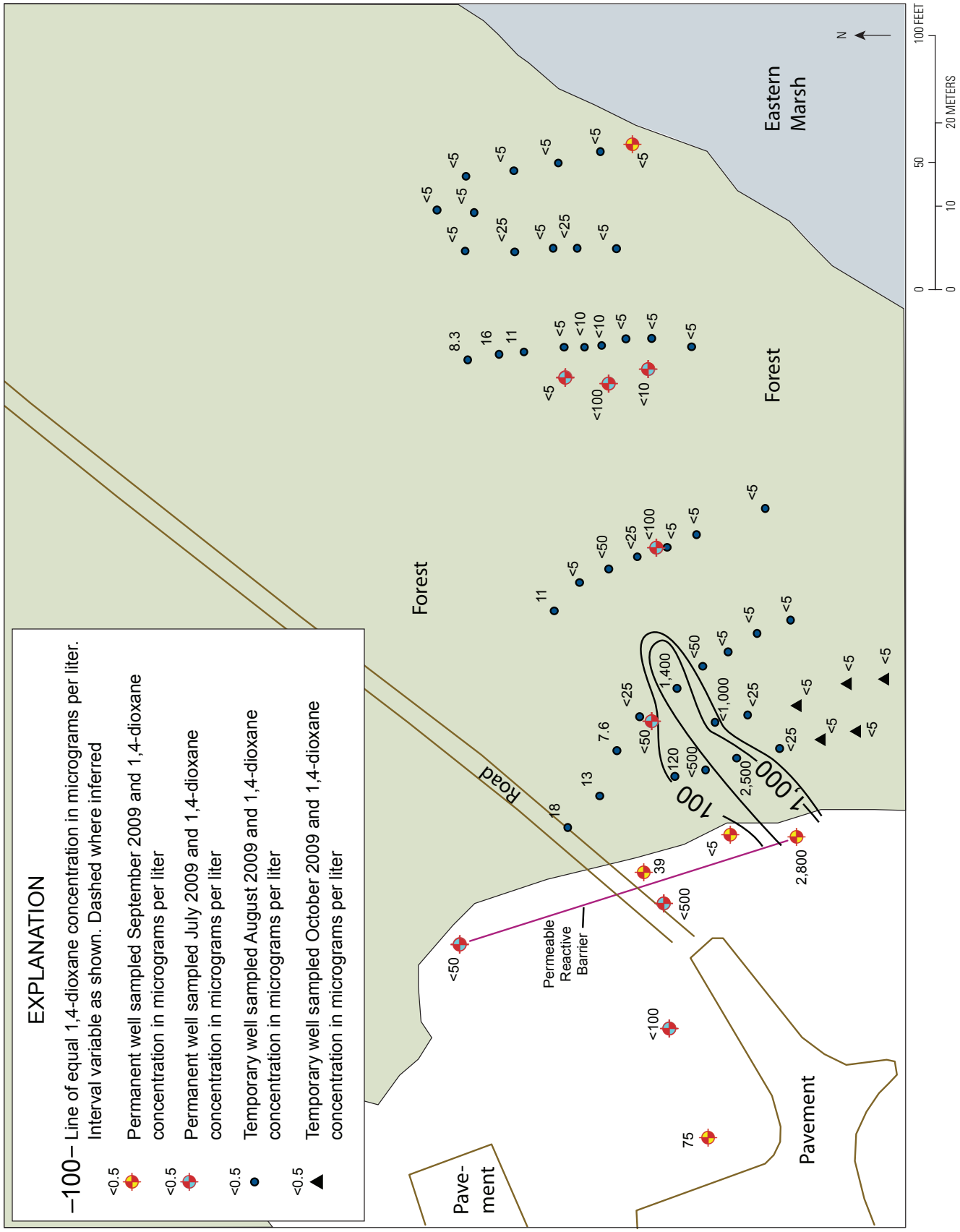


Figure 7. Distribution of 1,4-dioxane in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

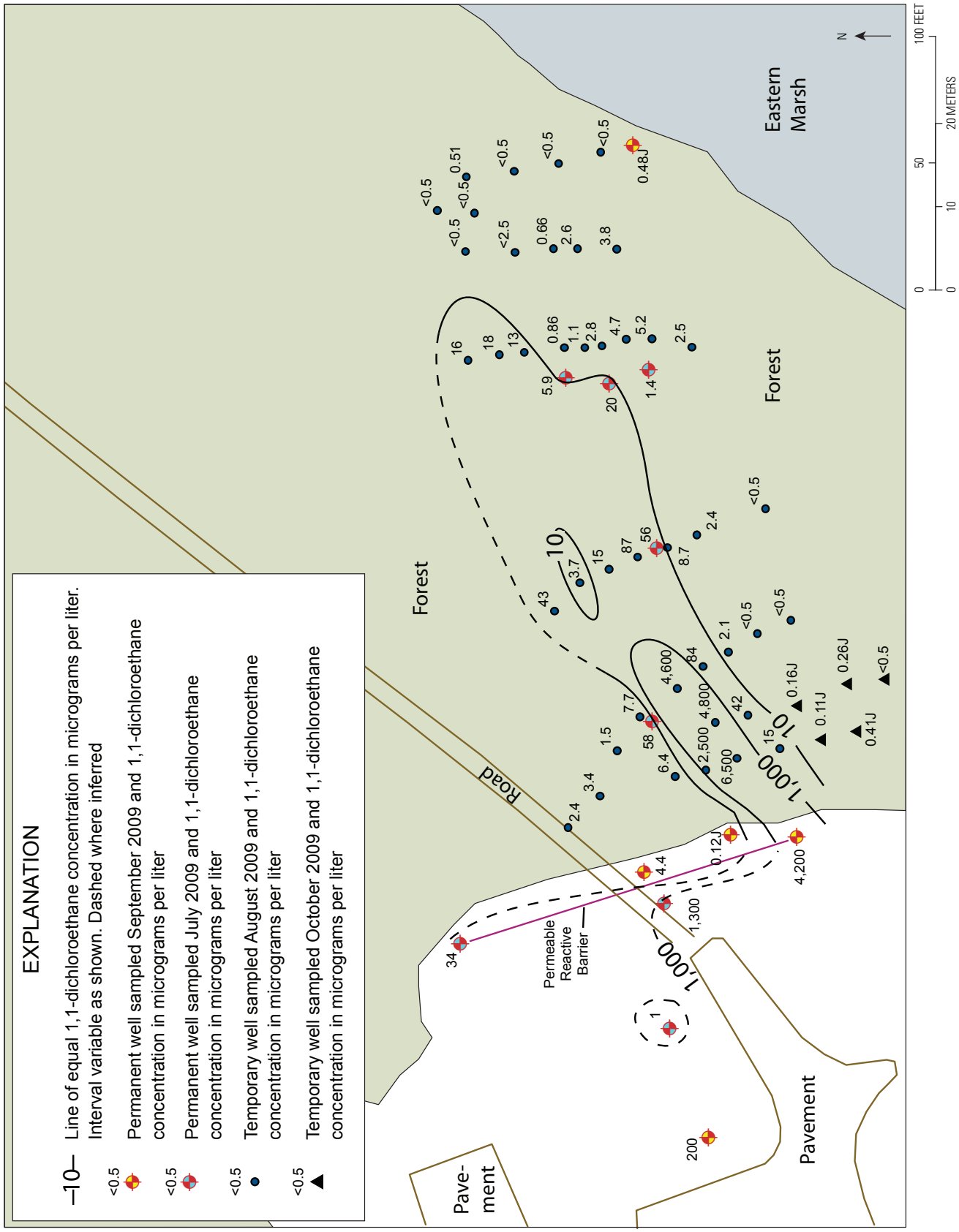


Figure 8. Distribution of 1,1-dichloroethane (1,1-DCA) in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina. [J, estimated value]

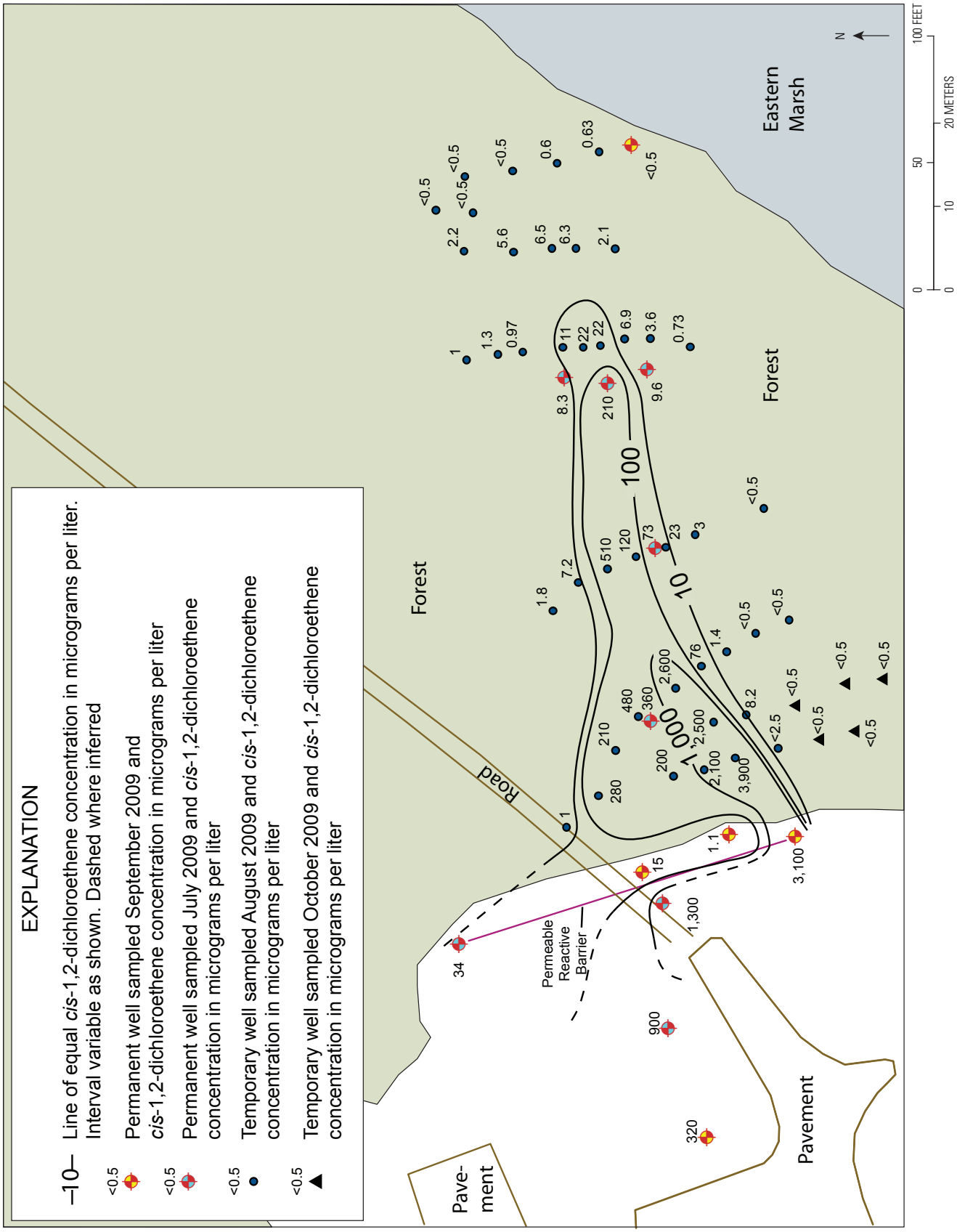


Figure 9. Distribution of *cis*-1,2-dichloroethene (*c*DCE) in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

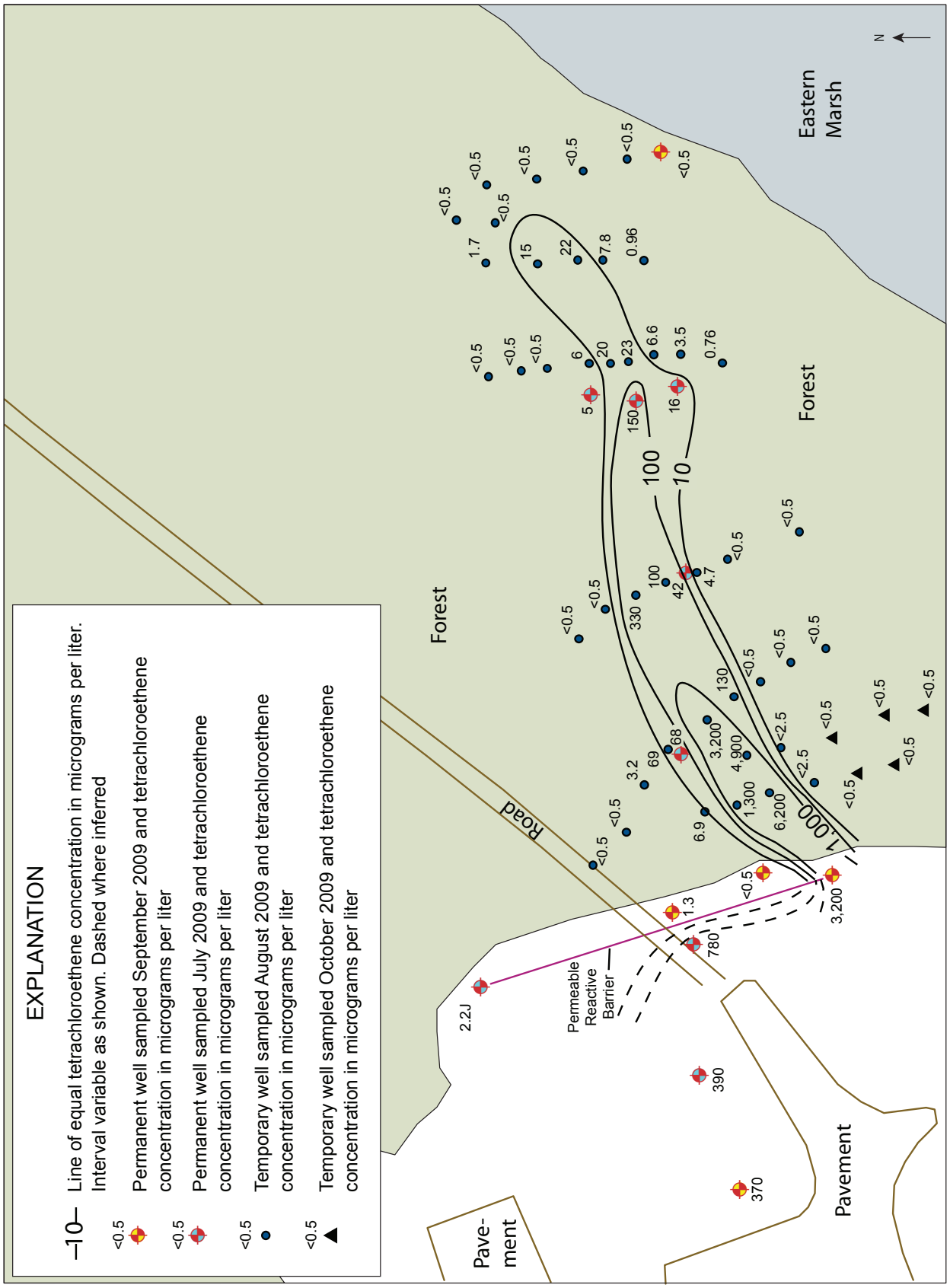


Figure 10. Distribution of tetrachloroethene (PCE) in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

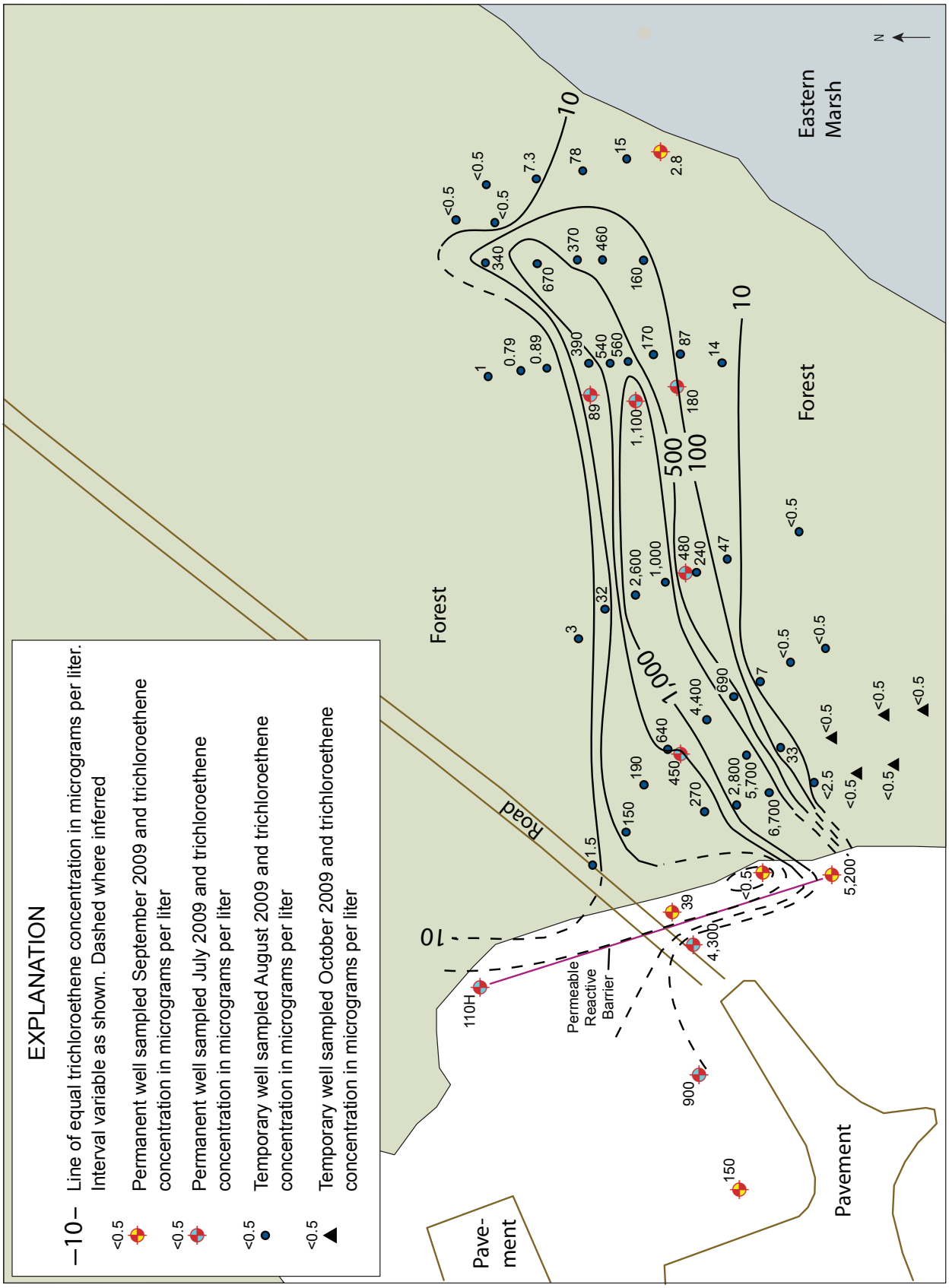


Figure 11. Distribution of trichloroethene (TCE) in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

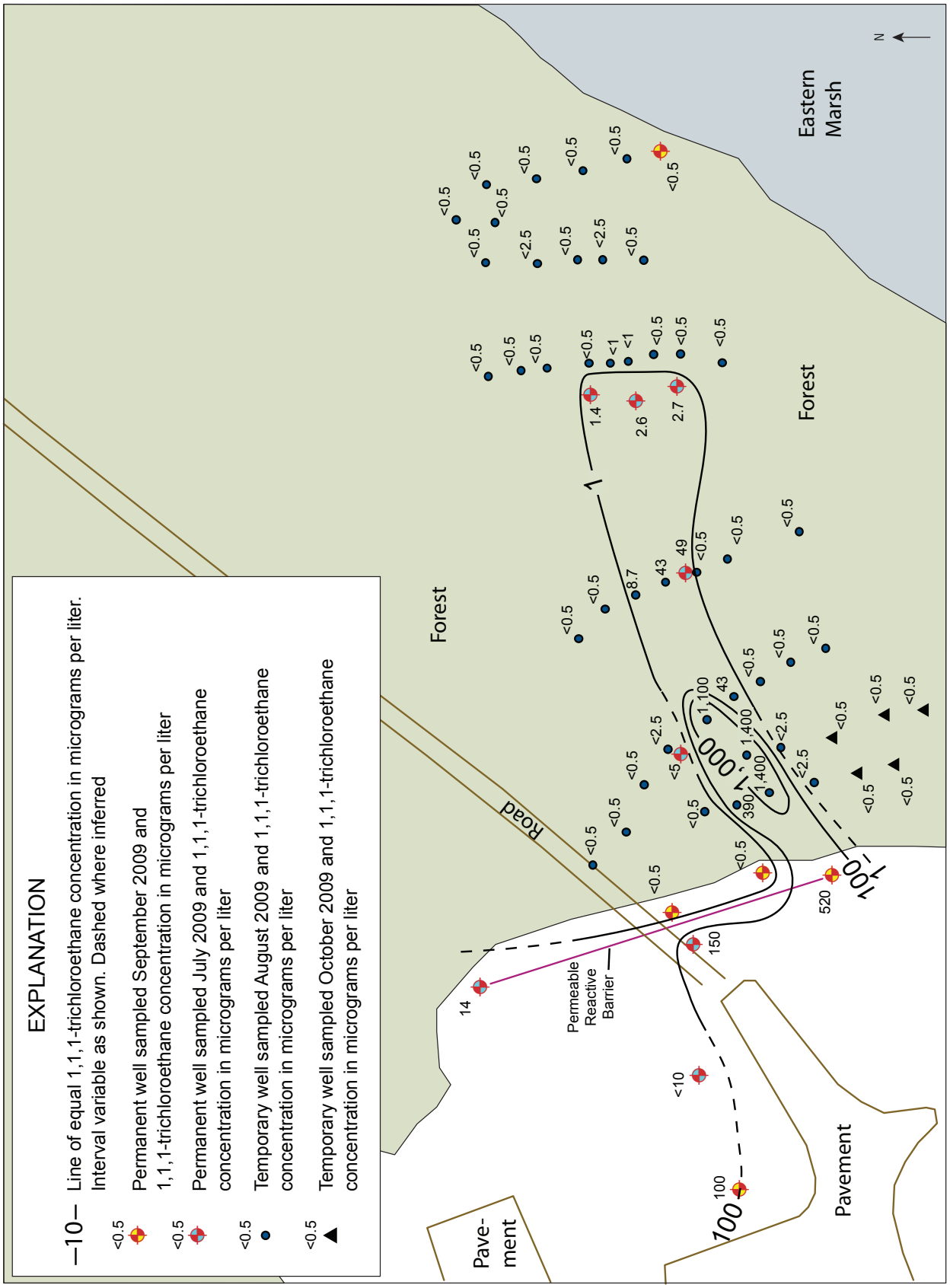


Figure 12. Distribution of 1,1,1-trichloroethane (1,1,1-TCA) in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

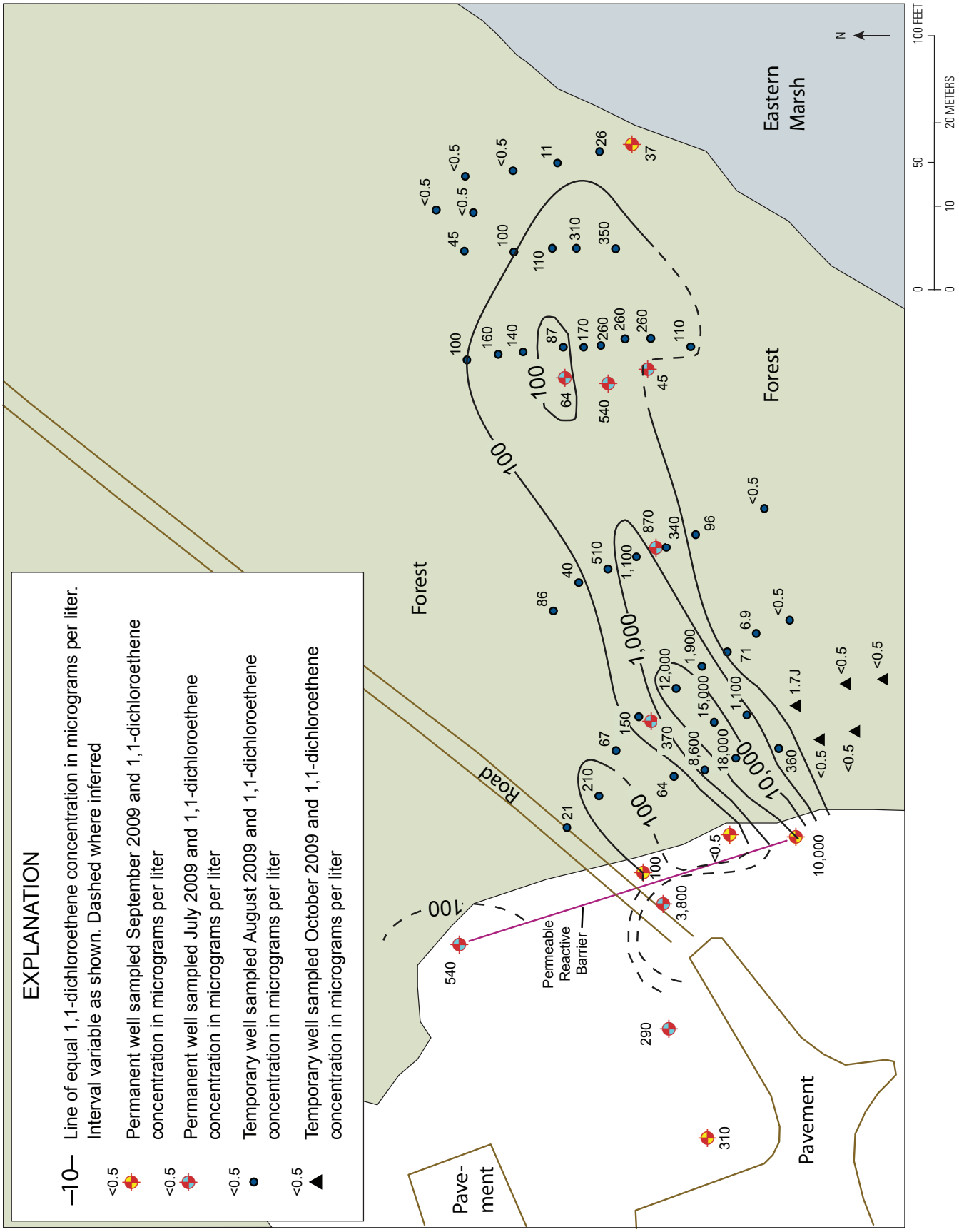


Figure 13. Distribution of 1,1-dichloroethene (1,1-DCE) in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

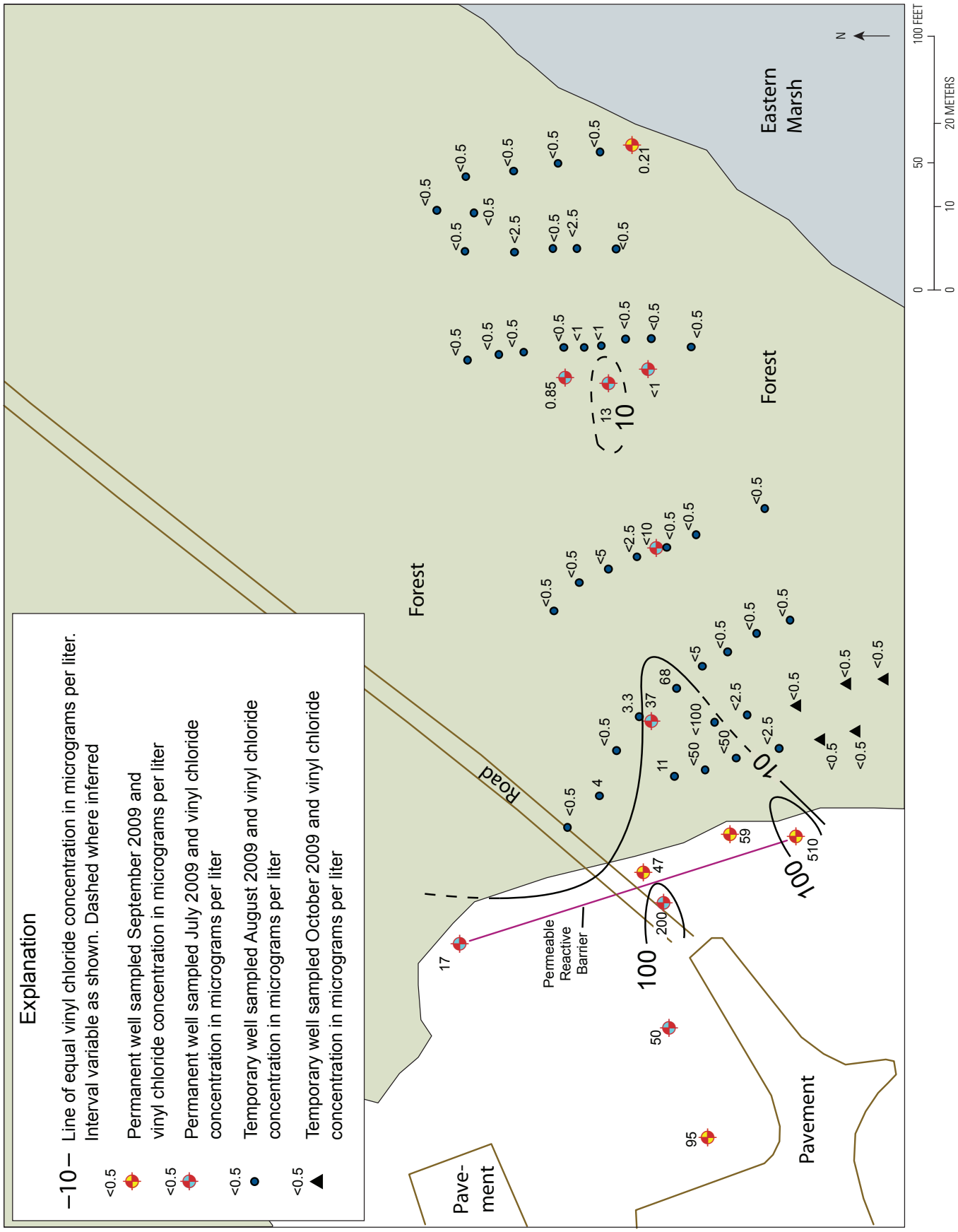


Figure 14. Distribution of vinyl chloride (VC) in groundwater during 2009, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

The southern contamination curves northeastward and joins the former contamination rather than tracking as a separate plume (figs. 9–13). Such curvature is characteristic of water movement around an impermeable barrier, but it also may indicate that the location of the original contamination may partly be controlled by lithology. That is, the contamination extending along the original axis of the plume may be moving through an area of higher hydraulic conductivity than the surrounding areas, such as a paleochannel.

The figures showing the distribution of contamination also illustrate a substantial decrease in contaminant concentrations from the upgradient to the downgradient sides of the PRB near the central part of the PRB. It is likely that much of that decrease represents contaminant destruction by the PRB.

Potential Causes for Movement of Contamination Around the Southern End of the Permeable Reactive Barrier

The diversion of contamination around the southern end of the PRB is likely caused by a permeability reduction associated with the abandoned trench or the PRB. If there was occlusion at the abandoned trench or in the PRB, then some level of groundwater mounding probably took place. Monitoring wells a few feet from the PRB on the upgradient and downgradient sides were installed at the time that the PRB was installed, so no data are available from those wells prior to installation of the PRB. Hydraulic gradient values across the PRB from the upgradient to the downgradient sides in the northern, middle, and southern parts of the PRB are shown in figure 15. Groundwater mounding, if it occurred, probably would be reflected by an increase in the hydraulic gradient (head difference divided by horizontal distance) across the PRB. The data are relatively variable (fig. 15) because the short distance between the wells (about 14–18 ft) magnifies the measurement uncertainty in the hydraulic-gradient calculation, as opposed to hydraulic gradients between wells farther apart. Although the data could indicate a continuing increase in hydraulic gradient in the northern part of the PRB (fig. 15A) and an initial increase in the central and southern parts of the PRB, the measurements are mostly within the range of measurement uncertainty (fig. 15B, C). Thus, the data are not precise enough to indicate a clear and substantial increase in hydraulic gradient across the PRB.

A record of hydraulic gradients prior to installation of the PRB can be seen by comparing water levels from older monitoring wells, more distant from the PRB than those in figure 15. The hydraulic gradient from well 12MW-03S (about 56 ft upgradient from the PRB) to well 12MW-05S (about 61 ft downgradient of the PRB) increased rapidly within the 2 months following the installation of the PRB (fig. 16A). The average hydraulic gradient after installation of the PRB (0.00156 from January 2003 to August 2006) was more than double the hydraulic gradient prior to installation (0.00069 from August 2000 to November 2002). The change also can be seen in the approximate doubling of hydraulic gradient from well 12MW-02S to well 12MW-05S (fig. 16B). A slight increase in hydraulic gradient between well 12MW-10S and well 12MW-05S also is apparent during the same time frame (fig. 16C).

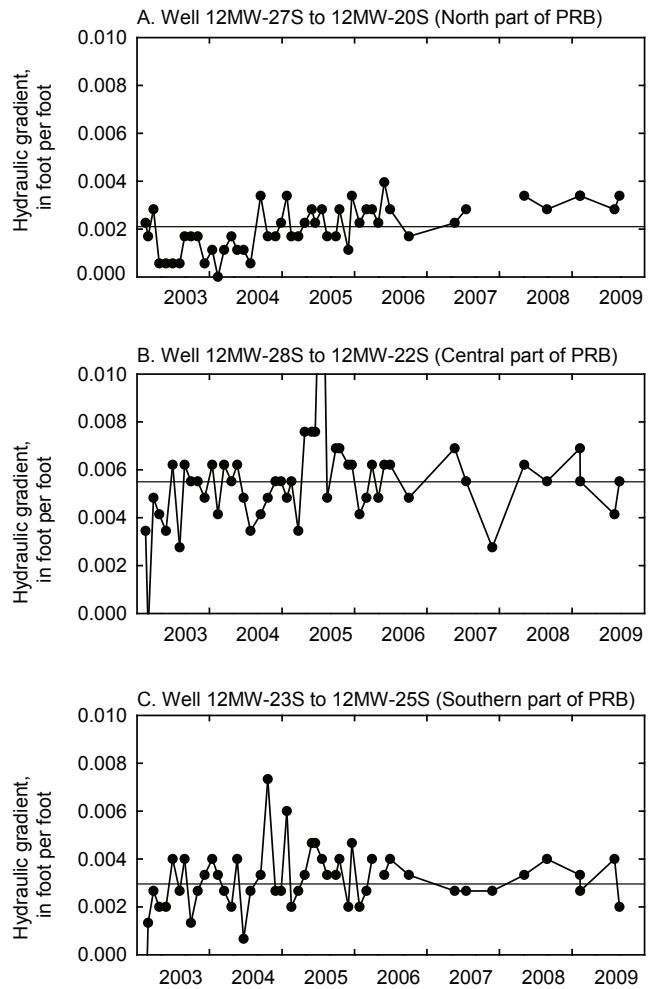


Figure 15. Hydraulic gradients from the upgradient to the downgradient sides of the permeable reactive barrier (PRB) in the (A) northern, (B) central, and (C) southern parts, with the horizontal lines representing average values, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2003–2009.

Much construction was taking place near the PRB in November and December 2002, so one possible explanation for the apparent shift in hydraulic gradient is that a piece of machinery disturbed the measuring points of the wells. It seems unlikely, though, that construction disturbed all of the upgradient wells in the same way. It also is possible that the measuring point on well 12MW-05S was disturbed during this period. This, too, seems unlikely because there were no construction activities near well 12MW-05S and because the hydraulic gradient from well 12MW-03S to well 12MW-05I (adjacent to well 12MW-05S but screened 5 ft deeper) showed

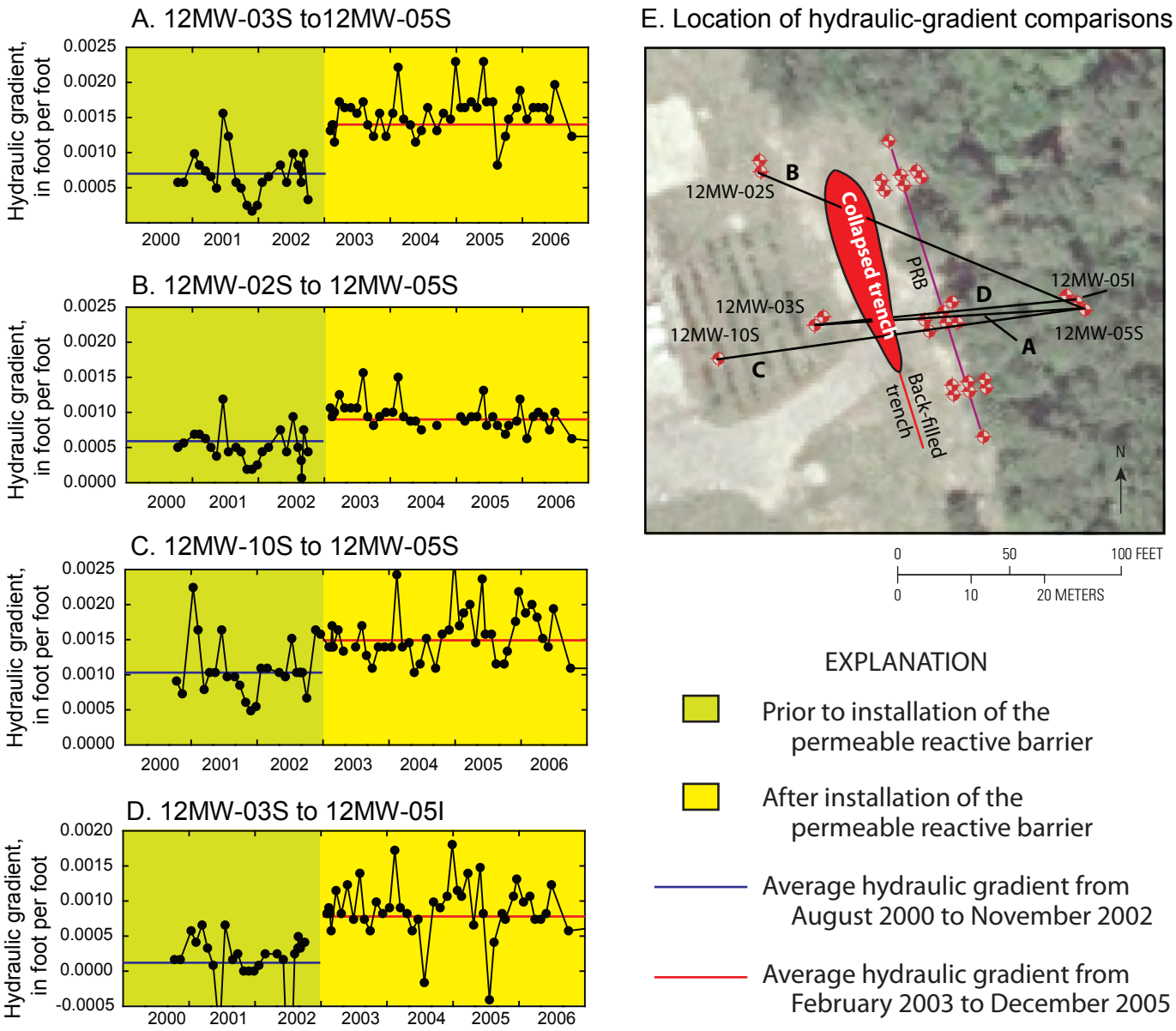


Figure 16. Hydraulic gradients over time from wells (A) 12MW-03S to 12MW-05S, (B) 12MW-02S to 12MW-05S, (C) 12MW-10S to 12MW-05S, and (D) 12MW-03S to 12MW-05I, and (E) a map showing the locations of the hydraulic-gradient comparisons, the collapsed trench, and the existing permeable reactive barrier (PRB), Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2000–2006.

a similar increase (fig. 16D). Therefore, the data appear to indicate that there was a rapid increase in hydraulic gradient at the time of construction of the PRB. A likely reason for the hydraulic-gradient increase is occlusion of the aquifer associated with the PRB installation.

One event that took place during installation of the PRB that may have caused permeability loss is the collapse and abandonment of the original trench planned for the PRB. The abandoned trench was approximately 25 ft upgradient (west) from the final location of the PRB and extended into clay below the contaminated part of the aquifer (fig. 16E). The northernmost 90 ft of the trench collapsed between November 11 and 13, 2002, expanding from a width of about 3 ft to a width of about 15 to 20 ft in the northernmost 50 ft and to a width of about 10 ft in the part of the trench from 50 to 70 ft from the northern end (fig. 16E) (CH2M Hill Constructors, Inc., 2003). The sidewalls of the trench collapsed, and the trench, originally about 35 ft deep, was filled in an average of 12 ft (CH2M Hill Constructors, Inc., 2003), or about 10 ft below the main body of contamination. The preconstruction lithology consisted of about 10 ft of clay extending from land surface to the contaminated aquifer. Membrane Interface Logs showed that the vertical location of the contamination prior to the construction was immediately below the clay (Columbia Technologies, written commun., 2003). With the collapse of the sidewalls, it is likely that the overlying clay collapsed into the contaminated zone. Thus, one potential source of aquifer permeability reduction associated with the PRB installation is the presence of clay collapsed into the contaminated target zone and possibly to a depth of 10 ft below the contamination.

A second potential source of permeability loss associated with the abandoned trench is that biopolymer slurry was used to stabilize the trench during excavation. The polymer slurry consisted of guar gum (Rantec G-150) with antimicrobial preservative (Troysan T-142), to prevent microbial degradation of the slurry during use, and soda ash to raise the pH (CH2M Hill Constructors, Inc., 2003). Guar gum has been shown to cause permeability loss in PRBs due to incomplete removal (Savoie and others, 2003) or by introduction of significant amounts of guar-derived organic carbon into the subsurface (Crane and others, 2004). Guar gum also is suspected to enhance microbial sulfate reduction and precipitation of iron sulfides by providing a source of carbon and electron donors (Johnson and others, 2008).

When the trench collapsed, it collapsed with the biopolymer slurry in the trench. As a corrective action, the trench was backfilled with material originally removed from the trench, which would have included a substantial amount of clay. As the trench was backfilled, the biopolymer slurry that was not trapped in the collapsed matrix, or entrapped by the backfilled material, collected on the surface and was removed by pumping (CH2M Hill Constructors, Inc., 2003). Unrecovered biopolymer slurry would have been entrapped in the more permeable material rather than in the collapsed clay. Parts of the abandoned trench where clay collapsed into the contaminated horizon would have experienced aquifer occlusion by virtue of the clay barrier, and parts of the abandoned trench where sand collapsed into the contaminated horizon would have experienced aquifer occlusion by virtue of the guar gum entrapped in the collapsed sand. The presence of antimicrobial preservative in the biopolymer slurry likely substantially delayed or prevented breakdown of the slurry by naturally occurring microbial processes. Therefore, the collapsed barrier probably was a major contributing factor in diverting contaminant flow from its original flow path.

It also is possible that permeability reduction took place within the PRB at the time of installation by virtue of the guar gum slurry that was used to support the sides of the PRB trench prior to placement of the ZVI and sand. After placement of the iron and sand, the bulk of the slurry was removed from the barrier by pumping and circulating using temporary 6-inch diameter slotted PVC pipes in the PRB (CH2M Hill Constructors, Inc., 2003). A liquid enzyme breaker (LEB-H) was circulated through the barrier to induce microbial degradation of the guar gum slurry; the circulation continued until the pH of the biopolymer slurry was reduced from about 10 to less than 6.5 (CH2M Hill Constructors, Inc., 2003). Persistence and degradation of the biopolymer slurry can be seen in the total organic carbon (TOC) data from wells screened in or at the edge of the PRB (fig. 17A, B, C). The TOC concentrations in the PRB were elevated following installation and declined thereafter, reflecting removal of the guar gum slurry and enzyme breaker. The TOC decline was relatively slow, however. Other studies have reported guar gum removal after about 6 to 9 months (Sivavec and others, 2001; Crane and others, 2004). At SWMU12, TOC concentrations (less than 100 milligrams per liter (mg/L)) in wells screened in the northern and southern parts of the PRB persisted for about 21 months following installation of the PRB (fig. 17A, C). During that time, there was a potential for reduced permeability in the PRB at those locations. The decline in TOC concentrations from greater than 900 mg/L in the northern part and greater than 400 mg/L in the southern part of the PRB to concentrations less than 100 mg/L by February 2005 probably means that the biopolymer slurry eventually was removed or was substantially diminished at those locations.

In contrast, the TOC concentrations in the PRB near its midpoint remained elevated at least through May 2005, 30 months after installation (fig. 17B). These data probably mean that guar gum persisted at that location and probably was accompanied by reduced permeability. Thus, some level of permeability reduction probably persisted during at least the first year or more following installation. Additional evidence is that the hydraulic gradient in the short distance between wells (about 14 to 18 ft) across the PRB is substantially steeper (fig. 15) than the gradient across the PRB measured in more distal wells (fig. 16). The steepest gradient across the PRB is in the central part (fig. 15B). Thus, most of the change in hydraulic gradient measured between distal wells takes place across the PRB.

Mineral precipitation may also cause permeability loss in the PRB. Anaerobic corrosion of ZVI is accompanied by

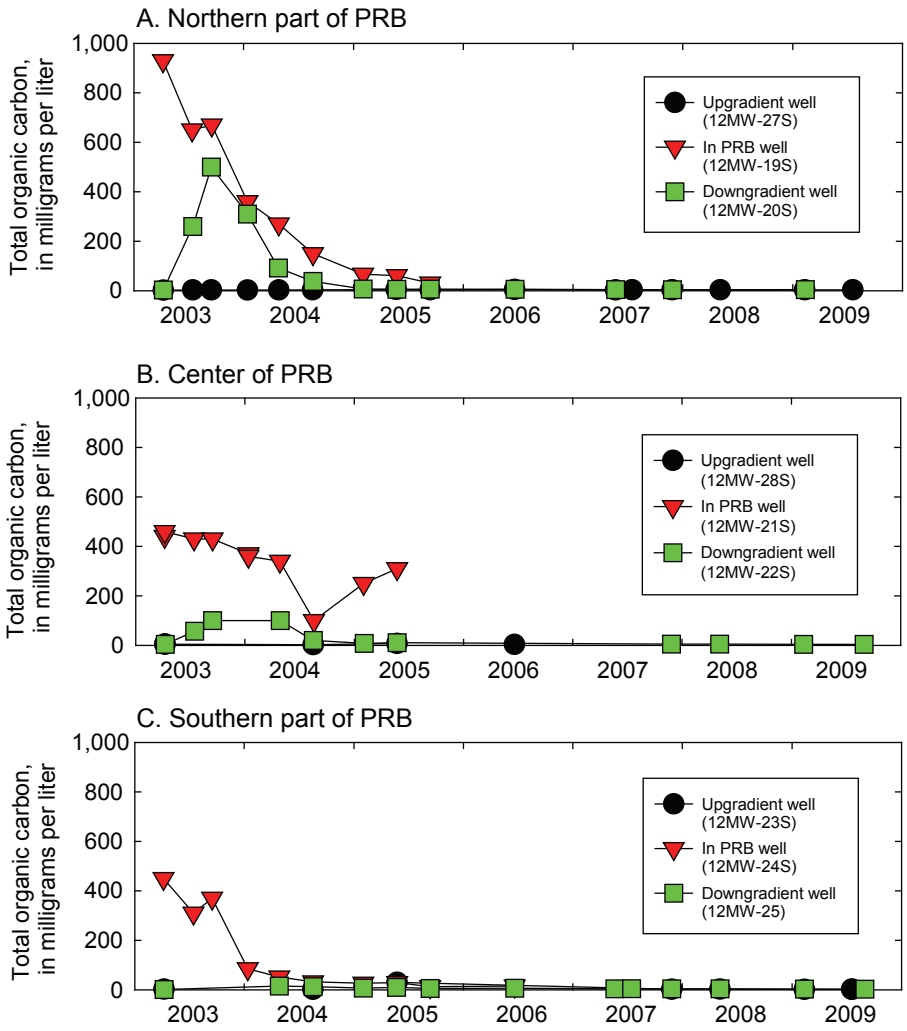


Figure 17. Changes in the total organic carbon content of groundwater in the (A) northern, (B) central, and (C) southern parts of the permeable reactive barrier (PRB), Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2003–2009.

an increase in dissolved iron, pH, and hydrogen (Henderson and Demond, 2007), as observed at the PRB in SWMU12. Wilkin and Puls (2003) showed that for such iron reactions, an increase in pH is accompanied by a decrease in redox potential. In this reducing alkaline environment, precipitation of solids from native groundwater constituents is favored, leading to the loss of permeability and possible reduction in the reactivity of the ZVI (Henderson and Demond, 2007). Typical precipitates include iron (hydr)oxides, iron and calcium carbonates, iron sulfides, and green rusts (Liang and others, 2003; Jambor and others, 2005). Much of the sulfur precipitation can occur in the native aquifer just upgradient from the PRB (Johnson and others, 2008).

Precipitation of iron sulfides probably is taking place in the PRB. Measured sulfate concentrations upgradient from the PRB (well 12MW-28S) range from about 4 to 15 mg/L (April 2003 to September 2009), but sulfate concentrations downgradient from the PRB (well 12MW-22S) started out at about 8 mg/L (April 2003) and rapidly declined to concentrations typically below 1.3 mg/L (July 2003 to September 2009). The loss of sulfate indicates that sulfate reduction was taking place within or immediately upgradient from the PRB. Further evidence for sulfate reduction is the observation that sulfide was undetectable in the upgradient well (less than 0.05 mg/L) and was detectable at concentrations of 0.075 to 0.2 mg/L during approximately half of the sampling events downgradient from the PRB. Sulfide from sulfate reduction has a strong tendency to precipitate as iron sulfide in the presence of Fe(II). Therefore, iron sulfides may also precipitate within the PRB.

Despite the probable permeability reduction in and near the PRB immediately following installation, there is evidence that contaminants moved through the PRB and were degraded, which is consistent with the planned purpose of the PRB. The concentrations of most VOCs on the downgradient side

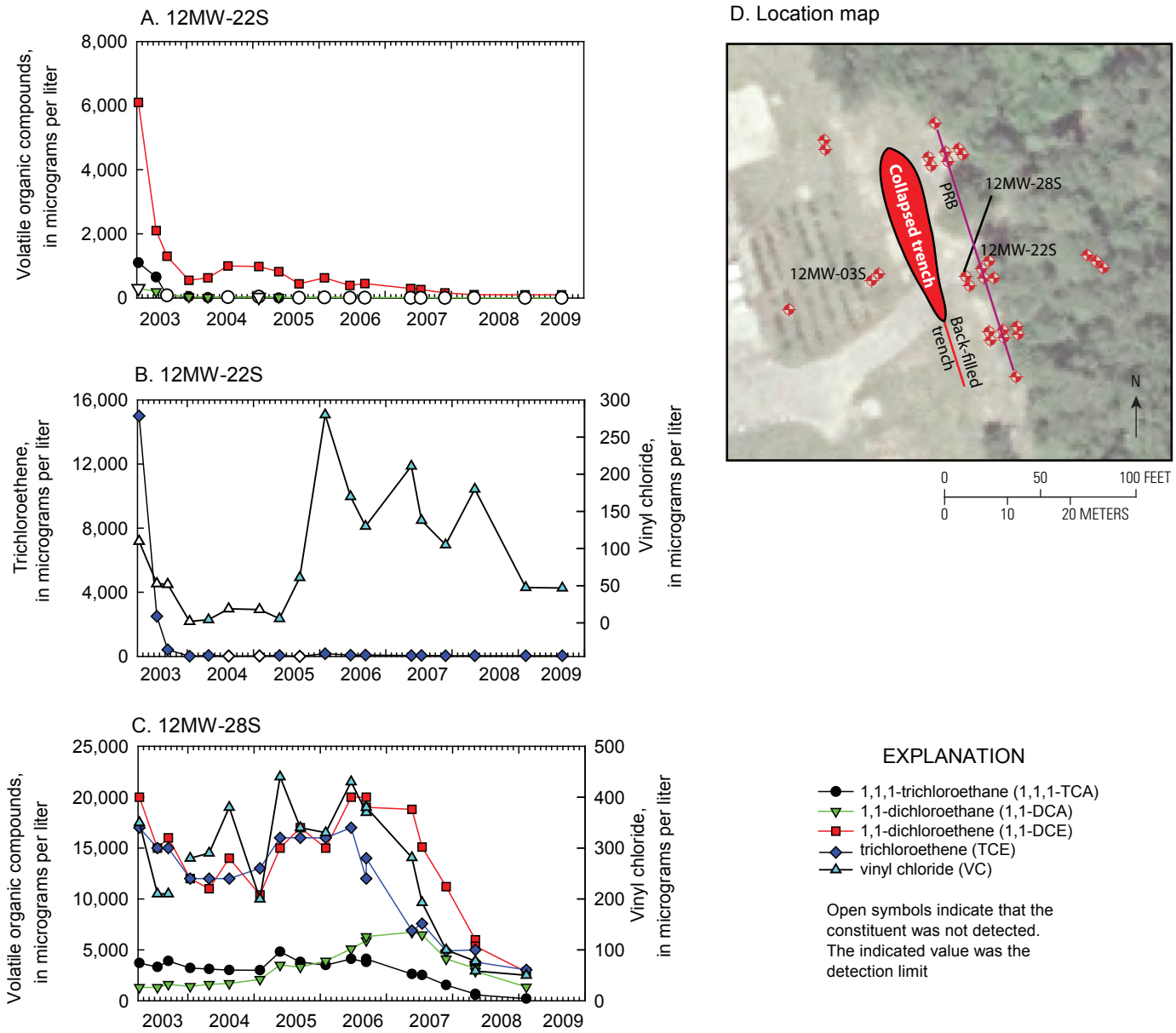


Figure 18. Changes in concentrations of selected volatile organic compounds in groundwater at wells (A and B) 12MW-22S and (C) 12MW-28S near the permeable reactive barrier (PRB), and (D) locations of wells and the PRB, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 2003–2009.

of the PRB rapidly decreased (fig. 18A, B), while concentrations on the upgradient side remained constant for several years (fig. 18C). An exception was VC, which substantially increased in concentration in 2005, consistent with extensive degradation of parent chlorinated solvents and transport to an environment less conducive to VC degradation. These data indicate movement of contamination through the PRB with contaminant degradation down to VC. These data and the decline in sulfate concentrations from the upgradient to the downgradient side of the PRB likely indicate water movement through the PRB and sulfate reduction within or immediately upgradient from the PRB. Thus, the central part of the PRB appears to have performed its role of degrading chlorinated solvents, at least until 2007.

In 2007, after 4 years of relative stability, VOC concentrations began substantially declining on the upgradient side of the PRB along the central part of the PRB at well 12MW-28S (fig. 18C). The cause of the decline has not been determined, but may be related to one or more of a number of factors. VOC concentrations upgradient from well 12MW-28S at well 12MW-03S (fig. 18D) were in the tens of thousands of micrograms per liter range in 2001 and thereafter substantially declined to concentrations of mostly less than a few hundred micrograms per liter (figs. 19B, 20B, 21B). Thus, the concentration decline in well 12MW-28S may simply be a reflection of declining concentrations from the passage of a contaminant pulse. Another possible explanation for the contamination decline at well 12MW-28S, however, is that the VOCs in groundwater at well 12MW-28S reflect the eventual dissipation of a body of contamination cut off from the plume by the collapsed trench (fig. 18D). In this scenario, the main body of contamination upgradient from the collapsed trench may be in the process of being entirely diverted around the PRB. The decline also may be due to a combination of the above factors.

Fate of Contamination Downgradient from the Permeable Reactive Barrier

VOC contamination in groundwater downgradient from the PRB is subject to several attenuating processes. A previous investigation showed that once beneath the forest, the groundwater contamination transport rate slows, and substantial VOC removal by phytovolatilization takes place during the active growing season (Vroblesky and others, 2007b). In addition, sorption onto the aquifer and clay matrices and biodegradation are active removal mechanisms at SWMU12 (Vroblesky and others, 2007b). The primary biodegradation processes involve dechlorination of PCE to TCE, TCE to *c*DCE, and 1,1,1-TCA to 1,1-DCE.

Substantial changes in groundwater-contaminant concentrations took place at some monitoring wells at SWMU12 during this investigation (figs. 19, 20, 21). In the mid-groundwater contamination plume downgradient from the PRB, multiple wells showed apparent pulses of increased contaminant concentrations (fig. 19C, D, F; fig. 20C, D, F; fig. 21D, F). For example, a pulse of increased PCE concentrations was detected at wells 12MW-05S and 12MW-29S during 2005–2006 (fig. 19C, 19F). A pulse of increased PCE concentrations appears to peak in early 2008 at well 12MW-12S, which is 133 ft downgradient from well 12MW-05S and 68 ft downgradient from well 12MW-29S (fig. 19D). It is possible that the pulse detected at well 12MW-12S is the downgradient arrival of the pulse seen a few years earlier at wells 12MW-05S and 12MW-29S.

Alternatively, the pulse of increased VOC contamination at well 12MW-12S may be the result of lateral shifting of the plume axis. The axis of maximum PCE and TCE concentrations probably is less than 25 ft wide (figs. 10, 11). Relatively small lateral shifts in the plume axis potentially could result in relatively large differences in contaminant concentration at a given location. Supporting evidence for lateral shifting is the data indicating that at about the same time that the PCE and TCE pulse began appearing at well 12MW-12S, the concentrations in nearby well 12MW-17S (16 ft to the southeast) began decreasing (figs. 4, 19E). Thus, the plume may have shifted northward.

Additional evidence for a plume shift can be seen in the fact that the PCE, TCE, and 1,1,-DCE concentrations at well 12MW-12S had been relatively high in early 2002, followed by a sharp decrease in concentration between September 2003 and January 2003 (figs. 19D, 21D). This decrease was not due to contaminant degradation because the degradation product *c*DCE also decreased in concentration (fig. 20D). One important event that took place during that time frame that appears to have had an immediate influence on the groundwater hydraulics was the activity associated with construction of the PRB during November and December 2002. As previously discussed in this report, a definitive change in the site hydrology likely took place at the time of the construction activity. Movement of contaminants around the southern end of the PRB is evidence of a distinct change in the direction of the hydraulic gradient. Thus, the sharp decrease in contaminant concentrations at well 12MW-12S in 2003 likely was the result of a southward shift in the axis of contamination related to construction of the PRB. The increasing concentrations at well 12MW-12S and decreasing concentrations at well 12MW-17S in 2006 may be related to a northward shift in the axis of contamination. A previous investigation showed that the hydraulic gradient at the toe of the contamination plume probably began shifting northeastward in late 2004 as a result of stage-level changes in George's Pond (Vroblesky and others, 2007b).

The areal distribution of PCE and TCE also indicates a possible northeastward transport path (figs. 10, 11). Figure 11 shows that the highest TCE concentrations detected at the eastern (downgradient) end of the plume were 670 µg/L at well 12TW-2009-13 and 340 µg/L at well 12TW-2009-14. There is some uncertainty about the actual northeastward extent of the contamination. When the temporary wells were being installed and sampled in August 2009, multiple locations near well 12TW-2009-15 at depths of 8.5 to 12.5 ft were dry holes

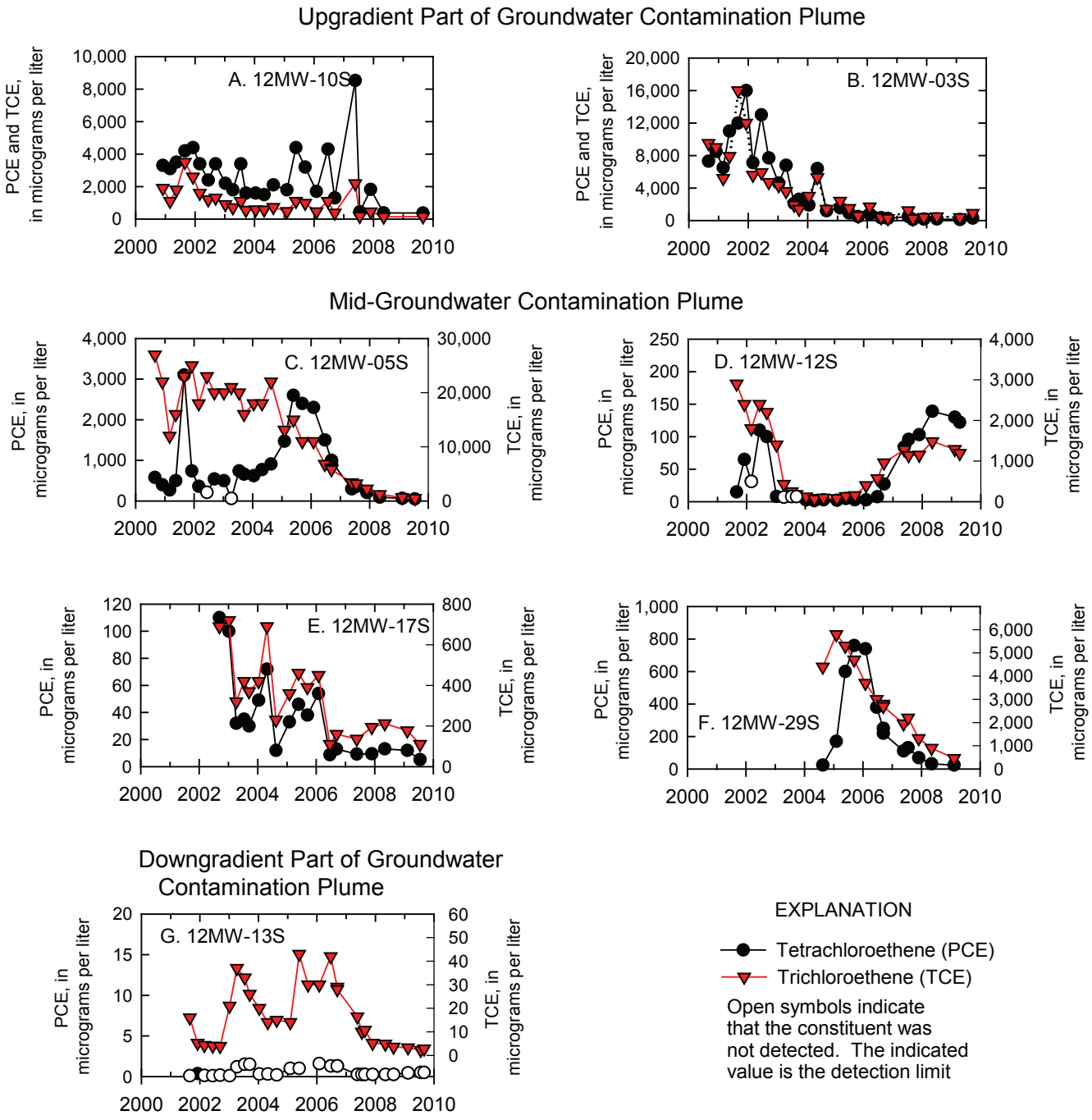


Figure 19. Concentrations of tetrachloroethene (PCE) and trichloroethene (TCE) over time in groundwater at selected wells in the groundwater-contamination plume, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000–2009.

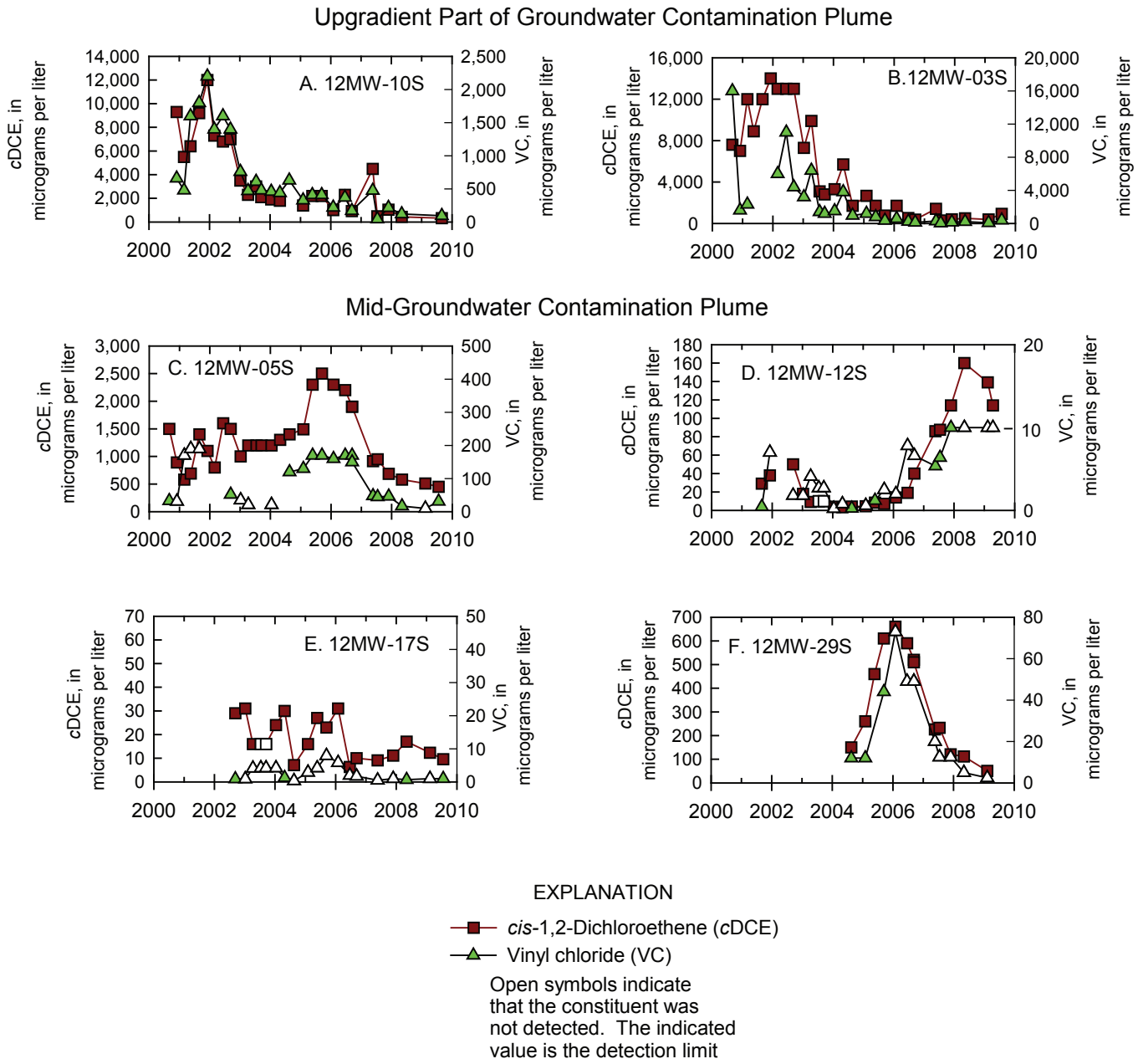


Figure 20. Concentrations of *cis*-1,2-dichloroethene (*c*DCE) and vinyl chloride (VC) over time in groundwater at selected wells in the groundwater-contamination plume, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000–2009.

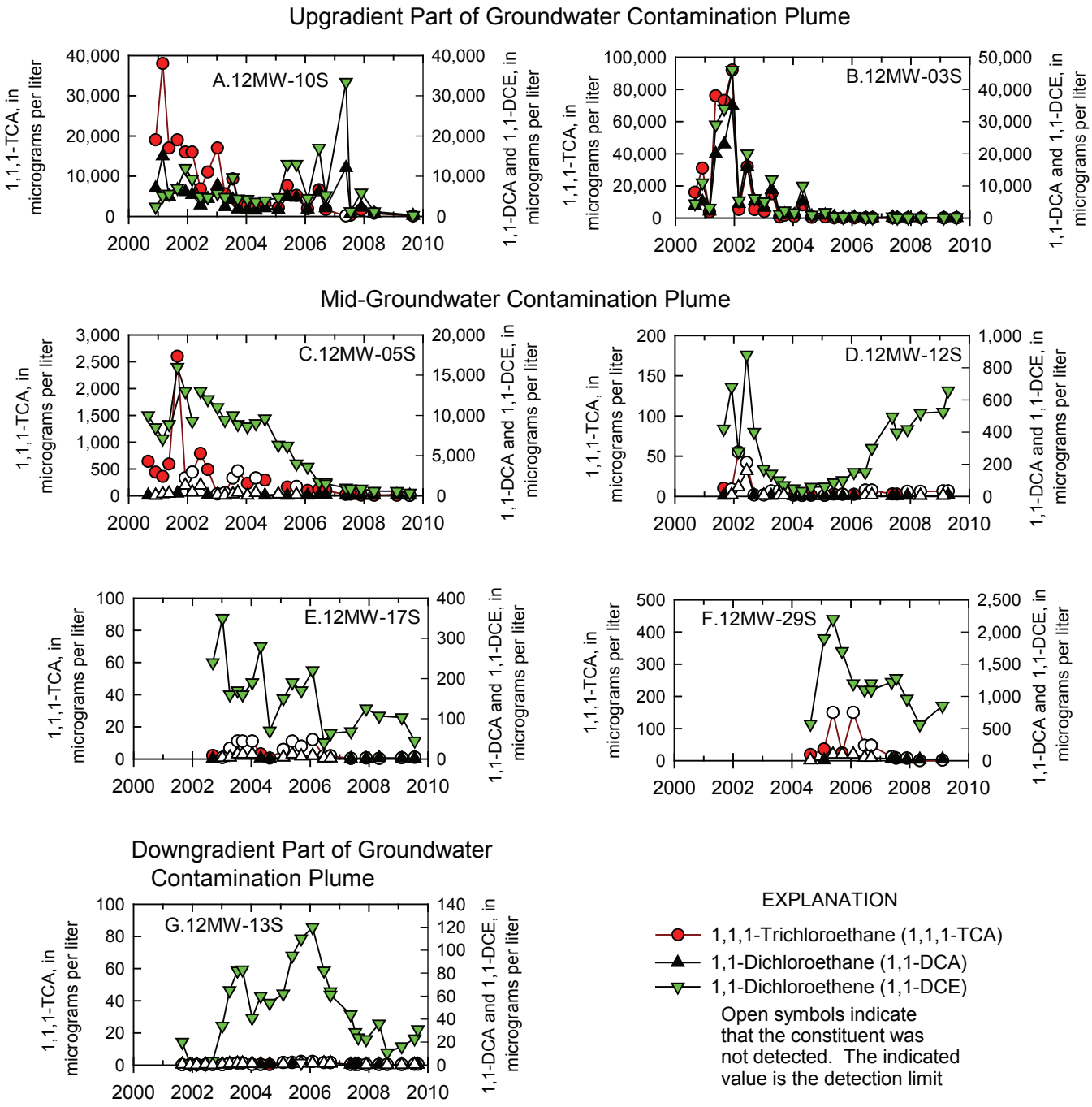


Figure 21. Concentrations of 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), and 1,1-dichloroethene (1,1-DCE) over time in groundwater at selected wells in the groundwater-contamination plume, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000–2009.

even though they were screened at the same depth as nearby wells. Thus, the contaminated sand horizon present at well 12TW-2009-13 was not present in some areas northeast of the well, even though the configuration of the TCE plume implies a northeastward transport direction. It is possible that the sand horizon at well 12TW-2009-13 is stratigraphically deeper toward the northeast and was below the horizon investigated with the temporary wells. Further investigations northeast of well 12TW-2009-13 are needed to resolve this question.

The eventual discharge point of contaminated groundwater to surface water is not known at this time. The presence of TCE and 1,1-DCE at well 12MW-13S (figs. 19G, 21G) and the absence of VOCs at nearby well 12MW-06S indicate that well 12MW-13S intersects a transport pathway of groundwater contamination to a potential discharge point in the eastern marsh. The areal distribution of TCE in wells during 2009, however, indicates a more northeasterly direction of transport (fig. 11). Additional temporary wells and installation of a piezometer north of well 12MW-12S and east of well 12PZ-09 (fig. 5) potentially could clarify the transport direction.

The fate and behavior of the plume in the forest likely will be difficult to monitor based on future well sampling because the present axis of maximum contamination in that area bypasses all but one of the existing monitoring wells (12MW-12S) (figs. 9–11, 13). Moreover, the 2009 data indicate that there are no optimally placed sentinel wells in the probable path of contaminant transport. Thus the monitoring network is no longer adequate to monitor the groundwater contamination downgradient from the PRB.

Summary

The U.S. Geological Survey (USGS) and the Naval Facilities Engineering Command Southeast have investigated natural and engineered remediation of groundwater contamination since 2000 at Solid Waste Management Unit 12 at the Naval Weapons Station Charleston, North Charleston, South Carolina. The primary volatile organic compounds (VOCs) of concern are tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), *cis*-1,2-dichloroethene (*c*DCE), vinyl chloride (VC), 1,1-dichloroethene (1,1-DCE), and 1,1-dichloroethane (1,1-DCA).

The groundwater contamination, consisting of chlorinated aliphatic VOCs, extends eastward at least 400 feet (ft) in the surficial aquifer from former building 88. 1,1,1-TCA and PCE are compounds that probably were original contaminants and are found in relatively high concentrations in groundwater adjacent to the eastern side of former building 88 and the former location of the underground storage tank. TCE probably is both an original contaminant and a transformation product. Many of the less chlorinated compounds, such as *c*DCE and VC, probably are transformation products of parent compounds. At least one compound, however, 1,1-DCE, is an abiotic derivative of 1,1,1-TCA.

The central part of the permeable reactive barrier (PRB), along the main axis of the contaminant plume, appears to be actively removing contamination. Evidence for the removal is that substantial concentration decreases have taken place on the downgradient edge of the PRB at well 12MW-22S along the major axis of the contaminant plume. In contrast to data from the central area of the PRB, the data from the southern end of the PRB indicate that contaminants are moving around the PRB. In addition, 1,1-DCE concentrations have increased substantially since 2004 at well 12MW-23S, upgradient from the PRB near well 12MW-26S.

Near the source area, at well 12MW-10S, concentrations of *c*DCE, VC, 1,1-DCA, and 1,1,1-TCA continued an irregular decline, while PCE and 1,1-DCE had marked fluctuations in concentration from 2005 to 2008. VOC concentrations at well 12MW-03S, the next well downgradient from the source area, were substantially lower in 2008, compared with concentrations in 2000.

Groundwater VOC concentrations also changed in some wells in the forested area in the mid-part of the plume. An increase in VOC concentrations at wells 12MW-05S and 12MW-29S during 2005–2006 may represent movement of a contaminant pulse through the forest. Declining concentrations in those wells from 2006 to 2008 may represent passage of the groundwater contaminant pulse. At well 12MW-12S, 67 ft downgradient from well 12MW-29S, VOC concentrations began rising in late 2006 and continued to rise through 2008, providing further evidence for movement of a contaminant pulse through the forest. The data also may reflect a lateral shift in the axis of the contamination plume, as might occur from the observed change in the piezometric surface. At the downgradient end of the plume, well 12MW-13S had continuous declines in TCE and 1,1-DCE concentrations from 2006 to August 2008.

References

Abdul, A.S., Gibson, T.L., and Rai, D.N., 1990, Laboratory studies of the flow of some organic solvents and their aqueous solutions through bentonite and kaolin clays: Ground Water, v. 28, no. 4, p. 524–533.

Barcelona, M., Wehrmann, H.A., and Varljen, M.D., 1994, Reproducible well-purging procedures and VOC stabilization criteria for ground-water sampling: Ground Water, v. 32, p. 12–22.

CH2M Hill Constructors, Inc., 2002, Solid Waste Management Unit 12, interim corrective measures, Naval Weapons Station Charleston, Charleston, South Carolina: Consultant's report to Naval Facilities Engineering Command, October 2002, 48 p.

CH2M Hill Constructors, Inc., 2003, Performance completion report, interim corrective measures, permeable reactive barrier, Solid Waste Management Unit 12, Naval Weapons Station Charleston, Charleston, South Carolina: Consultant's report to Naval Facilities Engineering Command, April 2003, 39 p.

Crane, C.E., Morgan, L.A., Evans, E., Dacyk, P., and Spies, J., 2004, Performance monitoring of a zero-valent iron permeable reactive barrier installed with biopolymer slurry, remediation of chlorinated and recalcitrant compounds, *in* Proceedings of the 4th International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 24–27, 2004, Monterey, CA: Columbus, OH, Battelle Press.

Environmental Science and Engineering, Inc., 1987, Confirmation study, characterization step, NWS Charleston, South Carolina: Consultant's report, August 1987.

Harmon Engineering and Testing, 1984, Initial assessment study of Naval Weapons Station Charleston, South Carolina: NEESA 12-040, Consultant's report to the U.S. Navy, January 1984.

Henderson, A.D., and Demond, A.H., 2007, Long-term performance of zero-valent iron permeable reactive barriers—A critical review: Environmental Engineering Science, v. 24, no. 4, p. 401–423.

Jambor, J.L., Raudsepp, M., and Mountjoy, K., 2005, Mineralogy of permeable reactive barriers for the attenuation of subsurface contaminants: The Canadian Mineralogist, v. 43, p. 2117–2140.

Johnson, R.L., Thoms, R.B., Johnson, R.O., Nurmi, J.T., and Tratnyek, P.G., 2008, Mineral precipitation upgradient from a zero-valent iron permeable reactive barrier: Ground Water Monitoring & Remediation, v. 28, no. 3, p. 56–64.

Kearney/Centaur, 1988, Interim RCRA facility assessment report, Naval Weapons Station, Charleston, South Carolina: Consultant's report, May 1988.

Liang, L.Y., Sullivan, A.B., West, O.R., Moline, G.R., and Kamolpornwijit, W., 2003, Predicting the precipitation of mineral phases in permeable reactive barriers: Environmental Engineering Science, v. 20, p. 635.

Mallinckrodt Baker, Inc., 2008, Dioxane—Material safety data sheet for Dioxane, accessed January 11, 2010, at *http://www.jtbaker.com/msds/englishhtml/d7552.htm*.

Savoie, J.G., Kent, D.B., Smithe, R.L., LeBlanc, D.R., and Hubble, D.W., 2003, Changes in ground-water quality near two granular-iron permeable reactive barriers in a sand and gravel aquifer, Cape Cod, Massachusetts, 1997–2000: U.S. Geological Survey Water-Resources Investigations Report 03–4309, 84 p.

Sevee, J.E., White, C.A., and Maher, D.J., 2000, An analysis of low-flow groundwater sampling methodology: Groundwater Monitoring and Remediation, v. 20, no. 2, p. 87–93.

Shanklin, D.E., Sidle, W.C., and Ferguson, M.E., 1995, Micropurge low-flow sampling of uranium-contaminated groundwater at the Fernald Environmental Management Project: Groundwater Monitoring and Remediation, v. 15, no. 3, p. 168–176.

Sivavec, T., Krug, T., and Berry-Spark, K., 2001, Performance monitoring of a permeable reactive barrier at the Somersworth, NH Landfill Superfund Site: presented at the 2001 International Containment and Remediation Technology Conference and Exhibition, June 2001, Orlando, FL.

South Carolina State Climatology Office, 2009, South Carolina Climate, data accessed December 15, 2009, at *http://www.dnr.sc.gov/climate/sco/ClimateData/cli_sc_climate.php#precipitation*.

Tetra Tech NUS, Inc., 2000a, RCRA facilities investigation report for SWMU12, former south side pentachlorophenol treatment area, Naval Weapons Station Charleston, Charleston, South Carolina: Consultant's report to Naval Facilities Engineering Command, v. 2, appendix C-5 [variously paged].

Tetra Tech NUS, Inc., 2000b, RCRA facilities investigation report for SWMU12, former south side pentachlorophenol treatment area, Naval Weapons Station Charleston, Charleston, South Carolina: Consultant's report to Naval Facilities Engineering Command, v. 1, 43 p.

Tetra Tech NUS, Inc., 2001, Addendum supplemental field investigation RCRA facilities investigation (RFI) report for SWMU12 former south side pentachlorophenol treatment area, Naval Weapons Station Charleston: Consultant's report to Southern Division Naval Facilities Engineering Command, Charleston, South Carolina, 39 p.

Vroblesky, D.A., Casey, C.C., and Lowery, M.A., 2007a, Influence of dissolved oxygen convection on well sampling: Groundwater Monitoring and Remediation, v. 27, no. 3, p. 49–58.

Vroblesky, D.A., Casey, C.C., Petkewich, M.D., Lowery, M.A., and Conlon, K.J., 2004, Interim progress report through October 2004 on ground-water contamination at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina: U.S. Geological Survey Open-File Report 2004–1429, 33 p.

Vroblesky, D.A., Casey, C.C., Petkewich, M.D., Lowery, M.A., Conlon, K.J., and Harrelson, L.G., 2007b, Investigation of ground-water contamination at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina: U.S. Geological Survey Scientific Investigations Report 2006–5311, 81 p.

Vroblesky, D.A., and Petkewich, M.D., 2009, Investigation of contaminated groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2008: U.S. Geological Survey Scientific Investigations Report 2009–5166, 76 p.

Vroblesky, D.A., Petkewich, M.D., Lowery, M.A., Conlon, K.J., and Harrelson, L.G., 2008, Investigation of contaminated groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, 2006–2007: U.S. Geological Survey Scientific Investigations Report 2008–5097, 70 p.

Wilkin, R.T., and Puls, R.W., 2003, Capstone report on the application, monitoring, and performance of permeable reactive barriers for groundwater remediation. Volume 1–Performance evaluations at two sites: Ada, OK, National Risk Management Research Laboratory, EPA/600/R03/045a.

Appendixes

1. Well-construction data, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina 32
2. Monthly water-level data from wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 1998 to August 2009 33
3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 38
4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 55
5. Concentrations of selected volatile organic compounds detected in groundwater from temporary wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August to October 2009 70
6. Lithologic log and well-construction diagram of well 12PZ-07 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009. 71
7. Lithologic log and well-construction diagram of well 12PZ-08 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 72
8. Lithologic log and well-construction diagram of well 12PZ-09 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 73
9. Lithologic log and well-construction diagram of well 12PZ-10 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 74

Appendix 1. Well-construction data, Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina.

[NAD 83, North American Datum of 1983; in., inches; ft, feet; rel., relative to; NAVD 88, North American Vertical Datum of 1988; bgs, below ground surface; btoc, below top of casing; ---, data not available; Horizontal coordinates for all wells (except those with *) were determined by geodimeter. Vertical datum was determined by differential leveling on 8/3/2004 and tied into a benchmark on 9/15/2004. Arbitrary horizontal coordinates output by geodimeter were transformed to South Carolina State Plane Coordinate System by using wells 12MW-04D, 12MW-09S, 12MW-08S, and 12MW-07S as control. State Plane coordinates for these four wells and for wells marked by * are from Appendix 1 of Vroblesky and others, 2004]

Well name	Installation date	State Plane Northing coordinate (NAD 83, feet)	State Plane Easting coordinate (NAD 83, feet)	Well diameter (in.)	Top of riser elevaton (ft rel. NAVD 88)	Ground elevation (ft rel. NAVD 88)	Stand-pipe height (ft)	Screen length (ft)	Depth of screen top (ft bgs)	Depth of screen bottom (ft bgs)	Depth of screen top (ft btoc)	Depth of screen bottom (ft btoc)	Elevation of screen top (ft rel. NAVD 88)	Elevation of screen bottom (ft rel. NAVD 88)
12MW-01D	2/25/1998	405035.719	2324888.00	2	10.74	8.26	2.48	10.00	29.00	39.00	31.48	41.48	-20.74	-30.74
12MW-01S	2/25/1998	405033.531	2324882.50	2	10.73	8.46	2.27	10.00	4.00	14.00	6.27	16.27	4.46	-5.54
12MW-02D	2/26/1998	405183.281	2325292.25	2	8.93	7.02	1.91	10.00	21.00	31.00	22.91	32.91	-13.98	-23.98
12MW-02S	2/26/1998	405178.156	2325293.00	2	9.01	7.02	1.99	10.00	4.00	14.00	5.99	15.99	3.02	-6.98
12MW-03D	2/25/1998	405113.344	2325320.75	2	9.07	6.67	2.40	10.00	20.00	30.00	22.40	32.40	-13.33	-23.33
12MW-03S	2/25/1998	405109.594	2325317.00	2	9.05	6.72	2.33	10.00	4.00	14.00	6.33	16.33	2.72	-7.28
12MW-04D	2/26/1998	405091.906	2325183.25	2	7.41	7.71	-0.30	10.00	22.00	32.00	21.70	31.70	-14.29	-24.29
12MW-04S*	2/27/1998	405097.125	2325181.25	2	7.44	7.75	-0.31	10.00	4.00	14.00	3.69	13.69	3.75	-6.25
12MW-05D	8/7/1999	405119.781	2325434.25	2	8.00	5.89	2.11	10.00	38.50	48.50	40.61	50.61	-32.61	-42.61
12MW-05I	8/27/1999	405122.906	2325429.75	2	8.10	5.81	2.29	10.00	19.00	29.00	21.29	31.29	-13.19	-23.19
12MW-05S	8/6/1999	405116.594	2325438.00	2	8.00	5.92	2.08	10.00	4.00	14.00	6.08	16.08	1.92	-8.08
12MW-06D	8/4/1999	405143.969	2325670.00	2	4.92	3.05	1.87	10.00	32.00	42.00	33.87	43.87	-28.95	-38.95
12MW-06S	8/4/1999	405147.406	2325674.00	2	5.38	3.17	2.21	10.00	4.00	14.00	6.21	16.21	-0.83	-10.83
12MW-07D	8/6/1999	404949.625	2325517.75	2	5.37	3.44	1.93	10.00	35.00	45.00	36.93	46.93	-31.56	-41.56
12MW-07S	8/5/1999	404946.938	2325523.25	2	5.43	3.45	1.98	10.00	4.00	14.00	5.98	15.98	-0.55	-10.55
12MW-08D	8/3/1999	405471.406	2325630.50	2	7.41	5.28	2.13	10.00	29.00	39.00	31.13	41.13	-23.72	-33.72
12MW-08S	8/3/1999	405475.406	2325633.25	2	7.16	5.25	1.91	10.00	4.00	14.00	5.91	15.91	1.25	-8.75
12MW-09D	8/5/1999	405320.875	2325275.75	2	10.29	8.23	2.06	10.00	26.00	36.00	28.06	38.06	-17.77	-27.77
12MW-09S	8/5/1999	405322.406	2325270.00	2	10.52	8.37	2.15	10.00	4.00	14.00	6.15	16.15	4.37	-5.63
12MW-10S	6/22/2000	405094.469	2325274.00	2	9.58	7.24	2.34	11.00	4.50	15.50	6.84	17.84	2.74	-8.26
12MW-11D	6/23/2000	405146.969	2325576.50	2	7.99	5.10	2.89	11.00	22.00	33.00	24.89	35.89	-16.90	-27.90
12MW-11S	6/24/2000	405150.438	2325573.25	2	7.83	5.14	2.69	10.00	4.00	14.00	6.69	16.69	1.14	-8.86
12MW-12D	8/22/2001	405133.906	2325574.75	2	8.27	5.16	3.11	10.00	20.00	30.00	23.11	33.11	-14.84	-24.84
12MW-12S	8/23/2001	405133.500	2325571.00	2	8.52	5.16	3.36	5.00	8.00	13	11.36	16.36	-2.84	-7.84
12MW-13S	8/23/2001	405124.125	2325665.00	2	6.35	2.97	3.38	5.00	8.00	13.00	11.38	16.38	-5.03	-10.03
12MW-14S*	8/20/2001	405022.030	2325936.00	0.5	7.36	4.00	3.36	10.00	5.00	15.00	8.36	18.36	-1.00	-11.00
12MW-15S*	8/20/2001	404999.770	2325854.88	0.5	7.62	4.40	3.22	10.00	5.00	15.00	8.22	18.22	-0.60	-10.60
12MW-16S*	8/23/2001	404968.200	2325930.33	0.5	8.23	4.69	3.39	10.00	5.00	15.00	8.54	18.54	-0.31	-10.31
12MW-17S	4/18/2002	405117.938	2325576.50	2	7.41	4.97	2.38	2.50	9	11.5	11.44	13.94	-4.03	-6.53
12MW-18S	1/23/2003	405192.000	2325350.25	2	10.59	8.33	2.26	5.00	10	15	12.26	17.26	-1.67	-6.67
12MW-19D	1/16/2003	405176.531	2325355.50	1	10.86	8.49	2.37	10.00	25	35	27.37	37.37	-16.51	-26.51
12MW-19S	1/16/2003	405172.156	2325357.00	1	10.81	8.54	2.27	5.00	10	15	12.27	17.27	-1.46	-6.46
12MW-20D	1/24/2003	405178.656	2325362.50	2	10.54	8.30	2.24	10.00	23	33	25.24	35.24	-14.70	-24.70
12MW-20S	1/23/2003	405175.531	2325364.75	2	10.50	8.24	2.26	5.00	10	15	12.26	17.26	-1.76	-6.76
12MW-21D	1/16/2003	405110.750	2325375.75	1	9.90	7.85	2.05	10.00	24	34	26.05	36.05	-16.15	-26.15
12MW-21S	1/16/2003	405115.813	2325374.50	1	9.74	7.63	2.11	5.00	10	15	12.11	17.11	-2.37	-7.37
12MW-22D	1/27/2003	405110.844	2325381.00	2	10.13	7.88	2.25	10.00	24	34	26.25	36.25	-16.12	-26.12
12MW-22S	1/28/2003	405119.688	2325378.50	2	9.88	7.58	2.30	5.00	10	15	12.30	17.30	-2.42	-7.42
12MW-23D	1/22/2003	405078.469	2325379.25	2	9.62	7.37	2.25	10.00	26	36	28.25	38.25	-18.63	-28.63
12MW-23S	1/21/2003	405082.875	2325378.50	2	9.67	7.43	2.24	5.00	13	18	15.24	20.24	-5.57	-10.57
12MW-24D	1/15/2003	405079.969	2325386.25	1	9.73	7.45	2.28	10.00	25	35	27.28	37.28	-17.55	-27.55
12MW-24S	1/15/2003	405084.031	2325385.75	1	9.65	7.38	2.27	5.00	13	18	15.27	20.27	-5.62	-10.62
12MW-25D	1/21/2003	405081.594	2325393.75	2	9.17	6.96	2.21	10.00	26	36	28.21	38.21	-19.04	-29.04
12MW-25S	1/21/2003	405085.531	2325393.25	2	9.17	6.96	2.21	5.00	13	18	15.21	20.21	-6.04	-11.04
12MW-26S	1/21/2003	405059.594	2325392.50	2	9.11	6.90	2.21	5.00	13	18	15.21	20.21	-6.10	-11.10
12MW-27D	1/22/2003	405174.281	2325346.75	2	10.94	8.70	2.24	10.00	23	33	25.24	35.24	-14.30	-24.30
12MW-27S	1/23/2003	405169.531	2325348.25	2	11.01	8.80	2.21	5.00	10	15	12.21	17.21	-1.20	-6.20
12MW-28D	1/27/2003	405106.906	2325368.25	2	9.64	7.39	2.25	10.00	23	33	25.25	35.25	-15.61	-25.61
12MW-28S	1/28/2003	405111.875	2325366.25	2	9.60	7.32	2.28	5.00	10	15	12.28	17.28	-2.68	-7.68
12MW-29S	7/19/2004	405114.750	2325506.25	2	7.38	5.28	2.10	2.25	9.75	12	11.85	14.10	-4.47	-6.72
12MW-30S	7/22/2004	405115.438	2325515.50	2	8.64	5.22	3.42	2.25	9.75	12	13.17	15.42	-4.53	-6.78
12PZ-01*	8/15/2002	405261.850	2325470.42	2	8.81	6.16	2.65	10.00	4.5	14.5	7.15	17.15	1.66	-8.34
12PZ-03D	3/10/2004	405130.594	2325712.75	1	4.72	---	---	2.5	---	---	11.8	14.3	-7.08	-9.58
12PZ-03S	3/8/2004	405130.438	2325709.75	1	5.45	---	---	2.5	---	---	7.5	10	-2.05	-4.55
12PZ-04	2/20/2004	405184.625	2325737.50	1	5.55	---	---	2.5	---	---	15	17.5	-9.45	-11.95
12PZ-05	2/19/2004	405118.969	2325753.50	1	4.34	---	---	2.5	---	---	12.23	14.73	-7.89	-10.39
12PZ-06	2/20/2004	405060.969	2325734.50	1	4.87	---	---	2.5	---	---	14.9	17.4	-10.03	-12.53
12PZ-07	8/20/2009	405249.25	2325402.00	2	8.94	---	---	5	11	16				
12PZ-08	8/20/2009	405034.031	2325520.25	2	7.02	---	---	5	10	15				
12PZ-09	8/20/2009	405243.344	2325569.50	2	7.03	---	---	5	13	18				
12PZ-10	8/20/2009	405356.719	2325548.00	2	7.15	---	---	5	10	15				

Appendix 2. Monthly water-level data from wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 1998 to August 2009.

[---, Not measured; all measurements are in feet relative to the North American Vertical Datum of 1988; *, measurement made by Tetra Tech NUS, Inc.]

Date	12MW-01D	12MW-01S	12MW-02D	12MW-02S	12MW-03D	12MW-03S	12MW-04D	12MW-04S	12MW-05D	12MW-05I	12MW-05S	12MW-06D	12MW-06S
4/18/1998*	4.33	4.33	4.26	4.26	4.25	4.25	4.39	4.33	---	---	---	---	---
5/18/1998*	3.75	3.73	3.60	3.61	3.60	3.59	3.75	3.65	---	---	---	---	---
6/25/1998*	2.32	2.31	2.16	2.16	2.15	2.14	2.20	2.21	---	---	---	---	---
8/11/1999*	2.41	2.38	2.29	2.29	2.29	2.28	2.36	2.38	2.52	---	2.22	2.41	1.63
10/28/1999*	4.19	4.19	4.16	4.11	4.12	4.13	4.22	4.20	3.95	---	4.06	3.69	3.56
8/3/2000	3.99	4.02	3.98	---	4.01	---	4.00	4.04	3.75	---	3.92	3.40	3.42
9/7/2000	---	---	---	---	---	---	---	---	---	---	5.31	3.92	3.99
10/12/2000	3.23	3.21	3.07	3.06	3.07	3.05	3.12	3.13	3.20	3.03	2.98	3.04	2.56
11/13/2000	2.28	2.27	2.08	2.07	2.07	2.05	2.14	2.14	2.30	2.03	1.98	2.22	1.54
1/12/2001	3.30	3.30	3.14	3.14	3.12	3.15	3.17	3.24	3.00	3.08	3.03	2.76	2.78
2/8/2001	3.15	3.15	2.99	3.00	2.99	2.99	3.07	3.10	2.86	2.94	2.89	2.71	2.64
3/14/2001	4.17	4.19	4.05	4.05	4.04	4.04	4.12	4.21	3.60	3.96	3.95	3.24	3.33
4/13/2001	3.61	3.59	3.43	3.43	3.43	3.43	3.60	3.51	3.45	3.39	3.35	3.18	2.92
5/14/2001	2.28	2.26	2.03	2.01	2.04	2.01	2.13	2.16	2.29	2.00	1.95	2.14	1.26
6/19/2001	2.50	2.48	2.43	2.44	2.43	2.44	2.41	2.43	2.19	2.55	2.25	2.30	1.70
7/19/2001	2.80	2.80	2.72	2.70	2.71	2.78	2.76	2.77	2.87	2.70	2.63	2.73	2.38
8/30/2001	2.25	2.24	2.15	2.14	2.14	2.13	2.21	2.22	2.43	2.11	2.06	2.39	1.57
9/27/2001	2.29	2.30	2.23	2.23	2.21	2.22	2.25	2.27	2.46	2.19	2.16	2.42	2.23
10/30/2001	1.29	1.27	1.21	1.20	1.20	1.20	1.28	1.25	1.69	1.20	1.17	1.76	1.30
11/27/2001	1.10	1.09	1.04	1.03	1.03	1.02	1.05	1.07	1.46	1.02	1.00	1.57	1.21
12/26/2001	1.38	1.36	1.32	1.31	1.30	1.30	1.33	1.34	1.67	1.30	1.27	1.69	1.48
1/22/2002	1.93	1.90	1.81	1.80	1.80	1.80	1.80	1.89	1.97	1.79	1.73	1.88	1.93
2/26/2002	2.26	2.25	2.08	2.07	2.09	2.07	2.22	2.21	2.19	2.04	1.99	2.08	2.08
5/3/2002	1.78	1.77	1.61	1.63	1.61	1.61	1.69	1.67	1.94	1.58	1.51	1.92	1.36
6/6/2002	0.96	0.95	0.83	0.83	0.83	0.83	0.85	0.86	1.32	0.81	0.76	1.41	0.61
7/12/2002	2.15	2.15	2.01	2.03	2.03	2.00	2.08	2.08	1.85	2.28	1.88	2.15	1.83
8/8/2002	1.53	1.51	1.41	1.40	1.41	1.42	1.45	1.29	1.81	1.39	1.32	1.85	1.12
8/26/2002	1.41	1.40	1.27	1.26	1.27	1.28	1.33	1.34	1.54	1.24	1.21	1.68	1.53
8/28/2002	1.86	1.88	1.78	1.69	1.75	1.77	1.84	1.89	1.90	1.71	1.68	1.92	2.05
9/9/2002	2.94	2.93	2.99	2.99	2.97	2.99	3.03	3.06	3.02	2.95	2.87	2.87	2.76
10/3/2002	4.23	4.24	4.22	4.23	4.28	4.20	4.27	4.31	3.95	4.15	4.16	3.54	3.59
11/21/2002	5.19	5.17	5.29	5.36	5.32	5.43	---	---	4.71	5.14	5.06	4.11	4.08
12/18/2002	4.72	4.72	4.68	4.69	4.68	4.70	4.77	4.74	4.25	4.56	4.50	3.81	3.72
2/3/2003	4.07	4.03	3.94	3.95	3.92	3.94	3.97	3.93	3.79	3.84	3.78	3.44	3.27
2/13/2003	4.00	3.98	3.92	3.94	3.95	3.96	3.92	3.95	3.72	3.85	3.79	3.36	3.27
2/20/2003	4.11	4.10	4.04	4.05	4.05	4.06	4.08	4.11	3.79	3.96	3.89	3.42	3.34
2/26/2003	4.10	3.99	4.10	4.10	4.19	4.08	4.12	4.15	3.83	4.01	3.94	3.48	3.39
3/25/2003	5.08	5.08	5.04	5.03	5.02	5.04	5.07	5.11	4.58	4.90	4.83	4.07	3.91
4/23/2003	3.96	3.94	3.86	3.84	3.87	3.87	3.87	3.89	3.84	3.77	3.67	3.52	3.17
5/27/2003	4.61	4.61	4.61	4.61	4.60	4.64	4.61	4.68	4.14	4.49	4.44	3.69	3.67
6/30/2003	3.56	3.55	3.45	3.45	3.45	3.47	3.54	3.50	3.49	3.38	3.28	3.26	2.81
8/4/2003	4.66	4.71	4.61	4.64	4.56	4.60	4.52	4.62	4.17	4.43	4.39	3.80	3.80
8/29/2003	3.06	3.05	2.84	2.89	2.92	2.91	2.95	2.95	3.06	2.82	2.74	2.91	2.22
9/30/2003	2.76	2.73	2.63	2.63	2.65	2.65	2.70	2.69	2.90	2.58	2.50	2.86	2.45
11/3/2003	2.86	2.86	2.76	2.76	2.78	2.80	2.82	2.85	2.84	2.68	2.61	2.71	2.53
12/8/2003	2.77	2.77	2.63	2.65	2.64	2.64	2.62	2.76	2.69	2.54	2.49	2.55	2.41
1/15/2004	2.79	2.78	2.66	2.66	2.67	2.69	2.73	2.77	2.70	2.58	2.50	2.56	2.39
2/13/2004	3.80	3.83	3.65	3.65	3.65	3.68	3.48	3.96	3.22	3.47	3.41	2.94	3.03
3/15/2004	3.37	3.37	3.29	3.28	3.30	3.31	3.34	3.57	3.23	3.20	3.13	2.99	2.76
4/21/2004	2.87	2.86	2.77	2.77	2.78	2.80	2.84	3.04	2.82	2.70	2.63	2.62	2.33
5/20/2004	2.47	2.45	2.38	2.39	2.38	2.39	2.43	2.45	2.58	2.32	2.25	2.46	1.76
6/21/2004	2.06	2.05	1.98	1.99	2.01	2.03	2.02	2.06	2.16	1.94	1.87	2.04	1.53
7/26/2004	2.69	2.66	2.67	---	2.69	2.73	2.70	2.75	2.57	2.75	2.53	2.59	2.47
9/15/2004	4.22	4.21	4.10	4.13	4.13	4.16	4.27	4.24	3.83	4.04	4.00	3.51	3.56
10/21/2004	3.16	3.13	2.91	---	2.94	2.96	3.01	3.04	2.94	2.85	2.77	2.78	2.61
11/29/2004	2.41	2.37	2.09	---	2.12	2.11	2.21	2.19	2.15	1.98	1.93	2.07	1.72
12/27/2004	2.64	2.63	2.28	---	2.28	2.32	2.33	2.40	2.14	2.10	2.04	2.01	2.01
1/25/2005	2.77	2.76	2.53	2.52	2.55	2.57	2.67	2.66	2.44	2.43	2.37	2.27	2.28
2/17/2005	2.98	2.97	2.76	2.74	2.79	2.8	2.87	2.91	2.63	2.67	2.6	2.45	2.53
3/24/2005	4.06	4.07	3.84	3.82	3.84	3.88	3.92	4.18	3.29	3.71	3.67	2.92	3.16
4/25/2005	3.00	2.98	2.75	2.73	2.77	2.78	2.83	2.99	2.79	2.70	2.58	2.64	2.25
5/31/2005	2.29	2.28	2.00	2.00	2.05	2.07	2.08	2.14	2.02	1.89	1.79	1.98	1.71
6/17/2005	2.19	2.16	1.94	1.92	1.98	2.00	2.07	2.06	2.14	1.90	1.79	2.12	1.55
7/21/2005	3.09	3.08	2.86	2.85	2.89	2.91	2.96	3.20	2.73	2.96	2.70	2.73	2.61
8/16/2005	4.24	4.23	4.11	4.14	4.19	4.11	4.21	4.41	3.81	4.06	4.01	3.47	3.65
9/29/2005	2.42	2.38	2.12	2.11	2.16	2.15	2.21	2.40	2.33	2.05	2.00	2.29	1.53
10/17/2005	3.38	3.35	3.16	3.14	3.19	3.19	3.31	3.38	3.20	3.10	3.01	3.02	2.93
12/1/2005	3.17	3.15	2.94	2.93	2.96	2.99	3.04	3.34	2.84	2.86	2.79	2.70	2.74
12/19/2005	4.35	4.37	4.13	4.14	4.14	4.18	4.18	4.48	3.50	4.02	3.95	3.17	3.35
1/26/2006	3.83	3.82	3.66	3.65	3.70	3.73	3.74	4.04	3.40	3.61	3.55	3.11	3.27
3/2/2006	4.29	4.29	4.20	4.20	4.22	4.25	4.26	4.39	3.79	4.12	4.05	3.42	3.57
3/30/2006	2.97	2.94	2.68	2.67	2.69	2.71	2.75	3.08	2.71	2.62	2.51	2.58	2.48
5/1/2006	2.14	2.11	1.87	1.85	1.90	1.90	1.97	1.99	2.06	1.81	1.70	2.01	1.49
5/31/2006	1.66	1.64	1.38	1.39	1.45	1.45	1.51	1.53	1.68	1.35	1.27	1.64	0.89
6/29/2006	2.43	2.41	2.16	2.18	2.19	2.26	2.27	2.27	2.18	2.11	2.02	2.12	2.13
10/2/2006	2.32	2.29	2.08	2.09	2.12	2.14	2.20	2.21	2.31	2.07	1.99	1.43	2.78
5/21/2007	0.69	0.64	0.47	0.46	0.52	0.52	0.53	0.77	0.95	0.44	0.37	1.02	-0.13
7/17/2007	0.84	0.85	---	0.69	0.71	0.72	0.74	0.76	1.05	0.65	0.59	1.13	0.22
11/26/2007	1.94	1.91	1.63	1.64	1.69	1.69	1.75	1.76	1.85	1.61	1.54	1.85	1.37
5/5/2008	1.91	1.87	1.63	1.60	1.70	1.68	1.71	2.05	1.91	1.63	1.49	2.66	1.34
8/28/2008	1.75	1.74	1.55	1.56	1.59	1.62	1.62	1.61	1.76	1.52	1.43	2.74	1.37
2/10/2009	2.52	2.52	2.23	2.21	2.24	2.26	2.30	2.32	2.20	2.13	2.00	2.06	1.97
2/11/2009	---	---	---	---	---	---	---	---	---	---	---	---	---
8/3/2009	3.05	3.04	2.61	2.63	2.66	2.70	2.73	2.74	2.55	2.51	2.47	2.46	2.33
8/28/2009	2.45	2.43	2.00	2.04	2.08	2.10	2.14	2.18	2.20	2.00	1.89	2.00	1.66

Appendix 2. Monthly water-level data from wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 1998 to August 2009 (continued).

[---. Not measured; all measurements are in feet relative to the North American Vertical Datum of 1988; *, measurement made by Tetra Tech NUS, Inc.]

Date	12MW-07D	12MW-07S	12MW-08D	12MW-08S	12MW-09D	12MW-09S	12MW-10S	12MW-11D	12MW-11S	12MW-12D	12MW-12S	12MW-13S	12MW-14S
4/18/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
5/18/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
6/25/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
8/11/1999*	2.66	2.13	2.43	2.58	2.30	2.26	---	---	---	---	---	---	---
10/28/1999*	3.84	4.07	3.70	3.74	4.04	4.09	---	---	---	---	---	---	---
8/3/2000	3.56	3.88	---	---	3.86	3.92	---	---	---	---	---	---	---
9/7/2000	---	5.09	---	---	---	5.44	---	---	---	---	---	---	---
10/12/2000	3.23	2.94	3.06	2.84	3.07	3.02	3.13	3.05	2.74	---	---	---	---
11/13/2000	2.37	1.90	2.28	2.11	2.12	2.02	2.10	2.10	1.76	---	---	---	---
1/12/2001	2.89	2.93	2.83	3.59	3.03	3.12	3.40	2.98	2.78	---	---	---	---
2/8/2001	2.86	2.83	2.77	3.40	2.91	2.94	3.16	---	---	---	---	---	---
3/14/2001	3.37	3.81	3.31	3.96	3.79	4.07	4.08	3.74	3.70	---	---	---	---
4/13/2001	3.36	3.29	3.28	3.37	3.39	3.47	3.52	3.36	3.09	---	---	---	---
5/14/2001	2.36	1.86	2.17	2.15	2.04	1.98	2.12	2.12	1.69	---	---	---	---
6/19/2001	2.54	2.18	2.30	2.41	2.30	2.29	2.52	2.30	1.99	---	---	---	---
7/19/2001	2.95	2.63	2.72	3.09	2.70	2.64	2.79	2.74	2.41	---	---	---	---
8/30/2001	2.61	2.03	2.42	2.43	2.19	2.10	2.22	2.21	1.83	---	---	1.89	---
9/27/2001	2.71	2.20	2.36	2.81	2.33	2.21	2.30	2.35	1.99	2.47	2.00	2.11	---
10/30/2001	1.95	1.17	1.75	1.57	1.36	1.20	1.27	1.41	1.02	1.35	1.01	1.10	---
11/27/2001	1.72	1.01	1.56	1.60	1.18	1.05	1.08	1.21	0.85	1.19	0.86	0.95	1.75
12/26/2001	1.87	1.29	1.68	1.48	1.41	1.33	1.36	1.44	1.11	1.46	1.11	1.20	2.00
1/22/2002	2.07	1.71	1.88	2.21	1.81	1.78	1.91	1.82	1.53	1.81	1.56	1.61	2.07
2/26/2002	2.20	1.95	2.06	2.51	2.04	2.05	2.17	2.04	1.78	2.06	1.78	1.85	2.23
5/3/2002	2.13	1.51	1.91	1.82	1.65	1.54	1.68	1.68	1.27	1.70	1.29	1.36	---
6/6/2002	1.63	0.74	1.38	1.00	0.98	0.81	0.92	1.02	0.58	1.01	0.58	0.65	---
7/12/2002	2.35	1.85	2.16	2.96	2.00	1.97	2.13	2.01	1.70	2.01	1.69	1.74	2.22
8/8/2002	2.07	1.33	1.84	2.08	1.50	1.34	1.49	1.55	1.14	1.55	1.13	1.20	1.98
8/26/2002	1.85	1.19	1.62	2.40	1.34	1.29	1.38	1.37	1.07	1.32	1.04	1.10	1.89
8/28/2002	2.09	1.60	1.87	2.99	1.79	1.82	1.85	1.81	1.55	1.79	1.49	1.56	2.11
9/9/2002	3.06	2.88	2.90	---	2.95	2.95	3.04	2.93	2.73	2.95	2.75	2.77	2.97
10/3/2002	3.78	4.10	3.66	3.88	4.11	4.21	4.27	4.06	4.00	4.06	4.01	3.94	3.38
11/21/2002	4.31	5.02	4.26	4.16	4.88	5.14	5.33	4.84	4.83	4.85	4.88	5.72	3.91
12/18/2002	3.97	4.45	3.94	4.07	4.42	4.64	4.76	4.36	4.32	4.37	4.38	4.22	3.65
2/3/2003	3.57	3.75	3.54	3.85	3.83	3.93	4.01	3.77	3.66	3.79	3.69	3.61	3.27
2/13/2003	3.51	3.77	3.46	3.75	3.80	3.89	4.02	3.74	3.68	3.70	3.70	3.61	---
2/20/2003	3.55	3.86	3.51	3.71	3.88	4.00	4.17	3.83	3.79	3.71	3.83	3.68	2.62
2/26/2003	3.57	3.94	3.58	3.77	3.93	4.32	4.17	3.88	3.81	3.88	3.84	3.46	3.30
3/25/2003	4.23	4.80	4.15	4.07	4.74	4.99	5.10	4.70	4.64	4.68	4.69	4.52	3.85
4/23/2003	3.71	3.67	3.61	3.39	3.75	3.80	3.89	3.73	3.50	3.72	3.55	3.46	3.41
5/27/2003	3.86	4.38	3.76	4.09	4.32	4.59	3.66	4.77	4.29	4.27	4.35	4.18	3.55
6/30/2003	3.44	3.26	3.34	3.37	3.38	3.39	3.51	3.37	3.10	3.37	3.12	3.09	2.45
8/4/2003	3.98	4.30	3.92	4.25	4.34	4.62	4.67	4.27	4.28	4.25	4.29	4.15	3.60
8/29/2003	3.10	2.76	2.97	2.85	2.89	2.85	2.95	2.87	2.57	2.88	2.60	2.58	2.88
9/30/2003	3.07	2.54	2.83	2.60	2.65	2.56	2.68	2.68	2.35	2.67	2.37	2.41	2.96
11/3/2003	2.92	2.61	2.69	3.27	2.71	2.72	2.84	2.70	2.45	2.71	2.46	2.49	1.63
12/8/2003	2.69	2.46	2.53	3.29	2.60	2.61	2.72	2.57	2.32	2.57	2.32	2.33	2.67
1/15/2004	2.71	2.50	2.56	3.33	2.62	2.63	2.73	2.60	2.33	2.60	2.36	2.36	2.61
2/13/2004	3.05	3.36	2.98	4.01	3.37	3.58	3.81	3.31	3.23	3.30	3.25	3.19	2.85
3/15/2004	3.14	3.13	3.09	3.76	3.21	3.25	3.36	3.17	2.98	3.17	2.99	3.07	2.86
4/21/2004	2.78	2.63	2.68	3.48	2.68	2.74	2.87	2.70	2.44	2.70	2.45	---	2.58
5/20/2004	2.60	2.24	2.54	3.18	2.41	2.37	2.42	2.39	2.03	2.39	2.06	2.08	2.39
6/21/2004	2.22	1.87	2.07	2.62	2.02	1.99	2.06	2.00	1.73	1.99	1.71	1.73	1.94
7/26/2004	2.71	2.53	2.67	3.81	2.65	2.67	2.78	2.62	2.41	2.62	2.39	2.42	2.59
9/15/2004	3.73	4.01	3.43	3.38	3.83	4.05	4.18	3.88	3.86	3.93	3.89	3.81	3.43
10/21/2004	3.07	2.84	2.60	1.91	2.70	2.79	3.03	2.80	2.65	2.80	2.67	2.67	2.88
11/29/2004	2.33	1.94	1.86	1.33	1.91	1.98	2.20	1.99	1.79	1.97	1.78	1.79	2.19
12/27/2004	2.26	2.05	1.74	1.98	2.01	2.17	2.48	2.04	1.91	2.04	1.91	1.90	2.17
1/25/2005	2.54	2.40	1.97	1.46	2.26	2.42	2.65	2.34	2.22	2.33	2.21	2.21	2.41
2/17/2005	2.71	2.66	2.2	1.86	2.49	2.63	2.91	2.57	2.44	2.55	2.47	2.48	2.57
3/24/2005	3.17	3.64	2.71	3.51	3.39	3.74	4.00	3.42	3.57	3.43	3.56	3.45	2.91
4/25/2005	2.91	2.67	2.43	1.34	2.56	2.62	2.82	2.64	2.47	2.64	2.47	2.46	2.69
5/31/2005	2.27	1.82	1.70	1.25	1.78	1.88	2.18	1.85	1.65	1.84	1.62	1.64	2.08
6/17/2005	2.45	1.88	1.79	0.51	1.76	1.80	2.05	1.91	1.66	1.89	1.66	1.71	2.32
7/21/2005	3.04	2.84	2.49	1.56	2.63	2.71	2.96	2.75	2.62	2.74	2.62	2.63	2.87
8/16/2005	3.74	4.07	3.46	3.06	3.78	4.02	4.20	3.88	3.94	3.87	3.93	3.87	3.45
9/29/2005	2.59	2.02	2.02	0.41	1.99	2.02	2.19	2.09	1.85	2.09	1.83	1.85	2.43
10/17/2005	3.32	3.10	2.82	2.03	2.96	3.02	3.23	3.07	2.92	3.06	2.91	2.92	3.11
12/1/2005	2.96	2.85	2.42	2.10	2.66	2.80	3.08	2.77	2.70	2.76	2.67	2.70	2.83
12/19/2005	3.38	3.88	2.99	3.69	3.64	4.00	4.31	3.68	3.84	3.67	3.84	3.70	3.05
1/26/2006	3.34	3.59	2.95	3.17	3.36	3.56	3.86	3.44	3.52	3.43	3.52	3.46	3.13
3/2/2006	3.61	4.07	3.31	3.43	3.87	4.11	4.38	3.90	3.97	3.89	3.98	3.88	3.34
3/30/2006	2.83	2.58	2.36	1.28	2.49	2.55	2.81	2.57	2.43	2.56	2.43	2.44	2.66
5/1/2006	2.29	1.76	1.75	0.36	1.74	1.74	1.95	1.81	1.58	1.81	1.54	1.60	2.14
5/31/2006	1.97	1.29	1.39	-0.26	1.31	1.30	1.50	1.41	1.14	1.40	1.11	1.11	1.81
6/29/2006	2.44	2.08	1.79	1.03	1.93	2.06	2.34	2.04	1.9	2.04	1.85	1.91	2.27
10/2/2006	2.65	2.11	2.01	0.58	1.97	1.97	2.17	2.11	1.93	2.11	1.92	1.98	2.55
5/21/2007	1.34	0.43	0.79	-1.16	0.51	0.38	0.55	0.61	0.29	0.60	0.21	0.22	1.11
7/17/2007	1.46	0.67	0.84	-0.88	0.67	0.63	0.91	0.80	0.57	0.77	0.47	0.51	1.39
11/26/2007	2.15	1.58	1.61	-0.10	1.54	1.85	1.92	1.63	1.46	1.64	1.43	1.45	2.08
5/5/2008	2.23	1.63	1.60	-0.21	1.52	1.47	2.28	1.66	1.39	1.66	1.32	1.42	2.11
8/28/2008	2.17	1.55	1.43	-0.15	1.42	1.45	2.61	1.56	1.40	1.55	1.28	1.37	2.10
2/10/2009	2.36	1.91	1.76	0.48	1.96	2.09	3.32	2.03	1.94	2.05	1.87	1.92	1.74
2/11/2009	---	---	---	---	---	---	---	---	---	---	---	---	---
8/3/2009	2.81	2.52	2.12	1.55	2.30	2.48	---	2.40	2.37	2.41	2.34	2.33	2.73
8/28/2009	2.57	1.95	1.89	1.14	1.83	1.91	---	1.94	1.78	1.94	1.77	1.77	2.49

Appendix 2. Monthly water-level data from wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 1998 to August 2009 (continued).

[---. Not measured; all measurements are in feet relative to the North American Vertical Datum of 1988; *, measurement made by Tetra Tech NUS, Inc.]

Date	12MW-15S	12MW-16S	12MW-17S	12MW-18S	12MW-19D	12MW-19S	12MW-20D	12MW-20S	12MW-21D	12MW-21S	12MW-22D	12MW-22S	12MW-23D
4/18/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
5/18/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
6/25/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
8/11/1999*	---	---	---	---	---	---	---	---	---	---	---	---	---
10/28/1999*	---	---	---	---	---	---	---	---	---	---	---	---	---
8/3/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
9/7/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
10/12/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
11/13/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
1/12/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
2/8/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
3/14/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
4/13/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
5/14/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
6/19/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
7/19/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
8/30/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
9/27/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
10/30/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
11/27/2001	0.64	0.81	---	---	---	---	---	---	---	---	---	---	---
12/26/2001	1.28	1.26	---	---	---	---	---	---	---	---	---	---	---
1/22/2002	1.70	1.35	---	---	---	---	---	---	---	---	---	---	---
2/26/2002	1.86	1.65	---	---	---	---	---	---	---	---	---	---	---
5/3/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
6/6/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
7/12/2002	0.07	1.60	---	---	---	---	---	---	---	---	---	---	---
8/8/2002	0.16	1.19	---	---	---	---	---	---	---	---	---	---	---
8/26/2002	1.20	0.99	1.10	---	---	---	---	---	---	---	---	---	---
8/28/2002	2.17	1.25	1.56	---	---	---	---	---	---	---	---	---	---
9/9/2002	2.26	2.66	---	---	---	---	---	---	---	---	---	---	---
10/3/2002	2.61	3.26	4.00	---	---	---	---	---	---	---	---	---	---
11/21/2002	3.28	3.91	4.85	---	---	---	---	---	---	---	---	---	---
12/18/2002	3.09	3.62	4.34	---	---	---	---	---	---	---	---	---	---
2/3/2003	2.66	3.08	3.66	---	---	---	---	---	---	---	---	---	---
2/13/2003	---	---	3.66	3.80	3.88	3.91	3.79	3.85	3.89	3.86	3.84	3.83	3.91
2/20/2003	2.52	4.14	3.80	---	---	---	---	---	---	---	---	---	---
2/26/2003	2.84	3.21	3.82	3.96	4.04	4.02	4.04	4.01	4.02	4.03	4.03	3.99	3.94
3/25/2003	3.22	3.86	4.67	4.96	4.93	4.95	4.92	4.90	4.92	4.97	4.93	4.91	4.90
4/23/2003	2.18	3.08	3.49	3.80	3.78	3.79	3.80	3.77	3.79	3.81	3.79	3.74	3.80
5/27/2003	3.37	3.60	4.31	4.56	4.55	4.56	4.54	4.53	4.50	4.56	4.51	4.49	4.48
6/30/2003	1.65	2.82	3.11	3.39	3.39	3.41	3.39	3.38	3.39	3.43	3.38	3.34	3.40
8/4/2003	3.14	3.60	4.28	4.56	4.52	4.54	4.51	4.53	4.46	4.48	4.45	4.46	4.42
8/29/2003	1.05	2.47	2.59	2.84	2.87	2.84	2.85	2.82	2.82	2.88	2.85	2.79	2.88
9/30/2003	1.34	2.51	2.36	2.59	2.57	2.57	2.58	2.54	2.59	2.61	2.58	2.53	2.64
11/3/2003	1.86	2.30	2.45	2.69	2.70	2.70	2.71	2.67	2.70	2.72	2.71	2.65	2.73
12/8/2003	2.11	2.15	2.31	2.56	2.58	2.57	2.58	2.56	2.58	2.56	2.56	2.51	2.59
1/15/2004	2.12	2.21	2.36	2.60	2.62	2.61	2.60	2.58	2.60	2.60	2.59	2.53	2.62
2/13/2004	3.36	2.60	3.25	3.49	3.52	3.51	3.50	3.50	3.48	3.44	3.48	3.44	3.48
3/15/2004	2.11	2.55	2.99	3.23	3.73	3.26	3.24	3.23	3.24	3.27	3.21	3.19	3.24
4/21/2004	1.70	2.18	2.45	2.71	2.73	2.73	2.71	2.69	2.72	2.75	2.70	2.66	2.73
5/20/2004	1.03	2.01	2.06	2.32	2.33	2.34	2.35	2.32	2.34	2.38	2.33	2.28	2.36
6/21/2004	0.80	1.58	1.73	1.94	1.96	1.96	1.95	1.93	1.95	1.96	1.94	1.90	1.98
7/26/2004	2.14	3.31	2.41	2.63	2.64	2.64	2.65	2.63	2.62	2.63	2.61	2.58	2.64
9/15/2004	2.79	3.41	3.87	4.07	4.10	4.09	4.09	4.03	4.10	3.98	4.05	4.04	4.07
10/21/2004	2.12	2.66	2.64	2.84	2.87	2.87	2.87	2.84	2.88	2.89	2.88	2.82	2.85
11/29/2004	1.49	1.83	1.78	2.01	2.05	2.02	2.03	2.00	2.05	2.06	2.05	1.97	2.08
12/27/2004	2.46	1.78	1.86	2.16	2.19	2.16	2.17	2.13	2.18	1.93	2.16	2.09	2.21
1/25/2005	2.22	2.11	---	2.44	2.50	2.49	2.46	2.43	2.49	2.34	2.48	2.44	2.46
2/17/2005	2.4	2.33	2.47	2.67	2.71	2.7	2.69	2.66	2.72	2.74	2.7	2.65	2.72
3/24/2005	3.39	2.85	3.56	3.77	3.79	3.79	3.75	3.74	3.86	3.60	3.72	3.70	3.71
4/25/2005	1.64	2.40	2.47	2.67	2.74	2.73	2.70	2.68	2.74	2.78	2.73	2.65	2.75
5/31/2005	1.44	1.69	1.64	1.89	2.14	1.91	1.91	1.87	1.95	1.89	1.91	1.82	1.97
6/17/2005	1.08	2.00	1.64	1.86	1.92	1.90	1.90	1.86	1.95	1.97	1.93	1.85	1.98
7/21/2005	1.87	2.71	2.62	2.80	2.86	2.85	2.83	2.79	2.86	2.93	3.04	2.60	2.88
8/16/2005	2.93	3.47	3.93	4.08	4.13	4.11	4.09	4.08	4.08	4.13	4.09	4.06	4.09
9/29/2005	0.50	2.04	1.84	2.13	2.10	2.08	2.09	2.05	2.20	2.12	2.10	2.02	2.16
10/17/2005	2.10	2.89	2.91	3.10	3.16	3.14	3.12	3.08	3.20	3.17	3.14	3.07	3.16
12/1/2005	2.65	2.65	2.68	2.86	2.91	2.89	2.89	2.85	2.92	2.91	2.91	2.84	2.92
12/19/2005	3.55	3.61	3.81	4.06	4.10	4.10	4.06	4.04	4.07	4.09	4.04	4.01	4.01
1/26/2006	3.15	3.14	3.48	3.63	3.67	3.66	3.64	3.62	3.65	3.69	3.65	3.62	3.64
3/2/2006	3.18	3.37	3.97	4.18	4.22	4.23	4.18	4.16	4.18	4.25	4.17	4.15	4.14
3/30/2006	1.95	2.38	2.40	2.61	2.65	2.64	2.63	2.59	2.67	2.68	2.65	2.59	2.67
5/1/2006	1.07	1.79	1.54	1.78	1.84	1.80	1.82	1.77	1.80	1.80	1.82	1.75	1.88
5/31/2006	0.31	1.39	1.11	1.31	1.37	1.35	1.36	1.30	1.38	1.39	1.38	1.31	1.44
6/29/2006	1.05	2.08	1.88	2.09	2.14	2.1	2.12	2.08	2.15	2.13	2.14	2.06	2.17
10/2/2006	1.40	2.38	1.92	2.05	2.10	2.09	2.09	2.05	2.13	2.12	2.12	2.06	2.16
5/21/2007	-0.86	0.76	0.26	0.42	0.47	0.44	0.46	0.41	0.50	0.49	0.48	0.40	0.55
7/17/2007	-0.68	1.01	0.54	0.63	0.68	0.65	0.66	0.62	0.72	0.70	0.69	0.62	0.75
11/26/2007	1.17	1.88	1.46	1.59	1.63	1.59	1.63	1.58	1.65	1.63	1.63	1.58	1.69
5/5/2008	1.14	1.88	1.37	1.59	1.64	1.61	1.61	1.55	1.65	1.66	1.65	1.56	1.70
8/28/2008	0.67	1.79	1.40	1.49	1.55	1.52	1.54	1.48	1.56	1.56	1.57	1.49	1.61
2/10/2009	1.43	3.12	1.90	2.14	---	---	2.17	2.13	---	---	2.19	2.11	2.22
2/11/2009	---	---	---	2.09	2.14	2.10	2.12	2.07	2.15	2.13	2.13	2.06	2.16
8/3/2009	2.79	2.58	2.36	2.54	2.54	2.52	2.55	2.51	2.56	2.51	2.54	2.49	2.57
8/28/2009	1.24	2.26	1.75	1.97	2.01	1.99	2.00	1.96	2.03	2.01	2.03	1.95	2.08

Appendix 2. Monthly water-level data from wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 1998 to August 2009 (continued).

[---. Not measured; all measurements are in feet relative to the North American Vertical Datum of 1988; *, measurement made by Tetra Tech NUS, Inc.]

Date	12MW-23S	12MW-24D	12MW-24S	12MW-25D	12MW-25S	12MW-26S	12MW-27D	12MW-27S	12MW-28D	12MW-28S	12MW-29S	12MW-30S	12PZ-01
4/18/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
5/18/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
6/25/1998*	---	---	---	---	---	---	---	---	---	---	---	---	---
8/11/1999*	---	---	---	---	---	---	---	---	---	---	---	---	---
10/28/1999*	---	---	---	---	---	---	---	---	---	---	---	---	---
8/3/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
9/7/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
10/12/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
11/13/2000	---	---	---	---	---	---	---	---	---	---	---	---	---
1/12/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
2/8/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
3/14/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
4/13/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
5/14/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
6/19/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
7/19/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
8/30/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
9/27/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
10/30/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
11/27/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
12/26/2001	---	---	---	---	---	---	---	---	---	---	---	---	---
1/22/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
2/26/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
5/3/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
6/6/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
7/12/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
8/8/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
8/26/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
8/28/2002	---	---	---	---	---	---	---	---	---	---	---	---	1.72
9/9/2002	---	---	---	---	---	---	---	---	---	---	---	---	---
10/3/2002	---	---	---	---	---	---	---	---	---	---	---	---	4.14
11/21/2002	---	---	---	---	---	---	---	---	---	---	---	---	5.03
12/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	4.52
2/3/2003	---	---	---	---	---	---	---	---	---	---	---	---	3.86
2/13/2003	3.81	3.84	3.85	3.83	3.85	3.80	3.87	3.89	3.87	3.88	---	---	3.85
2/20/2003	---	---	---	---	---	---	---	---	---	---	---	---	3.96
2/26/2003	3.98	3.86	4.02	3.96	3.96	3.83	4.01	4.04	4.03	3.98	---	---	4
3/25/2003	4.95	4.88	4.92	4.87	4.91	4.88	4.95	4.95	4.94	4.98	---	---	4.87
4/23/2003	3.79	3.79	3.77	3.78	3.76	3.78	3.79	3.78	4.10	3.80	---	---	3.73
5/27/2003	4.52	4.45	4.49	4.45	4.49	4.50	4.55	4.54	4.52	4.54	---	---	4.49
6/30/2003	3.40	3.39	3.36	3.39	3.34	3.37	3.40	3.39	3.40	3.43	---	---	3.34
8/4/2003	4.49	4.40	4.42	4.41	4.45	4.47	4.51	4.54	4.47	4.50	---	---	4.47
8/29/2003	2.87	2.88	2.81	2.89	2.81	2.85	2.85	2.85	2.87	2.88	---	---	2.79
9/30/2003	2.59	2.62	2.56	2.64	2.57	2.59	2.58	2.57	2.61	2.61	---	---	2.54
11/3/2003	2.71	2.73	2.69	2.72	2.67	2.69	2.73	2.70	2.72	2.73	---	---	2.63
12/8/2003	2.58	2.58	2.54	2.57	2.53	2.56	2.59	2.57	2.59	2.58	---	---	---
1/15/2004	2.62	2.61	2.36	2.62	2.56	2.61	2.63	2.60	2.61	2.62	---	---	---
2/13/2004	3.51	3.46	3.47	3.46	3.46	3.50	3.54	3.50	3.51	3.50	---	---	---
3/15/2004	3.26	3.23	3.11	3.24	3.22	3.22	3.26	3.25	3.25	3.28	---	---	---
4/21/2004	2.72	2.72	2.67	2.73	2.69	2.71	2.73	2.72	2.73	2.74	---	---	2.61
5/20/2004	2.35	2.35	2.30	2.35	2.29	2.28	2.36	2.34	2.35	2.37	---	---	2.22
6/21/2004	1.96	1.99	1.93	1.98	1.95	1.94	1.95	1.95	1.96	1.97	---	---	1.85
7/26/2004	2.64	2.62	2.60	2.64	2.60	2.63	2.65	2.64	2.64	2.63	---	---	2.55
9/15/2004	4.08	4.03	4.03	4.02	4.03	4.07	4.08	4.09	4.08	4.10	3.95	3.95	3.95
10/21/2004	2.96	2.91	2.85	2.89	2.85	2.88	2.89	2.87	2.89	2.89	2.73	2.72	2.72
11/29/2004	2.06	2.09	2.00	2.06	2.02	2.03	2.04	2.03	2.07	2.05	1.85	1.84	1.88
12/27/2004	2.18	2.18	2.13	2.18	2.14	2.16	2.20	2.17	2.20	2.17	1.98	1.97	2.01
1/25/2005	2.56	2.50	2.44	2.50	2.47	2.50	2.50	2.49	2.50	2.51	2.30	2.28	2.28
2/17/2005	2.72	2.72	2.65	2.7	2.69	2.72	2.72	2.69	2.74	2.73	2.54	2.53	2.52
3/24/2005	3.75	3.70	3.71	3.62	3.71	3.75	3.79	3.77	3.75	3.75	3.63	3.62	3.62
4/25/2005	2.75	2.74	2.69	2.75	2.70	2.74	2.73	2.72	2.74	2.76	2.55	2.53	2.55
5/31/2005	1.94	1.93	1.87	1.94	1.87	1.93	1.95	1.92	1.94	1.93	1.73	1.70	1.72
6/17/2005	1.96	1.99	1.88	1.97	1.89	1.95	1.91	1.90	1.95	1.96	1.73	1.70	1.67
7/21/2005	2.87	2.88	2.79	2.85	2.81	2.86	2.85	2.84	2.87	2.87	2.69	2.66	2.66
8/16/2005	4.13	4.09	4.09	4.05	4.08	4.12	4.12	4.11	4.10	4.13	4.00	3.99	3.97
9/29/2005	2.11	2.14	2.05	2.14	2.06	2.07	2.10	2.08	2.12	2.12	1.93	1.93	1.92
10/17/2005	3.16	3.17	3.10	3.16	3.10	3.13	3.15	3.13	3.15	3.17	2.96	3.00	2.97
12/1/2005	2.93	2.93	2.87	2.89	2.90	2.91	2.92	2.87	2.92	2.93	2.73	2.72	2.73
12/19/2005	4.08	3.99	4.03	3.96	4.01	4.04	4.11	4.10	4.06	4.10	3.88	3.86	3.90
1/26/2006	3.66	3.63	3.63	3.61	3.63	3.63	3.66	3.66	3.65	3.68	3.55	3.55	3.52
3/2/2006	4.20	4.13	4.17	4.12	4.16	4.15	4.21	4.21	4.16	4.22	4.04	4.03	4.05
3/30/2006	2.67	2.67	2.62	2.66	2.61	2.63	2.65	2.64	2.66	2.68	2.48	2.46	2.49
5/1/2006	1.78	1.87	1.79	1.86	1.81	1.82	1.82	1.81	1.86	1.82	1.66	1.66	1.64
5/31/2006	1.40	1.42	1.34	1.44	1.35	1.37	1.38	1.37	1.39	1.40	1.19	1.19	1.19
6/29/2006	2.16	2.16	2.11	2.15	2.1	2.15	2.15	2.13	2.16	2.15	1.96	1.95	1.92
10/2/2006	2.14	2.75	2.10	2.17	2.09	2.14	2.09	2.08	2.12	2.13	1.98	1.97	1.93
5/21/2007	0.49	0.57	0.43	0.55	0.45	0.47	0.46	0.45	0.50	0.50	0.36	0.31	---
7/17/2007	0.70	0.76	0.66	0.76	0.66	0.68	0.66	0.67	0.71	0.70	0.60	0.57	---
11/26/2007	1.65	1.69	1.63	1.67	1.61	1.50	1.62	---	1.63	1.62	1.51	1.50	1.50
5/5/2008	1.67	1.71	1.62	1.70	1.62	1.65	1.64	1.61	1.67	1.65	1.45	1.44	---
8/28/2008	1.58	1.61	1.54	1.58	1.52	1.56	1.56	1.53	1.57	1.57	1.43	1.42	1.33
2/10/2009	2.21	---	---	2.20	2.16	2.19	2.18	2.19	2.22	2.21	2.00	1.99	1.96
2/11/2009	2.15	2.17	2.11	2.15	2.11	2.15	2.14	2.13	2.16	2.14	---	---	---
8/3/2009	2.56	2.68	2.52	2.54	2.50	2.55	2.56	2.56	2.57	2.55	2.40	2.40	2.36
8/28/2009	2.04	2.09	1.99	2.07	2.01	2.03	2.03	2.02	2.06	2.03	1.82	1.72	1.79

Appendix 2. Monthly water-level data from wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, April 1998 to August 2009 (continued).

[---. Not measured; all measurements are in feet relative to the North American Vertical Datum of 1988; *, measurement made by Tetra Tech NUS, Inc.]

Date	12PZ-03D	12PZ-03S	12PZ-04	12PZ-05	12PZ-06	12PZ-07	12PZ-08	12PZ-09	12PZ-10
4/18/1998*	---	---	---	---	---	---	---	---	---
5/18/1998*	---	---	---	---	---	---	---	---	---
6/25/1998*	---	---	---	---	---	---	---	---	---
8/11/1999*	---	---	---	---	---	---	---	---	---
10/28/1999*	---	---	---	---	---	---	---	---	---
8/3/2000	---	---	---	---	---	---	---	---	---
9/7/2000	---	---	---	---	---	---	---	---	---
10/12/2000	---	---	---	---	---	---	---	---	---
11/13/2000	---	---	---	---	---	---	---	---	---
1/12/2001	---	---	---	---	---	---	---	---	---
2/8/2001	---	---	---	---	---	---	---	---	---
3/14/2001	---	---	---	---	---	---	---	---	---
4/13/2001	---	---	---	---	---	---	---	---	---
5/14/2001	---	---	---	---	---	---	---	---	---
6/19/2001	---	---	---	---	---	---	---	---	---
7/19/2001	---	---	---	---	---	---	---	---	---
8/30/2001	---	---	---	---	---	---	---	---	---
9/27/2001	---	---	---	---	---	---	---	---	---
10/30/2001	---	---	---	---	---	---	---	---	---
11/27/2001	---	---	---	---	---	---	---	---	---
12/26/2001	---	---	---	---	---	---	---	---	---
1/22/2002	---	---	---	---	---	---	---	---	---
2/26/2002	---	---	---	---	---	---	---	---	---
5/3/2002	---	---	---	---	---	---	---	---	---
6/6/2002	---	---	---	---	---	---	---	---	---
7/12/2002	---	---	---	---	---	---	---	---	---
8/8/2002	---	---	---	---	---	---	---	---	---
8/26/2002	---	---	---	---	---	---	---	---	---
8/28/2002	---	---	---	---	---	---	---	---	---
9/9/2002	---	---	---	---	---	---	---	---	---
10/3/2002	---	---	---	---	---	---	---	---	---
11/21/2002	---	---	---	---	---	---	---	---	---
12/18/2002	---	---	---	---	---	---	---	---	---
2/3/2003	---	---	---	---	---	---	---	---	---
2/13/2003	---	---	---	---	---	---	---	---	---
2/20/2003	---	---	---	---	---	---	---	---	---
2/26/2003	---	---	---	---	---	---	---	---	---
3/25/2003	---	---	---	---	---	---	---	---	---
4/23/2003	---	---	---	---	---	---	---	---	---
5/27/2003	---	---	---	---	---	---	---	---	---
6/30/2003	---	---	---	---	---	---	---	---	---
8/4/2003	---	---	---	---	---	---	---	---	---
8/29/2003	---	---	---	---	---	---	---	---	---
9/30/2003	---	---	---	---	---	---	---	---	---
11/3/2003	---	---	---	---	---	---	---	---	---
12/8/2003	---	---	---	---	---	---	---	---	---
1/15/2004	---	---	---	---	---	---	---	---	---
2/13/2004	---	---	---	---	---	---	---	---	---
3/15/2004	2.92	-4.18	2.97	2.94	2.94	---	---	---	---
4/21/2004	2.47	2.71	2.40	2.45	2.60	---	---	---	---
5/20/2004	2.08	1.99	2.00	2.05	2.43	---	---	---	---
6/21/2004	1.72	1.71	1.67	1.69	2.04	---	---	---	---
7/26/2004	2.47	2.92	2.40	2.49	2.60	---	---	---	---
9/15/2004	3.68	1.13	3.50	3.66	3.46	---	---	---	---
10/21/2004	2.68	2.36	2.62	2.59	2.86	---	---	---	---
11/29/2004	1.80	2.25	1.61	1.80	2.14	---	---	---	---
12/27/2004	1.88	2.16	1.77	---	---	---	---	---	---
1/25/2005	2.24	2.53	2.07	---	---	---	---	---	---
2/17/2005	2.48	2.64	2.42	---	---	---	---	---	---
3/24/2005	3.20	2.77	3.07	---	---	---	---	---	---
4/25/2005	2.47	2.78	2.41	---	---	---	---	---	---
5/31/2005	1.65	2.90	1.61	---	---	---	---	---	---
6/17/2005	1.81	2.50	1.77	---	---	---	---	---	---
7/21/2005	2.69	2.67	2.65	---	---	---	---	---	---
8/16/2005	2.11	4.44	4.11	---	---	---	---	---	---
9/29/2005	1.83	2.60	1.70	---	---	---	---	---	---
10/17/2005	2.92	2.63	2.88	---	---	---	---	---	---
12/1/2005	2.69	2.74	2.57	---	---	---	---	---	---
12/19/2005	3.41	2.81	3.21	---	---	---	---	---	---
1/26/2006	3.32	2.91	3.21	---	---	---	---	---	---
3/2/2006	3.67	2.98	---	---	---	---	---	---	---
3/30/2006	2.44	2.92	2.44	---	---	---	---	---	---
5/1/2006	1.64	2.64	1.59	---	---	---	---	---	---
5/31/2006	1.16	2.26	---	---	---	---	---	---	---
6/29/2006	1.98	2.93	---	---	---	---	---	---	---
10/2/2006	2.05	2.61	---	---	---	---	---	---	---
5/21/2007	0.25	1.33	---	---	---	---	---	---	---
7/17/2007	0.55	0.65	---	---	---	---	---	---	---
11/26/2007	1.56	2.46	---	---	---	---	---	---	---
5/5/2008	---	---	---	---	---	---	---	---	---
8/28/2008	---	---	---	---	---	---	---	---	---
2/10/2009	1.93	2.93	---	---	---	---	---	---	---
2/11/2009	---	---	---	---	---	---	---	---	---
8/3/2009				---	---	---	---	---	---
8/28/2009	1.83	2.56	1.81	---	---	1.87	1.87	1.71	1.73

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009.

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-02D	8/30/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<10	<10	38	<5	2.1	<5	<5	<5	<2
12MW-02D	11/29/2000	<0.18	<0.18	<0.21	0.22J	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	52	<0.18	2.7J	<0.21	<0.18	<0.17	<0.15
12MW-02D	2/27/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	11	<0.26	1.3J	<0.13	<0.13	<0.14	<0.17
12MW-02D	5/15/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	34	<0.33	2.3J	<0.38	<0.43	1.5	<0.19
12MW-02D	8/29/2001	<0.22	<0.23	<0.2	0.32J	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	29	<0.26	2.2J	<0.13	<0.13	<0.14	<0.17
12MW-02D	12/3/2001	<0.22	<0.23	<0.2	<0.16	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	44	<0.26	2.9J	<0.13	<0.13	<0.14	<0.17
12MW-02D	2/27/2002	<0.22	<0.23	<0.2	<0.16	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	7.8	<0.26	1.9J	<0.13	<0.13	<0.14	<0.17
12MW-02D	6/10/2002	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<5	<5	53	<0.24	3.6	<0.1	<0.17	<0.13	<0.18
12MW-02D	9/9/2002	0.52J	0.39J	<0.18	1.2	<5.4	---	<0.24	<0.24	0.25J	<10	<10	<10	<0.24	5.9	2.1	<0.19	1.2	<0.2
12MW-02D	1/8/2003	<0.17	<0.64	<0.15	0.35J	<8.8	---	<0.12	<0.15	<0.28	<10	<10	41	<0.24	3.2	0.2J	<0.17	0.36J	<0.18
12MW-02D	4/9/2003	<0.16	<0.11	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<0.5	<0.5	6.5	<0.12	2.7	<0.17	<0.14	<0.12	<0.1
12MW-02D	7/16/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<5	<5	42	<0.43	2.4	<0.31	<0.34	<0.25	<0.11
12MW-02D	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	<0.34	<0.25	<0.11
12MW-02D	5/23/2005	<0.29	<0.21	<0.18	<0.17	<3.5	---	<0.22	<0.2	<0.23	<0.5	<0.5	20	<0.2	2	<0.21	<0.19	<0.28	<0.15
12MW-02D	6/20/2006	<0.19	<0.19	<0.19	<0.15	<7.7	---	<0.2	<0.21	<0.19	<0.4	<0.5	17	<0.36	1.3J	<0.16	<0.19	<0.3	<0.2
12MW-02S	8/30/2000	<5	12	<5	200	---	---	<5	<5	<5	<10	<10	67	<5	1.9	<5	<5	<5	<2
12MW-02S	11/29/2000	<0.18	5.7	<0.21	110	---	---	<0.18	<0.17	0.75	<0.5	<0.5	3.3	<0.18	<1	<0.21	<0.18	0.24J	<0.15
12MW-02S	2/27/2001	<2.2	8.6	<2	160	---	---	<1.6	<2.3	<2.4	<0.5	<0.5	37	<2.6	1.1J	<1.3	<1.3	<1.4	<1.7
12MW-02S	5/15/2001	<2.7	5.4J	<3.5	81	---	---	<3.5	<2.7	<3.1	<0.5	<0.5	6.3	<3.3	1.7J	<3.8	<4.3	6.4J	<1.9
12MW-02S	8/29/2001	<0.33	2.1J	<0.3	23	---	<0.2	<0.24	<0.3	<0.56	<0.5	<0.5	<0.5	<0.47	1.9J	<0.21	<0.35	4.8	<0.35
12MW-02S	12/3/2001	<0.44	5.5	<0.39	69	---	<0.2	<0.32	<0.46	0.66J	<0.5	<0.5	6.1	<0.51	2.3J	<0.25	<0.26	0.47J	<0.35
12MW-02S	2/27/2002	<1.1	2.8J	<0.98	46	---	<0.2	<0.81	<1.2	<1.2	<0.5	<0.5	1.2J	<1.3	1.2J	<0.63	<0.65	<0.68	<0.87
12MW-02S	6/10/2002	<0.84	6.7J	<0.76	84	<44	<1	<0.6	<0.75	<1.4	<5	<5	16	<1.2	2.7	<0.52	<0.87	<0.64	<0.88
12MW-02S	9/9/2002	<1.3	5.4	<0.88	58	<27	---	<1.2	<1.2	<1	<10	<10	11	<1.2	1.8	<0.82	<0.96	<0.83	<0.99
12MW-02S	1/8/2003	<0.84	15	<0.76	130	<44	<1	<0.6	<0.75	1.6J	<10	<10	24	<1.2	1.8	<0.52	<0.87	2.3	<0.88
12MW-02S	4/9/2003	<2.1	27	<1.8	250	<40	---	<1.4	<2	2.9J	<0.5	<0.5	21	<1.4	3.3	<2.2	<1.8	<1.5	<1.3
12MW-02S	7/15/2003	<2.7	14	<3.4	100	<64	---	<2.9	<3	<4	<50	<50	76	<4.3	1.3J	<3.1	<3.4	<2.5	<1.1
12MW-02S	9/17/2003	<1.6	26	<1.4	150	<32	---	<1.1	<1.6	<2.2	<5	<5	60	<1.2	1.2J	<1.7	<1.4	2.1J	2.8J
12MW-02S	1/14/2004	<2.1	29	<1.8	140	<40	---	<1.4	<2	<2.7	<10	<10	<10	<1.4	1.4J	<2.2	<1.8	<1.5	<1.3
12MW-02S	4/28/2004	<2.4	200	<2.7	530	69J	---	<2.3	<2.8	11	<20	<20	140	<2.2	4.1	<2.6	<2.6	11	3.4J
12MW-02S	8/16/2004	<0.27	<0.3	<0.34	1.9	<6.4	---	<0.29	<0.3	<0.4	<50	<50	670	<0.43	1.2J	<0.31	<0.34	<0.25	<0.11
12MW-02S	2/2/2005	<0.29	0.66J	<0.18	5.4	<3.5	---	<0.22	<0.2	0.29J	<0.5	<0.5	1.4J	<0.2	<0.54	<0.21	<0.19	0.36J	<0.15
12MW-02S	5/23/2005	<0.29	0.54J	<0.18	4.2	<3.5	---	<0.22	<0.2	<0.23	<0.5	<0.5	2.8	<0.2	1.4J	<0.21	<0.19	<0.28	<0.15
12MW-02S	9/12/2005	<0.21	1.1	<0.16	7.8	<7	---	<0.2	<0.23	0.18J	<0.5	<0.5	9.3	<0.25	1.6J	<0.16	<0.21	<0.19	0.37J
12MW-02S	1/30/2006	<0.21	11	0.17J	55	10J	---	<0.2	<0.23	0.84	<0.5	<0.5	10	<0.25	---	<0.16	<0.21	0.71	1.8
12MW-02S	6/20/2006	<0.19	0.8	<0.19	6.1	<7.7	---	<0.2	<0.21	<0.19	<0.4	<0.5	1.1	<0.36	<0.54	<0.16	<0.19	<0.3	<0.2
12MW-02S	9/11/2006	<0.19	0.66J	<0.21	4.1	<6.6	---	<0.21	<0.2	<0.34	<0.4	<0.5	1.2	<0.3	---	<0.16	<0.17	<0.19	<0.17
12MW-02S	5/21/2007	0.648J	4.55	<0.25	31.3	---	---	<0.3	<0.25	2.64	<2	<2	7.45J	<2	1.2	0.316J	<0.25	6.17	<0.5
12MW-02S	11/28/2007	7.98	15.7	<0.25	90.8	---	---	<0.3	<0.25	11.7	<2	<2	43.3	<2	1.4	7.2	<0.25	43.2	1.11
12MW-02S	2/10/2009	47	86.1	0.85J	462	---	---	<0.3	<0.25	48.1	<10	<10	21.6J	<2	1.7	68.4	<0.25	362	3.86
12MW-03D	8/30/2000	<5	<5	<5	<5	---	---	<5	<5	18	<10	<10	24	<5	1.6	<5	<5	6	<2
12MW-03D	11/30/2000	<0.36	<0.35	<0.42	0.99J	---	---	<0.37	<0.35	24	<0.5	<0.5	24	<0.36	2.1J	<0.41	<0.36	5.8	<0.31
12MW-03D	2/27/2001	<0.22	<0.23	<0.2	0.54	---	---	<0.16	<0.23	6.8	8.5	8.6	13	<0.26	<0.96	<0.13	<0.13	1.4	<0.17
12MW-03D	5/15/2001	9.8	1.6	<0.35	7.5	---	---	<0.35	<0.27	15	<0.5	<0.5	22	<0.33	1.5J	6	<0.43	15	0.88
12MW-03D	8/29/2001	<0.17	<0.64	<0.15	2.7	---	<0.2	<0.12	<0.15	19	<0.5	<0.5	21	<0.24	1.8J	<0.1	<0.17	12	0.73

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-03D	12/4/2001	<0.17	<0.64	<0.15	6.3	---	<0.2	<0.12	<0.15	44	<0.5	<0.5	47	<0.24	2.5J	<0.1	<0.17	33	1.3
12MW-03D	2/27/2002	<0.22	<0.23	<0.2	1.2	---	0.07J	<0.16	<0.23	13	<0.5	<0.5	15	<0.26	1.2J	<0.13	<0.13	3.3	0.2J
12MW-03D	6/11/2002	<0.17	<0.64	<0.15	3.2	<8.8	---	<0.12	<0.15	21	<5	<5	50	<0.24	1.4J	<0.1	<0.17	19	<0.18
12MW-03D	9/10/2002	0.57J	0.45J	<0.18	2.1	<5.4	---	<0.24	<0.24	14	<10	<10	16	<0.24	1.2J	0.7	<0.19	4.6	0.3J
12MW-03D	1/9/2003	<0.17	<0.64	<0.15	1.2	<8.8	<1	<0.12	<0.15	11	<10	<10	<10	<0.24	1.9	<0.1	<0.17	2	0.73
12MW-03D	4/9/2003	<0.27	1.8	<0.34	1.9	<6.4	---	<0.29	<0.3	11	<0.5	<0.5	3.4	<0.43	2.1	<0.31	<0.34	3.2	0.65
12MW-03D	7/15/2003	<0.16	1.5	<0.14	1.9	<3.2	---	<0.11	<0.16	13	<10	<10	68	<0.12	1.6J	<0.17	0.15J	3.3	0.82
12MW-03D	8/16/2004	<0.27	4.7	<0.34	4.3	<6.4	---	<0.29	<0.3	16	---	---	---	<0.43	---	<0.31	<0.34	4	1.8
12MW-03D	5/25/2005	<0.29	1.5	<0.18	2.3	<3.5	---	<0.22	<0.2	8.7	<0.5	<0.5	18	<0.2	1.7J	0.23J	<0.19	3.4	0.27J
12MW-03D	6/21/2006	<0.19	0.56J	<0.21	1.3	<6.6	---	<0.21	<0.2	6.9	<0.4	<0.5	2.7	<0.3	0.97J	<0.16	<0.17	1.8	0.19J
12MW-03D	5/21/2007	<0.3	<0.3	<0.25	1.12	---	---	<0.3	<0.25	10.1	<2	<2	32.1	<2	1.2	<0.25	<0.25	1.54	<0.5
12MW-03D	5/6/2008	<0.3	2.74	<0.25	2.17	---	---	<0.3	<0.25	2.74	<2	<2	<6	<2	1.7	<0.25	<0.25	0.492J	<0.5
12MW-03D	9/1/2009	<0.5	0.44J	<0.5	0.31J	<5	---	<0.5	<0.5	2	---	---	---	<0.5	---	<0.5	<0.5	0.55	<0.5
12MW-03S	8/30/2000	16,000	4,000	2,300	4,500	---	---	<5	<5	7,600	39	<10	140	<5	3.6	7,300	<5	9,500	1,600
12MW-03SR	8/30/2000	19,000	2,000	1,100	5,200	---	---	<5	<5	8,500	<10	<10	190	<5	3.6	8,800	<5	12,000	850
12MW-03S	11/30/2000	31,000	5,100	<170	11,000	---	---	<150	<140	7,000	32	17	160	<140	7.8	8,500	<140	9,000	160J
12MW-03S	2/27/2001	3,700	2,100	<200	3,100	---	---	<160	<230	12,000	11	30	140	<260	3J	6,500	<130	5,200	230J
12MW-03SR	2/27/2001	3,800	2,100	<200	3,300	---	---	<160	<230	12,000	12	34	190	<260	2.4J	7,100	<130	5,700	210J
12MW-03S	5/15/2001	76,000	20,000	<1,700	29,000	---	---	<1700	<1,400	8,900	69	24	180	<1,700	24	11,000	<2100	7,900	<940
12MW-03S	8/29/2001	73,000	23,000	<760	34,000	---	51	<600	<750	12,000	75	53	190	<1,200	30	12,000	<870	16,000	<880
12MW-03SR	8/29/2001	74,000	24,000	<350	30,000		52	<350	<270	13,000	120	80	290	<330	28	12,000	<430	12,000	1,200
12MW-03S	12/5/2001	92,000	35,000	<760	46,000	---	71	<600	<750	14,000	120	200	410	<1,200	48	16,000	<870	12,000	<880
12MW-03SR	12/5/2001	93,000	36,000	<760	48,000	---	72	<600	<750	15,000	140	190	430	<1200	46	16,000	<870	13,000	<880
12MW-03S	2/27/2002	5,300	4,500	<200	5,400	---	1.2	<160	<230	13,000	14	44	130	<260	6.7	7,100	<130	5,600	600
12MW-03SR	2/27/2002	5,700	4,600	<200	5,800	---	0.98	<160	<230	13,000	45	45	140	<260	6.6	7,500	<130	6,000	620
12MW-03S	6/11/2002	32,000	16,000	260J	20,000	<8,800	26	<120	<150	13,000	64	140	400	<240	24	13,000	<170	5,900	1,100
12MW-03SR	6/11/2002	33,000	16,000	270J	20,000	<8,800	26	<120	<150	14,000	66	130	390	<240	25	13,000	<170	6,100	1,200
12MW-03S	9/10/2002	5,200	5,300	75	6,100	6,800	---	<6	<7.5	13,000	42	14	67	<12	10	7,700	<8.7	4,700	440
12MW-03SR	9/10/2002	5,300	5,300	<190	6,300	<11,000	---	<150	<190	13,000	15	<10	62	<300	12	7,700	<220	4,900	480J
12MW-03S	1/9/2003	4,000	3,300	45	5,100	2,700	4.1	<6	<7.5	7,300	17	<10	71	<12	7.7	4,600	<8.7	4,300	320
12MW-03SR	1/9/2003	3,700	3,100	<76	4,600	<4,400	4.6	<60	<75	7,000	20	<10	44	<120	7.7	4,500	<87	4,200	360
12MW-03S	4/10/2003	15,000	8,800	150J	12,000	12,000	12.4	<57	<80	9,900	15	51	64	<58	11	6,800	<72	3,600	640
12MW-03SR	4/10/2003	15,000	8,500	140J	11,000	9,900	---	<57	<80	9,900	13	20	87	<58	12	6,700	<72	3,800	590
12MW-03S	7/17/2003	580	960	<85	1,200	<1,600	0.094	<73	<74	3,100	<10	20	73	<110	<5	2,100	<84	1,900	140
12MW-03SR	7/17/2003	590	990	<85	1,300	<1,600	0.073	<73	<74	3,200	1.8	6.7	81	<110	<5	2,100	<84	2,200	140
12MW-03S	9/16/2003	1,700	1,200	<50	2,300	1,100J	1.35	<56	<53	2,800	<5	12	79	<59	5.2	2,600	<59	1,400	120J
12MW-03SR	9/16/2003	---	---	---	---	---	1.61	---	---	---	---	---	---	---	<5	---	---	---	---
12MW-03S	1/14/2004	940	1,000	<17	1,700	1,000J	0.166	<15	<15	3,300	10	<10	80	<21		1,900	<17	3,000	150
12MW-03SR	1/14/2004	---	---	---	---	---	0.471	---	---	---	---	---	---	---	---	---	---	---	---
12MW-03S	4/27/2004	8,100	5,100	65J	10,000	3,300	2.84	<29	<30	5,700	12J	28	170	<43	5.3	6,400	<34	5,300	380
12MW-03SR	4/27/2004	---	---	---	---	---	3.19	---	---	---	---	---	---	---	5.2	---	---	---	---
12MW-03S	8/18/2004	370	590	<27	1,000	<400	0.548	<23	<28	1,700	<5	<5	52	<22	2.8	1,200	<26	1,400	96
12MW-03SR	8/18/2004	1,120	1,050	13.5	1,820	722	0.508	<0.33	1.22	2,070	---	---	---	4.12J	3.1	1,710	<0.39	2,040	78.0J
12MW-03S	2/2/2005	650	890	10.4	1,820	593	0.262	1	1.13	2,670	2.7J	5.3	28	5	<5	1,550	1	2,400	120
12MW-03SR	2/2/2005	---	---	---	---	---	0.287	---	---	---	---	---	---	---	<5	---	---	---	---
12MW-03S	5/24/2005	67J	360	<85	540	<1,600	<0.07M	<73	<74	1,700	<2.5	2.7J	39	<110	7	910	<84	1,500	79J

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-03S	9/13/2005	29J	160	<13	270	940J	---	<16	<18	760	<0.5	<0.5	2.3	<20	1.5J	470	<16	560	36J
12MW-03S	1/31/2006	39J	260	<13	590	<560	---	<16	<18	1,700	<0.5	<0.5	5.1	<20	---	770	<16	1700	58
12MW-03S	6/21/2006	<9.4	92	<9.7	150	110	---	<9.8	<10	520	<0.4	<0.5	2.2	<18	1.6J	340	<9.6	370	23J
12MW-03S	9/12/2006	<9.4	78	<11	120	<330	---	<10	<10	370	<0.4	<0.5	1.9	<15	---	260	<8.5	260	13J
12MW-03S	5/21/2007	9.04	201H	2.06	407H	220	---	<0.3	<0.25	1,410H	<2	<2	11.0J	<2	1.9	500H	<0.25	1,220H	28.6
12MW-03S	7/16/2007	1.88	59.7	0.727J	84	<20	---	<0.3	<0.25	291	<2	<2	<6	<2	2.3	111	<0.25	232	3.61
12MW-03S	11/27/2007	3.74J	68.5	<1.25	140	---	---	<1.5	<1.25	393	<2	<2	41.0B	<10	1.9	166	<1.25	391	15.1
12MW-03S	5/6/2008	2.76J	77.5	<1.25	137	---	---	<1.5	<1.25	491	<2	<2	<6	<10	2.4	178	<1.25	484	21
12MW-03S	2/12/2009	<1.63	57.4	<1.25	116	---	---	<1.5	<1.25	376	<10	<10	<10	<10	1.6	121	<1.25	377	8.34
12MW-03S	7/20/2009	<10H	140	<10	290	<100	---	<10	<10	900	<10	<10	30	<10	1.9	390	<10	900H	50
12MW-04D	8/28/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	64	<5	2.7	<5	<5	<5	<2
12MW-04D	11/28/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	100	<0.18	3.3J	<0.21	<0.18	<0.17	<0.15
12MW-04D	2/26/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	46	<0.26	1.3J	<0.13	<0.13	<0.14	<0.17
12MW-04D	5/14/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	57	<0.33	3J	<0.38	<0.43	<0.34	<0.19
12MW-04D	8/27/2001	<0.27	<0.29	<0.35	<0.26	---	<0.2	<0.35	<0.27	<0.31	<0.5	<0.5	39	<0.33	1.9J	<0.38	<0.43	<0.34	<0.19
12MW-04D	12/3/2001	<0.17	<0.64	<0.15	<0.13	---	---	<0.12	<0.15	<0.28	<0.5	<0.5	73	<0.24	4.3	<0.1	<0.17	<0.13	<0.18
12MW-04D	2/26/2002	<0.22	<0.23	<0.2	<0.16	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	33	<0.26	1J	<0.13	<0.13	<0.14	<0.17
12MW-04D	6/11/2002	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<5	<5	62	<0.24	3	<0.1	<0.17	<0.13	<0.18
12MW-04D	9/9/2002	<0.26	<0.24	<0.18	<0.33	<5.4	---	<0.24	<0.24	<0.2	<10	<10	38	<0.24	2.9	<0.16	<0.19	<0.17	<0.2
12MW-04D	1/7/2003	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<10	<10	<10	<0.24	2	<0.1	<0.17	<0.13	<0.18
12MW-04D	4/7/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	12	<0.43	2.1	<0.31	<0.34	0.28J	<0.11
12MW-04D	7/14/2003	<0.16	<0.11	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<10	<10	53	<0.12	1.8	<0.17	<0.14	<0.12	<0.1
12MW-04D	8/18/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	---	---	---	<0.18	---	<0.2	<0.21	<0.2	<0.15
12MW-04S	8/28/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	38	<5	6.4	<5	<5	<5	<2
12MW-04S	11/28/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	6.5	8.5	12	<0.18	7.7	<0.21	<0.18	<0.17	<0.15
12MW-04S	2/26/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	77	<0.26	6.8	<0.13	<0.13	<0.14	<0.17
12MW-04S	5/14/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	<0.5	<0.33	11	<0.38	<0.43	<0.34	<0.19
12MW-04S	8/27/2001	<0.27	<0.29	<0.35	<0.26	---	<0.2	<0.35	<0.27	<0.31	<0.5	<0.5	2.1	<0.33	7.2	<0.38	<0.43	<0.34	<0.19
12MW-04S	12/3/2001	<0.17	<0.64	<0.15	<0.13	---	---	<0.12	<0.15	<0.28	<0.5	<0.5	<0.5	<0.24	9.7	<0.1	<0.17	<0.13	<0.18
12MW-04S	2/26/2002	<0.22	<0.23	<0.2	<0.16	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	1.9	<0.26	5.2	<0.13	<0.13	<0.14	<0.17
12MW-04S	6/11/2002	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<5	<5	<5	<0.24	8	<0.1	<0.17	<0.13	<0.18
12MW-04S	9/9/2002	<0.26	<0.24	<0.18	<0.33	<5.4	---	<0.24	<0.24	<0.2	<10	<10	16	<0.24	11	<0.16	<0.19	<0.17	<0.2
12MW-04S	1/7/2003	<0.17	<0.64	<0.15	<0.13	<8.8	<1	<0.12	<0.15	<0.28	<10	<10	<10	<0.24	7.6	<0.1	<0.17	<0.13	<0.18
12MW-04S	4/7/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	22	<0.43	7.5	<0.31	<0.34	<0.25	<0.11
12MW-04S	7/14/2003	<0.16	<0.11	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<5	<5	25	<0.12	7.5	<0.17	<0.14	<0.12	<0.1
12MW-04S	9/16/2003	<0.16	<0.11	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<5	<5	35	<0.12	11	<0.17	<0.14	<0.12	<0.1
12MW-04S	1/12/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<10	<10	<10	<0.43	7.2	<0.31	<0.34	<0.25	<0.11
12MW-04S	4/26/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<5	<5	29	<0.43	10	<0.31	<0.34	<0.25	<0.11
12MW-04S	8/18/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<5	<5	26	<0.43	9.1	<0.31	<0.34	<0.25	<0.11
12MW-04S	2/1/2005	<0.29	<0.21	<0.18	<0.17	3.9J	---	<0.22	<0.2	<0.23	<0.5	0.65J	30	<0.2	7.5	<0.21	<0.19	<0.28	<0.15
12MW-04S	5/23/2005	<0.29	<0.21	<0.18	<0.17	10J	---	<0.22	<0.2	<0.23	<0.5	<0.5	7.4	<0.2	8.3	<0.21	<0.19	<0.28	<0.15
12MW-04S	9/12/2005	<0.21	<0.17	<0.16	<0.2	<7	---	<0.2	<0.23	<0.18	<0.5	<0.5	18	<0.25	9.6	<0.16	<0.21	<0.19	<0.2
12MW-04S	1/30/2006	<0.21	<0.17	<0.16	<0.2	<7	---	<0.2	<0.23	<0.18	<0.5	<0.5	10	<0.25	---	<0.16	<0.21	<0.19	<0.2
12MW-04S	6/21/2006	<0.19	<0.21	<0.21	<0.14	<6.6	---	<0.21	<0.2	<0.34	<0.4	<0.5	3.7	<0.3	7.8	<0.16	<0.17	<0.19	<0.17
12MW-04S	9/11/2006	<0.19	<0.21	<0.21	<0.14	<6.6	---	<0.21	<0.2	<0.34	<0.4	<0.5	3.5	<0.3	---	<0.16	<0.17	<0.19	<0.17
12MW-04S	5/22/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<2	<2	<6	<2	5.7	<0.25	<0.25	<0.25	<0.5

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-04S	11/28/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<2	<2	50.3	<2	7.5	<0.25	<0.25	<0.25	<0.5
12MW-04S	2/10/2009	<0.325	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<10	<10	31.2	<2		<0.45	<0.25	<0.25	<0.5
12MW-05D	8/30/2000	<5	<5	<5	<5	---	---	<5	<5	6.2	<10	<10	<10	<5	2.6	<5	<5	9.6	<2
12MW-05D	11/30/2000	1.4	<0.18	<0.21	2.6	---	---	<0.18	<0.17	2.5	<0.5	<0.5	5.9	<0.18	2.5J	3.1	<0.18	5.3	<0.15
12MW-05D	2/28/2001	<0.22	<0.23	<0.2	0.68	---	---	<0.16	<0.23	1.4	6.6	<0.5	10	<0.26	3.6	<0.13	<0.13	1.8	<0.17
12MW-05D	5/15/2001	<0.27	<0.29	<0.35	0.83J	---	---	<0.35	<0.27	2.1	<0.5	<0.5	13	<0.33	3.7	<0.38	<0.43	1.8	<0.19
12MW-05D	8/28/2001	<0.17	<0.64	<0.15	0.97	---	0.36	<0.12	<0.15	3.5	<0.5	5.1	34	<0.24	5.4	<0.1	<0.17	0.55	<0.18
12MW-05D	12/4/2001	<0.22	<0.23	<0.2	0.3J	---	<0.2	<0.16	<0.23	0.75J	<0.5	<0.5	6.4	<0.26	4.3	<0.13	<0.13	1	<0.17
12MW-05D	2/28/2002	<0.22	<0.23	<0.2	0.37J	---	---	<0.16	<0.23	0.76J	<0.5	<0.5	5.9	<0.26	2.9J	<0.13	<0.13	0.74	<0.17
12MW-05D	6/11/2002	<0.17	<0.64	<0.15	0.39J	<8.8	---	0.15J	<0.15	0.97J	<5	<5	6J	<0.24	4	<0.1	<0.17	0.89	<0.18
12MW-05D	9/10/2002	<0.26	<0.24	<0.18	<0.33	<5.4	---	<0.24	<0.24	0.54J	<10	<10	<10	<0.24	3.7	<0.16	<0.19	0.56J	<0.2
12MW-05D	1/8/2003	<0.17	<0.64	<0.15	0.34J	<8.8	---	<0.12	<0.15	0.39J	<10	<10	<10	<0.24	3	<0.1	<0.17	0.64	<0.18
12MW-05D	4/7/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	6.8	<0.43	3.7	<0.31	<0.34	0.47J	<0.11
12MW-05I	8/30/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<10	<10	16	<5	1.8	<5	<5	<5	<2
12MW-05I	11/30/2000	23	3.3	<0.42	12	---	---	<0.37	<0.35	23	<0.5	<0.5	22	<0.36	2.1J	12	<0.36	20	0.43J
12MW-05I	2/28/2001	0.33J	<0.23	<0.2	0.46J	---	---	<0.16	<0.23	1.1	<0.5	<0.5	9.8	<0.26	<0.96	0.46	<0.13	0.73	<0.17
12MW-05I	5/16/2001	1.4	<0.29	<0.35	0.6J	---	---	<0.35	<0.27	0.31J	<0.5	<0.5	13	<0.33	1.2J	0.86J	<0.43	0.71J	<0.19
12MW-05I	8/29/2001	0.48J	<0.29	<0.35	0.59J	---	<0.2	<0.35	<0.27	<0.31	<0.5	<0.5	12	<0.33	<0.96	0.7J	<0.43	0.73J	<0.19
12MW-05I	12/4/2001	<0.22	<0.23	<0.2	0.25J	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	17	<0.26	3.5	<0.13	<0.13	1	<0.17
12MW-05I	2/27/2002	<0.22	<0.23	<0.2	0.4J	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	11	<0.26	1.3J	<0.13	<0.13	1.5	<0.17
12MW-05I	6/11/2002	<0.17	<0.64	<0.15	0.35J	<8.8	---	<0.12	<0.15	<0.28	<5	<5	14J	<0.24	1.1J	<0.1	<0.17	1	<0.18
12MW-05I	9/10/2002	<0.26	<0.24	<0.18	<0.33	<5.4	---	<0.24	<0.24	<0.2	<10	<10	<10	<0.24	1.4J	0.17J	<0.19	0.63	<0.2
12MW-05I	1/8/2003	<0.17	<0.64	<0.15	<0.13	<8.8	<1	<0.12	<0.15	<0.28	<10	<10	14	<0.24	0.99J	<0.1	<0.17	0.61	<0.18
12MW-05I	4/7/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	7.9	<0.43	2	<0.31	<0.34	0.3J	<0.11
12MW-05I	7/14/2003	<0.16	<0.11	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<1	<1	7.1	<0.12	0.69J	<0.17	<0.14	0.37J	<0.1
12MW-05I	8/18/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	<0.34	<0.25	<0.11
12MW-05I	5/25/2005	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	8.1	<0.43	1.2J	<0.31	<0.34	0.61J	<0.11
12MW-05I	6/22/2006	<0.19	<0.21	<0.21	<0.14	<6.6	---	<0.21	<0.2	<0.34	<0.4	<0.5	8.1	<0.3	1.4J	<0.16	<0.17	<0.19	<0.17
12MW-05S	8/30/2000	640	66	13	10,000	---	---	<5	<5	1,500	<10	<10	170	<5	2.4	580	<5	27,000	33
12MW-05SR	8/30/2000	730	71	15	12,000	---	---	<5	<5	1,600	<10	<10	170	<5	2.4	670	<5	31,000	36
12MW-05S	11/30/2000	440	<35	<42	8,500	---	---	<37	<35	890	<0.5	8.8	170	<36	2.5J	400	<36	22,000	<31
12MW-05SR	11/30/2000	450J	<140	<170	8,400	---	---	<150	<140	710	<0.5	<0.5	150	<140	4.5J	260J	<140	21,000	<120
12MW-05S	2/28/2001	360J	<230	<200	7,100	---	---	<160	<230	580J	<0.5	6	130	<260	1.6J	270J	<130	12,000	<170
12MW-05SR	2/28/2001	360J	<230	<200	7,200	---	---	<160	<230	580J	8.6	6.6	140	<260	2.3J	280J	<130	12,000	<170
12MW-05S	5/16/2001	590J	<290	<350	8,900	---	---	<350	<270	690J	<0.5	<0.5	130	<330	3.7	500J	<430	16,000	<190
12MW-05SR	5/16/2001	510J	<290	<350	9,200	---	---	<350	<270	690J	<0.5	4.6	99	<330	3.2	440J	<430	17,000	<190
12MW-05S	8/29/2001	2,600	310J	<350	16,000	---	0.72	<350	<270	1,400	8.9	<0.5	110	<330	1.7J	3,100	<430	23,000	<190
12MW-05SR	8/29/2001	1,900	<290	<350	13,000	---	1.1	<350	<270	1,300	<0.5	<0.5	110	<330	1.8J	2,200	<430	21,000	<190
12MW-05S	12/4/2001	<330	<1300	<300	13,000	---	<0.2	<240	<300	1,100J	<0.5	<0.5	110	<470	4	740J	<350	25,000	<350
12MW-05SR	12/4/2001	<330	<1300	<300	14,000	---	<0.2	<240	<300	1,200J	<0.5	<0.5	140	<470	3.7	<210	<350	25,000	<350
12MW-05S	2/28/2002	<440	<460	<390	9,300	---	<0.2	<320	<460	800J	<0.5	<0.5	85	<510	2J	360J	<260	18,000	<350
12MW-05S	6/11/2002	790J	<1300	<300	13,000	<18,000	<1	<240	<300	1,600J	<5	<5	170	<470	3.3	<210	<350	23,000	<350
12MW-05SR	6/11/2002	840J	<1300	<300	14,000	<18,000	---	<240	<300	1,700J	<5	<5	170	<470	3.7	<210	<350	23,000	<350
12MW-05S	9/10/2002	490	74J	<15	12,000	<880	---	<12	<15	1,500	<10	<10	56	<24	4.9	540	<17	20,000	52J
12MW-05SR	9/10/2002	<330	<1300	<300	12,000	<18,000	---	<240	<300	1,700J	<10	<10	130	<470	4.7	560J	<350	20,000	<350
12MW-05S	1/8/2003	<33	<130	<30	11,000	<1,800	<1	<24	<30	1,000	<10	<10	160	<47	3.4	500	<35	20,000	<35

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-05SR	1/8/2003	<330	<1300	<300	11,000	<18,000	<1	<240	<300	1,200J	<10	<10	35	<470	3	550J	<350	20,000	<350
12MW-05S	4/10/2003	<53	<60	<68	9,400	<1,300	<1	<58	<59	1,200	<0.5	1.4	39	<85	2.2	<61	<67	21,000	<21
12MW-05SR	4/10/2003	<330	<210	<280	8,100	<6,300	---	<230	<320	1,100J	<0.5	2.5	62	<230	2.4	380J	<290	18,000	<210
12MW-05S	7/17/2003	<330	<210	<280	10,000	<6,300	<0.07	<230	<320	1,200J	<13	<13	140	<230	<5	740J	<290	20,000	<210
12MW-05SR	7/17/2003	<330	<210	<280	9,900	<6,300	---	<230	<320	1,200J	<10	<10	130	<230	---	720J	<290	19,000	<210
12MW-05S	9/16/2003	<460	<430	<400	8,900	<6,800	<0.07	<450	<420	1,200J	<5	5.2	95	<470	<5	660J	<470	16,000	<350
12MW-05SR	9/16/2003	<460	<430	<400	9,300	<6,800	---	<450	<420	1,300J	<5	<5	100	<470	---	700J	<470	18,000	<350
12MW-05S	1/14/2004	230	<60	<68	8,600	<1,300	0.07	<58	<59	1,200	<10	<10	62	<85	---	620	<67	18,000	<21
12MW-05SR	1/14/2004	<530	<600	<680	9,000	<13,000	---	<580	<590	1,200J	<10	<10	78	<850	---	650J	<670	18,000	<210
12MW-05S	4/27/2004	<330	<370	<420	9,000	<8,000	<0.07	<360	<370	1,300J	---	---	---	<530	<5	770J	<420	18,000	<130
12MW-05SR	4/27/2004	<530	<600	<680	7,500	<13,000	---	<580	<590	1,300J	<5	<5	170	<850	---	810J	<670	20,000	<210
12MW-05S	8/18/2004	290	68J	<43	9,600	<630	<0.067	<36	<44	1,400	<50	<50	180	<35	2.5	910	<42	22,000	120
12MW-05SR	8/18/2004	<380	<390	<430	8,800	<6,300	---	<360	<440	1,500	<20	<20	140	<350	---	1,000J	<420	22,000	<310
12MW-05S	2/2/2005	157J	<200	<36	6,330	<13	0.084	1	1.95	1,490	<5	5.5J	100	410J	<5	1,470	3.59	13,100	130
12MW-05SR	2/2/2005	<580	<420	<360	8,900	<7,000	---	<440	<400	2,000	<5	<5	100	1,100J	---	2,300	<380	20,000	<290
12MW-05S	5/24/2005	160	40J	<15	6,200	<280	0.064JM	<17	<16	2,300	<2.5	<2.5	92	<16	43	2,600	<15	15,000	170
12MW-05SR	5/24/2005	<530	<600	<680	5,900	<13,000	---	<580	<590	2,300J	<2.5	<2.5	92	<850	---	2,800	<670	16,000	<210
12MW-05S	9/13/2005	79	35J	<13	4,000	<560	---	<16	<18	2,500	<0.5	<0.5	4.6	<20	---	2,400	<16	11,000	140
12MW-05SR	9/13/2005	<210	<170	<160	3,900	<7,000	---	<200	<230	2,100	<0.5	<0.5	110	<250	---	2,200	<210	9,800	<200
12MW-05S	1/31/2006	99J	65J	<18	3,600	<350	---	<22	<20	2,300	<0.5	1.1J	69	34J	---	2,300	<19	11,000	160
12MW-05SR	1/31/2006	<210	<170	<160	3,600	<7,000	---	<200	<230	2,400	<0.5	0.78J	73	<250	---	2,500	<210	11,000	<200
12MW-05S	6/20/2006	120J	100J	<97	1,700	30J	---	<98	<100	2,200	1.1J	2.7	130	<180	3.3	1,500	<96	6,800	170J
12MW-05SR	6/20/2006	120J	120J	<97	1,900	<3,900	---	<98	<100	2,500	0.88J	2.4	100	<180	---	1,700	<96	6,900	200J
12MW-05S	9/12/2006	100J	100J	<97	1,700	<3,900	---	<98	<100	1,900	0.43J	1.1J	130	<180	---	1,000	<96	6,100	170J
12MW-05SR	9/12/2006	99J	98J	<97	1,500	<3,900	---	<98	<100	1,900	<0.4	0.6J	110	<180	---	980	<96	5,800	150J
12MW-05S	5/22/2007	22.5	59.7	1.68	990	<20	---	<0.3	<0.25	914	<2	2.71J	2,070	<2	2	296	0.79J	3,400	47.7
12MW-05SR	5/22/2007	23.3	60.9	1.6	1,050	---	---	<0.3	0.28J	971	<2	5.38J	2,520	<2	---	325	0.68J	3,510	49.4
12MW-05S	7/17/2007	27.2J	63.2	<12.5	874	<1,000	---	<15	<12.5	948	<2	<2	3,100	<100	2.7	355	<12.5	3,190	44.4J
12MW-05SR	7/17/2007	20.8J	60.3	<12.5	869	---	---	<15	<12.5	927	<2	<2	3,390	<100	---	358	<12.5	3,190	45.2J
12MW-05S	11/27/2007	9.52J	33.8	<6.25	858	---	---	<7.5	<6.25	685	<100	<100	3,480B	<50	2.6	208	<6.25	2,230	46.5
12MW-05S	5/6/2008	6.38J	55.5	<5	586	---	---	<6	<5	580	<2	<2	8,870	<40	2.6	91.3	<5	1,210	16.7J
12MW-05SR	5/6/2008	6.39J	56.7	<5	572	---	---	<6	<5	605	<2	<2	7,730	<40	2.8	85.4	<5	1,190	15.7J
12MW-05S	2/11/2009	6.86J	126	<5	564	---	---	<6	<5	510	<10	12.9J	6,490	<40	2.4	64.1	<5	666	<10
12MW-05SR	2/11/2009	<6.5	107	<5	496	---	---	<6	<5	455	<10	12.3J	6,250	<40	---	56.3	<5	629	<10
12MW-05S	7/20/2009	<5.0H	58	<5	370	<50H	---	1.3JH	<5	360	<10	23	6,200	<5.0H	2.2	68	<5.0H	450	37
12MW-06D	8/29/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	27	<5	1.8	<5	<5	<5	<2
12MW-06D	11/29/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	16	<0.18	2.8J	<0.21	<0.18	<0.17	<0.15
12MW-06D	2/27/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	16	<0.26	1.5J	<0.13	<0.13	<0.14	<0.17
12MW-06D	5/14/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	9.2	<0.26	3.9	<0.13	<0.13	<0.14	<0.17
12MW-06D	8/28/2001	<0.17	<0.64	<0.15	<0.13	---	---	<0.12	<0.15	<0.28	<0.5	<0.5	310	<0.24	2.1J	<0.1	<0.17	<0.13	<0.18
12MW-06D	7/16/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.25	<0.25	<0.25	<0.5
12MW-06D	11/28/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<2	<2	21.9J	<2	---	<0.25	<0.25	<0.25	<0.5
12MW-06D	2/11/2009	<0.325	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.45	<0.25	<0.25	<0.5
12MW-06S	8/29/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	36	<5	2	<5	<5	<5	<2
12MW-06S	11/29/2000	0.42J	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	46	<0.18	4.3	<0.21	<0.18	<0.17	<0.15
12MW-06S	2/27/2001	0.29J	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	23	<0.26	1.4J	<0.13	0.15J	<0.14	<0.17

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-06S	5/14/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	11	<0.26	2.9J	<0.13	<0.13	<0.14	<0.17
12MW-06S	8/28/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	15	<0.33	3.2	<0.38	<0.43	<0.34	<0.19
12MW-06S	12/4/2001	<0.22	<0.23	<0.2	<0.16	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	430	<0.26	3.4	<0.13	<0.13	0.15J	<0.17
12MW-06S	2/26/2002	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	71	<0.26	3.5	<0.13	<0.13	<0.14	<0.17
12MW-06S	6/11/2002	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<5	<5	75	<0.24	5.1	<0.1	<0.17	<0.13	<0.18
12MW-06S	9/9/2002	<0.26	<0.24	<0.18	<0.33	<5.4	---	<0.24	<0.24	<0.2	<10	<10	28	<0.24	4.8	<0.16	<0.19	<0.17	<0.2
12MW-06S	1/7/2003	<0.26	<0.24	<0.18	<0.33	<5.4	<1	<0.24	<0.24	<0.2	<10	<10	44	<0.24	3.6	<0.16	<0.19	<0.17	<0.2
12MW-06S	4/8/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	20	<0.43	2.5	<0.31	<0.34	<0.25	<0.11
12MW-06S	8/19/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	---	---	---	<0.18	---	<0.2	<0.21	<0.2	<0.15
12MW-06S	5/23/2005	<0.29	<0.21	<0.18	<0.17	<3.5	---	<0.22	<0.2	<0.23	---	---	---	<0.2	---	<0.21	<0.19	<0.28	<0.15
12MW-06S	6/22/2006	<0.19	<0.21	<0.21	<0.14	<6.6	---	<0.21	<0.2	<0.34	---	---	---	<0.3	---	<0.16	<0.17	<0.19	<0.17
12MW-06S	5/21/2007	<0.3H	<0.3H	<0.25H	<0.3H	---	---	<0.3H	<0.25H	<0.3H	---	---	---	<2H	---	<0.25H	<0.25H	<0.25H	<0.5H
12MW-06S	5/6/2008	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.25	<0.25	<0.25	<0.5
12MW-06S	2/11/2009	<0.33	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.45	<0.25	<0.25	<0.5
12MW-07D	8/28/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	19	<5	2.1	<5	<5	<5	<2
12MW-07D	11/29/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	10	<0.18	2.3J	<0.21	<0.18	<0.17	<0.15
12MW-07D	2/26/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	5.8	20	<0.26	1.4J	<0.13	<0.13	<0.14	<0.17
12MW-07D	5/14/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	9.4	<0.26	2.2J	<0.13	<0.13	<0.14	<0.17
12MW-07D	8/29/2001	0.7J	<0.29	<0.35	0.78J	---	<0.2	<0.35	<0.27	<0.31	11	<0.5	11	<0.33	1.1J	1J	<0.43	0.44J	<0.19
12MW-07S	8/28/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	120	<5	3.1	<5	<5	<5	<2
12MW-07S	11/28/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	120	<0.18	1.5J	<0.21	<0.18	<0.17	<0.15
12MW-07S	2/26/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	340	<0.26	<0.96	<0.13	0.14J	<0.14	<0.17
12MW-07S	5/14/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	190	<0.26	1.2J	<0.13	<0.13	<0.14	<0.17
12MW-07S	8/29/2001	0.55J	<0.29	<0.35	0.67J	---	<0.2	<0.35	<0.27	<0.31	<0.5	<0.5	150	<0.33	<0.96	0.77J	<0.43	0.38J	<0.19
12MW-07S	5/22/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.25	<0.25	<0.25	<0.5
12MW-07S	11/28/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<2	<2	45	<2	1.05	<0.25	<0.25	<0.25	<0.5
12MW-07S	2/12/2009	<0.325	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.45	<0.25	<0.25	<0.5
12MW-08D	8/29/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	7.6	<5	5.3	<5	<5	<5	<2
12MW-08D	11/28/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	8.3	<0.18	3J	<0.21	<0.18	<0.17	<0.15
12MW-08D	2/26/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	5.7	<0.26	1.8J	<0.13	<0.13	<0.14	<0.17
12MW-08D	5/14/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	2.5	<0.33	3.1J	<0.38	<0.43	<0.34	<0.19
12MW-08D	8/27/2001	<0.27	<0.29	<0.35	<0.26	---	<0.2	<0.35	<0.27	<0.31	<0.5	<0.5	5.4	<0.33	3.9	<0.38	<0.43	<0.34	<0.19
12MW-08S	8/28/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	150	<5	1.3	<5	<5	<5	<2
12MW-08S	11/28/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	52	<0.18	<1	<0.21	<0.18	<0.17	<0.15
12MW-08S	2/26/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	53	<0.26	<0.96	<0.13	<0.13	<0.14	<0.17
12MW-08S	5/14/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	12	<0.33	2.5J	<0.38	<0.43	<0.34	<0.19
12MW-08S	8/27/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	3.7	<0.33	1.7J	<0.38	<0.43	<0.34	<0.19
12MW-09D	8/29/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	720	<5	3	<5	<5	<5	<2
12MW-09D	11/29/2000	<0.18	0.24J	<0.21	0.18J	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	940	<0.18	5.4	<0.21	<0.18	<0.17	<0.15
12MW-09D	2/27/2001	<0.22	0.34J	<0.2	0.34J	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	640	<0.26	4.8	<0.13	<0.13	<0.14	<0.17
12MW-09D	5/15/2001	<0.27	0.31J	<0.35	0.3J	---	---	<0.35	<0.27	<0.31	<0.5	<0.5	380	<0.33	5	<0.38	<0.43	<0.34	<0.19
12MW-09D	8/29/2001	<0.22	0.33J	<0.2	0.52	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	570	<0.26	4.4	<0.13	<0.13	<0.14	<0.17
12MW-09D	12/3/2001	<0.17	<0.64	<0.15	<0.13	---	<0.2	<0.12	<0.15	<0.28	13	<0.5	550	<0.24	4.6	<0.1	<0.17	<0.13	<0.18
12MW-09D	2/26/2002	<0.22	<0.23	<0.2	0.19J	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	310	<0.26	5.1	<0.13	<0.13	<0.14	<0.17
12MW-09D	6/10/2002	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<5	<5	360	<0.24	5.8	<0.1	<0.17	<0.13	<0.18
12MW-09D	9/10/2002	<0.26	<0.24	<0.18	<0.33	<5.4	---	<0.24	<0.24	<0.2	<10	<10	230	<0.24	5.2	<0.16	<0.19	<0.17	<0.2

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-09D	1/7/2003	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<10	<10	300	<0.24	4.1	<0.1	<0.17	<0.13	<0.18
12MW-09D	4/9/2003	<0.16	0.14J	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<0.5	<0.5	340	<0.12	4.4	<0.17	<0.14	<0.12	<0.1
12MW-09D	7/16/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<50	<50	370	<0.43	4	<0.31	<0.34	<0.25	<0.11
12MW-09D	8/16/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	---	---	---	<0.18	---	<0.2	<0.21	<0.2	<0.15
12MW-09S	8/29/2000	<5	120	<5	120	---	---	<5	<5	<5	<2	<2	61	<5	2.5	<5	<5	<5	<2
12MW-09S	11/29/2000	1	97	<0.21	98	---	---	<0.18	<0.17	0.3J	<0.5	5.6	130	<0.18	1.9J	<0.21	<0.18	0.94	0.49J
12MW-09S	2/27/2001	0.79	86	<0.2	86	---	---	<0.16	<0.23	0.32J	<0.5	<0.5	92	<0.26	1.9J	<0.13	<0.13	0.89	0.24J
12MW-09S	5/15/2001	<2.2	73	<2.8	60	---	---	<2.8	<2.2	<2.4	<0.5	5.9	270	<2.7	3.3	<3	<3.4	<2.7	<1.5
12MW-09S	8/29/2001	<1.7	76	<1.6	83	---	<0.2	<1.3	<1.8	<1.9	<0.5	<0.5	230	<2.1	2.2J	<1	<1	1.3J	<1.4
12MW-09S	12/3/2001	<1.3	73	<1.2	69	---	<0.2	<0.95	<1.2	<2.2	<0.5	<0.5	120	<1.9	4	<0.82	<1.4	<1	<1.4
12MW-09S	2/26/2002	<1.7	51	<1.6	52	---	---	<1.3	<1.8	<1.9	<0.5	<0.5	64	<2.1	2.2J	<1	<1	<1.1	<1.4
12MW-09S	6/10/2002	<1.3	100	<1.2	110	290	---	<0.95	<1.2	<2.2	<5	<5	57	<1.9	3.2	<0.82	<1.4	<1	<1.4
12MW-09S	9/10/2002	<1	35	<0.7	31	150	---	<0.96	<0.98	<0.81	<10	<10	220	<0.95	2.4	<0.66	<0.77	1.3J	<0.79
12MW-09S	1/7/2003	<0.67	20	<0.6	18	63J	7	<0.48	<0.6	<1.1	<10	<10	560	<0.94	10	<0.41	<0.7	<0.51	<0.7
12MW-09S	4/8/2003	<0.33	22	<0.28	23	68	---	<0.23	<0.32	<0.44	<0.5	<0.5	630	<0.23	4	<0.34	<0.29	0.47J	<0.21
12MW-09S	7/15/2003	<0.53	30	<0.68	32	80	---	<0.58	<0.59	<0.8	<50	<50	660	<0.85	2.4	<0.61	1.5J	0.71J	0.39J
12MW-09S	9/17/2003	<0.33	28	<0.28	28	85	---	<0.23	<0.32	<0.44	<50	<50	700	<0.23	3.3	<0.34	0.46J	0.61J	<0.21
12MW-09S	1/13/2004	<0.41	23	<0.35	24	87	---	<0.28	<0.4	<0.55	<10	<10	220	<0.29	2.1	<0.43	<0.36	<0.31	<0.26
12MW-09S	4/28/2004	<0.47	23	<0.54	26	83	---	<0.45	<0.55	<0.36	<5	<5	54	<0.44	3.7	<0.51	<0.52	<0.5	<0.39
12MW-09S	8/16/2004	<0.53	20	<0.68	25	77	---	<0.58	<0.59	<0.8	<5	<5	87	<0.85	2.5	<0.61	<0.67	<0.49	<0.21
12MW-09S	5/25/2005	<0.66	29	<0.85	30	99	---	<0.73	<0.74	<1	<25	<25	100	<1.1	2.1	<0.77	<0.84	0.94J	0.62J
12MW-09S	1/31/2006	<0.52	27	<0.41	34	110	---	<0.51	<0.58	<0.45	<0.5	<0.5	72	<0.62	---	<0.4	<0.52	0.78J	0.65J
12MW-09S	6/22/2006	<0.47	17	<0.53	25	76	---	<0.52	<0.51	<0.85	<0.4	<0.5	110	<0.76	1.8	<0.4	<0.43	<0.47	0.63J
12MW-09S	9/12/2006	<0.47	15	<0.53	21	59	---	<0.52	<0.51	<0.85	<0.4	<0.5	49	1J	---	<0.4	<0.43	0.6J	0.57J
12MW-09S	5/22/2007	<0.3	9.03	<0.25	14.1	---	---	<0.3	<0.25	0.328J	<2	<2	56.8	<2	1.4	<0.25	<0.25	<0.25	<0.5
12MW-09S	11/28/2007	<0.3	5.84	<0.25	8.15	---	---	<0.3	<0.25	0.401J	<2	<2	71.2	<2	1.7	<0.25	<0.25	<0.25	<0.5
12MW-09S	2/12/2009	<0.325	2.52	<0.25	4.74	---	---	<0.3	<0.25	<0.3	<10	<10	17.2J	<2	1.8	<0.45	<0.25	<0.25	<0.5
12MW-10S	11/30/2000	19,000	7,000	<420	2,400	---	---	<370	<350	9,300	38	330	1,200	<360	14	3,300	<360	1,900	660J
12MW-10S	2/28/2001	38,000	15,000	<390	5,100	---	---	<320	<460	5,500	97	240	1,400	<510	17	3,100	<260	1,100	480J
12MW-10S	5/16/2001	17,000	5,000	<440	5,600	---	---	<430	<340	6,400	27	190	970	<420	14	3,500	<540	1,800	1,600
12MW-10SR	5/16/2001	16,000	5,200	<700	5,800	---	---	<690	<550	6,700	28	200	1,100	<660	15	3,500	<860	1,700J	1,700
12MW-10S	8/29/2001	19,000	6,600	<190	7,000	---	6.1	<150	<190	9,200	23	130	510	<300	12	4,200	<220	3,500	1,800
12MW-10SR	8/29/2001	18,000	5,900	<390	6,600	---	4.8	<320	<460	8,300	35	160	610	<510	13	3,700	<260	2,400	1,700
12MW-10S	12/5/2001	16,000	6,100	<300	12,000	---	5.4	<240	<300	12,000	28	150	370	<470	13	4,400	<350	2,600	2,200
12MW-10SR	12/5/2001	17,000	5,900	<300	11,000	---	5.3	<240	<300	12,000	42	200	450	<470	11	4,100	<350	2,500	2,300
12MW-10S	2/27/2002	16,000	5,400	<390	9,300	---	8.2	<320	<460	7,300	31	210	790	<510	13	3,400	<260	1,600	1,400
12MW-10SR	2/27/2002	16,000	5,400	<390	9,300	---	7.5	<320	<460	7,300	28	190	810	<510	12	3,300	<260	1,600	1,400
12MW-10S	6/11/2002	6,800	2,800	<140	4,900	<4,300	6	<190	<200	6,800	6.3J	140	470	<190	12	2,400	<150	1,200	1,600
12MW-10S	9/10/2002	11,000	4,400	47	4,700	1,700	---	<4.8	<6	7,000	130	11	180	<9.4	13	3,400	<7	1,300	1,400
12MW-10S	1/8/2003	17,000	7,700	79J	5,700	<1,800	4.3	<24	<30	3,500	160	36	31	<47	12	2,200	<35	900	760
12MW-10S	4/10/2003	5,600	2,400	<170	4,800	<3,200	9.2	<150	<150	2,300	11	140	710	870	11	1,800	<170	710	470
12MW-10S	7/16/2003	9,300	4,200	<270	9,700	<5,100	4.94	<230	<240	3,000	20	96	940	<340	15	3,400	<270	1,100	610
12MW-10S	9/16/2003	3,600	1,800	<140	4,400	<2,600	1.33	<120	<120	2,100	4.2	44	810	<170	11	1,600	<130	550	480
12MW-10S	1/14/2004	2,700	1,600	<27	4,300	<510	5.59	<23	<24	1,900	54	<10	1,200	<34		1,600	<27	580	460
12MW-10S	4/27/2004	2,500	1,500	<140	3,600	<2,600	6.33	<120	<120	1,800	---	---	---	<170	9.8	1,500	<130	570	440
12MW-10S	8/18/2004	3,100	2,100	27J	3,900	<130	5.35	<7.2	<8.8	---	<50	<50	1,100	<7	11	2,100	<8.4	730	630

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-10SR	8/18/2004	2,910	2,090	26.5	3,310	529	---	0.571J	1.59	2,520	---	---	---	4.24J	---	2,150	1.04	689	422
12MW-10S	2/2/2005	2,100	1,700	21J	4,700	330J	4.4	<8.7	<7.9	1,400	25J	100	1,300	<8	12	1,800	<7.6	470	330
12MW-10S	5/24/2005	7,600	5,000	82J	13,000	<1,400	18	<87	<79	2,200	26	74	860	<80	20	4,400	<76	1,100	410
12MW-10S	9/13/2005	5,200	4,700	<200	13,000	<8,700	---	<250	<290	2,200	<0.5	1.6	1,600	<310	---	3,200	<260	980	410J
12MW-10S	1/31/2006	1,900	1,800	<82	4,500	<3,500	---	<100	<120	1,000	2.9	14	300	<120	---	1,700	<100	460	220J
12MW-10S	6/21/2006	6,600	6,200	91J	17,000	1,200	---	<82	<81	2,300	140	230	710	<120	---	4,300	<68	1,100	370
12MW-10S	9/12/2006	1,700	2,100	<85	5,200	<2,600	---	<82	<81	920	1.4	6.5	460	<120	---	1,300	<68	380	170J
12MW-10S	5/22/2007	10,500	12,100	142J	33,400	<10,000	---	<150	<125	4,490	74.2	110	654	<1,000	21	8,530	<125	2,190	476J
12MW-10S	7/16/2007	265	671	7.66	1,230	<20	---	<0.3	0.375J	480	3.27J	6.77J	84.8	<2	10	435	<0.25	174	45.1
12MW-10S	11/27/2007	1,600	2,260	39.9	4,320	---	---	<6	<5	1,040	<20		649B	<40	11	1,820	<5	447	217
12MW-10S	5/6/2008	766	776	8.31J	1,190	---	---	<6	<5	433	10.1J	40	895	<40	7.7	379	<5	132	121
12MW-10S	9/1/2009	100	200	2.3	310	75	---	0.34J	<1	320	<10	13	120	<1	9.9	370	0.34J	150	95
12MW-11D	8/29/2000	<5	<5	<5	<5	---	---	<5	<5	<5	<2	<2	39	<5	2.6	<5	<5	<5	<2
12MW-11D	11/29/2000	<0.18	<0.18	<0.21	<0.17	---	---	<0.18	<0.17	<0.17	<0.5	<0.5	39	<0.18	4.1	<0.21	<0.18	<0.17	<0.15
12MW-11D	2/27/2001	<0.22	<0.23	<0.2	0.41J	---	---	<0.16	<0.23	0.75J	<0.5	6.9	42	<0.26	1.6J	2.3	<0.13	0.98	<0.17
12MW-11D	5/15/2001	<0.27	<0.29	<0.35	<0.26	---	---	<0.35	<0.27	<0.31	<0.5	5.2	28	<0.33	2.8J	<0.38	<0.43	<0.34	<0.19
12MW-11D	8/28/2001	<0.22	<0.23	<0.2	0.24J	---	---	<0.16	<0.23	<0.24	<0.5	6.6	26	<0.26	2.2J	<0.13	<0.13	0.47	<0.17
12MW-11D	12/4/2001	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	31	<0.26	3.2J	<0.13	<0.13	<0.14	<0.17
12MW-11D	2/27/2002	<0.22	<0.23	<0.2	<0.16	---	---	<0.16	<0.23	<0.24	<0.5	<0.5	22	<0.26	2.5	<0.13	<0.13	<0.14	<0.17
12MW-11D	6/10/2002	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<5	<5	35	<0.24	3.1	<0.1	<0.17	<0.13	<0.18
12MW-11D	9/9/2002	<0.26	<0.24	<0.18	<0.33	<5.4	---	<0.24	<0.24	<0.2	<10	<10	65	<0.24	2.5	<0.16	<0.19	<0.17	<0.2
12MW-11D	1/8/2003	<0.17	<0.64	<0.15	<0.13	<8.8	---	<0.12	<0.15	<0.28	<10	<10	40	<0.24	2.8	<0.1	<0.17	<0.13	<0.18
12MW-11D	4/9/2003	<0.16	<0.11	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<0.5	<0.5	12	<0.12	2.4	<0.17	<0.14	<0.12	<0.1
12MW-11D	7/16/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<5	<5	83	<0.43	2.7	<0.31	<0.34	<0.25	<0.11
12MW-11S	8/29/2000	<5	20	<5	130	---	---	<5	<5	<5	<2	<2	17	<5	6	<5	<5	7.6	<2
12MW-11S	11/29/2000	0.34J	6.1	<0.21	65	---	---	<0.18	<0.17	0.37J	<0.5	<0.5	19	<0.18	2.1J	<0.21	<0.18	3.8	<0.15
12MW-11SR	11/29/2000	0.57J	8.5	<0.21	74	---	---	<0.18	<0.17	0.68	<0.5	<0.5	14	<0.18	2.4J	<0.21	<0.18	6.4	<0.15
12MW-11S	2/27/2001	<0.87	9.3	<0.78	70	---	---	<0.65	<0.92	8.9	<0.5	<0.5	19	<1	1.4J	15	<0.52	16	<0.7
12MW-11S	5/15/2001	<1.1	5.5	<1.4	41	---	---	<1.4	<1.1	<1.2	<0.5	<0.5	12	<1.3	2.2J	<1.5	<1.7	2.6J	<0.75
12MW-11S	8/28/2001	1.1J	7	<0.78	80	---	<0.2	<0.65	<0.92	1.3J	<0.5	<0.5	15	<1	1.4J	<0.5	<0.52	38	<0.7
12MW-11S	1/8/2003	<0.17	12	0.23J	71	<8.8	---	<0.12	<0.15	0.58J	---	---	---	<0.24	---	<0.1	<0.17	1.4	<0.18
12MW-11S	8/19/2004	<1.5	13	<1.7	110	<25	---	<1.4	<1.8	<1.2	---	---	---	<1.4	---	<1.6	<1.7	<1.6	<1.2
12MW-11S	5/23/2005	<2.7	13	<3.4	89	<64	---	<2.9	<3	<4	---	---	---	<4.3	---	<3.1	<3.4	6.6J	<1.1
12MW-11S	6/20/2006	<0.94	8	<0.97	52	<39	---	<0.98	<1	<0.95	---	---	---	<1.8	---	<0.81	<0.96	3.1J	<0.98
12MW-11S	5/22/2007	<0.3	9.93	<0.25	55.5	---	---	<0.3	<0.25	1.16	<2	<2	37.6	<2	---	<0.25	<0.25	7.85	<0.5
12MW-11S	4/14/2009	<0.325	8.64	<0.25	64.7	---	---	<0.3	<0.25	6.36	---	---	---	<2	---	2.46	<0.25	85.4	<0.5
12MW-11SR	4/14/2009	<0.65	7.3	<0.5	59.7	---	---	<0.6	<0.5	4.92	---	---	---	<4	---	2.19	<0.5	68.3	<1
12MW-11S	7/20/2009	1.4	5.9H	0.23JH	64	<5	---	<1.0H	<1.0H	8.3	---	---	---	<1.0H	---	5.2	<0.5	89H	0.85
12MW-12D	8/28/2001	<0.22	<0.23	<0.2	0.34J	---	<0.2	<0.16	2	<0.24	<0.5	<0.5	8.5	<0.26	4.2	<0.13	0.41	2.3	<0.17
12MW-12D	8/18/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	---	---	---	<0.18	---	<0.2	<0.21	<0.2	<0.15
12MW-12D	7/16/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.25	<0.25	<0.25	<0.5
12MW-12S	8/28/2001	10	5.8	0.95	420	---	<0.2	<0.16	<0.23	29J	<0.5	<0.5	20	<0.26	1.6J	15	0.22J	2,900	0.44J
12MW-12S	12/4/2001	<8.7	<9.2	<7.8	680	---	<0.2	<6.5	<9.2	38	<0.5	<0.5	24	<10	2.4J	65	<5.2	2,400	<7
12MW-12S	2/27/2002	<55	<58	<49	280	---	<0.2	<41	<58	<61	<0.5	<0.5	21	<64	1.3J	<31	<32	1,800	<44
12MW-12S	6/10/2002	<42	<160	<38	880	<2,200	<1	<30	<37	<70	<5	<5	33	<59	2.8	110	<44	2,400	<44
12MW-12S	9/9/2002	<1.7	7.5J	<1.5	400	<88	---	<1.2	<1.5	50	<10	<10	20	<2.4	2.2	100	<1.7	2,200	<1.8

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-12S	1/8/2003	<1.7	<6.4	<1.5	170	<88	<1	<1.2	<1.5	18	<10	<10	13	<2.4	1J	8	<1.7	1,400	<1.8
12MW-12S	4/10/2003	<6.6	4.7J	<5.6	140	<130	---	<4.5	<6.4	9.2J	<0.5	<0.5	13	<4.6	1.3J	<6.9	<5.8	430	<4.1
12MW-12S	7/16/2003	<6.6	<7.5	<8.5	99	<160	---	<7.3	<7.4	<10	<25	<25	63	<11	1.5J	<7.7	<8.4	250	<2.7
12MW-12S	9/15/2003	<6.6	<7.5	<8.5	68	<160	<0.07	<7.3	<7.4	<10	<0.5	<0.5	8.6	<11	<5	<7.7	<8.4	180	<2.7
12MW-12S	1/13/2004	1.2	2.7	<0.28	48	<6.3	<0.07	<0.23	<0.32	4	<10	<10	<10	<0.23	---	2.6	<0.29	120	<0.21
12MW-12S	4/26/2004	<0.94	2.3J	<1.1	33	<16	<0.07	<0.9	<1.1	3.3	---	---	---	<0.88	<5	1.4J	<1	65	<0.77
12MW-12S	8/17/2004	1.2	3.1	0.29J	58	<3.2	<0.067	<0.18	<0.22	4.2	<1.3	<1.3	21	<0.18	1.7	2.7	<0.21	93	0.24J
12MW-12S	2/1/2005	<1.2	2.8J	<0.73	60	<14	---	<0.87	<0.79	4.4	0.66J	<0.5	14	1.5J	<0.54	2J	<0.76	80	<0.58
12MW-12S	5/24/2005	2.7J	4.1J	<3.4	86	<64	---	<2.9	<3	8.4J	<25	<25	69J	<4.3	5.7	4.6J	<3.4	130	1.2J
12MW-12S	9/12/2005	<2.6	3.1J	<2	100	<87	---	<2.5	<2.9	7.2J	<0.5	<0.5	18	<3.1	1.6J	2.7J	<2.6	150	<2.5
12MW-12S	1/30/2006	2.4J	3.5J	<1.6	150	<70	---	<2	<2.3	14	<0.5	<0.5	8.9	4.3J	---	2.7J	<2.1	400	<2
12MW-12S	6/20/2006	<7.5	<7.7	<7.7	150	<310	---	<7.8	<8.2	19J	<0.4	<0.5	17	16J	1.4J	7.6J	<7.6	570	<7.8
12MW-12S	9/11/2006	<7.5	<8.4	<8.5	300	<260	---	<8.2	<8.1	40J	<0.4	<0.5	3.8	<12	---	27	<6.8	960	<6.6
12MW-12S	5/22/2007	2.82	2.89	0.492J	495	---	---	<0.3	<0.25	86	<2	<2	45.7	<2	1.2	84	0.364J	1,280	5.34
12MW-12S	7/16/2007	2.61	2.86	0.387J	396	---	---	<0.3	<0.25	87.5	<2	<2	52.2	<2	1.5	95.8	0.477J	1,140	6.37
12MW-12S	11/26/2007	<6	<6	<5	417	---	---	<6	<5	114	<2	<2	33.4B	<40	1.4	103	<5	1,150	<10
12MW-12S	5/6/2008	<6	<6	<5	518	---	---	<6	<5	160	<2	<2	54.1	<40	1.7	139	<5	1,480	<10
12MW-12S	2/11/2009	<6.5	<6	<5	525	---	---	<6	<5	139	<10	<10	66	<40	1.2	130	<5	1290	<10
12MW-12S	4/14/2009	<6.5	10.2J	<5	657	---	---	<6	<5	114	---	---	---	<40	---	122	<5	1190	<10
12MW-12S	7/20/2009	2.6JH	20H	<10H	540	<100H	---	<10	<10H	210H	<10	<10	69	<10H	1.4	150	<10H	1,100	13H
12MW-13S	8/28/2001	<0.17	<0.64	<0.15	20	---	---	<0.12	<0.15	0.47J	<0.5	<0.5	4	<0.24	2.2J	<0.1	<0.17	16	<0.18
12MW-13S	12/4/2001	<0.22	<0.23	<0.2	1	---	<0.2	1.7	<0.23	<0.24	<0.5	<0.5	<0.5	<0.26	5.6	0.35J	<0.13	5.2	<0.17
12MW-13S	2/26/2002	<0.22	<0.23	<0.2	1	---	<0.2	<0.16	<0.23	<0.24	<0.5	<0.5	2.9	<0.26	1.7J	<0.13	<0.13	4.3	<0.17
12MW-13S	6/11/2002	<0.17	<0.64	<0.15	0.82	<8.8	<1	<0.12	<0.15	<0.28	<5	<5	<5	<0.24	1.6J	<0.1	<0.17	4	<0.18
12MW-13S	9/10/2002	<0.26	<0.24	<0.18	3.5	<5.4	---	<0.24	<0.24	<0.2	<10	<10	<10	<0.24	1.2J	<0.16	<0.19	3.9	<0.2
12MW-13S	1/7/2003	<0.17	<0.64	<0.15	34	<8.8	<1	<0.12	<0.15	<0.28	<10	<10	<10	<0.24	1.5J	<0.1	<0.17	21	<0.18
12MW-13S	4/8/2003	<1.1	<1.2	<1.4	65	<26	<1	<1.2	<1.2	<1.6	<0.5	<0.5	1.7	<1.7	2	<1.2	<1.3	37	<0.42
12MW-13SR	4/8/2003	<0.16	0.77	<0.14	52	<3.2	---	<0.11	<0.16	0.39J	---	---	---	<0.12	---	<0.17	<0.14	31	<0.1
12MW-13S	7/15/2003	<1.3	<1.5	<1.7	82	<32	---	<1.5	<1.5	<2	<0.5	<0.5	1.8	<2.1	0.88J	<1.5	<1.7	33	<0.53
12MW-13SR	7/15/2003	<1.3	<1.5	<1.7	76	<32	---	<1.5	<1.5	<2	---	---	---	<2.1	---	<1.5	<1.7	31	<0.53
12MW-13S	9/15/2003	<1.3	<1.5	<1.7	83	<32	<0.07	<1.5	<1.5	<2	<0.5	<0.5	1.1	<2.1	<5	<1.5	<1.7	26	<0.53
12MW-13SR	9/15/2003	<1.3	<1.5	<1.7	82	<32	---	<1.5	<1.5	<2	---	---	---	<2.1	---	<1.5	<1.7	25	<0.53
12MW-13S	1/13/2004	<0.27	<1.2	<0.34	41	<26	0.043J	<0.29	<0.3	<0.4	<10	<10	<10	<0.43	7.6	<0.31	<0.34	20	<0.11
12MW-13SR	1/13/2004	<1.1	<1.2	<1.4	47	<26	---	<1.2	<1.2	<1.6	---	---	---	<1.7	---	<1.2	<1.3	21	<0.42
12MW-13S	4/28/2004	<0.27	0.77J	<0.34	60	<6.4	<0.07	<0.29	<0.3	<0.4	<0.5	<0.5	3.5	<0.43	<5	<0.31	<0.34	14	<0.11
12MW-13SR	4/28/2004	<1.5	<1.6	<1.7	57	<25	---	<1.4	<1.8	<1.2	---	---	---	<1.4	---	<1.6	<1.7	15	<1.2
12MW-13S	8/17/2004	0.23J	0.82	<0.22	54	<3.2	<0.067	<0.18	<0.22	0.27J	<0.5	<0.5	4.1	<0.18	0.8J	<0.2	<0.21	15	0.23J
12MW-13SR	8/17/2004	<0.38	0.91J	<0.43	55	<6.3	---	<0.36	<0.44	<0.29	---	---	---	<0.35	---	<0.41	<0.42	15	<0.31
12MW-13S	2/2/2005	<1.5	<1	<0.91	62	<17	---	<1.1	<0.99	<1.2	<0.5	<0.5	2.6	1.3J	<0.54	<1	<0.95	14	<0.73
12MW-13SR	2/2/2005	<1.5	1.1J	<0.91	61	<17	---	<1.1	<0.99	<1.2	---	---	---	1.7J	---	<1	<0.95	14	<0.73
12MW-13S	5/24/2005	<1.5	1.3J	<0.91	95	<17	0.063JM	<1.1	<0.99	<1.2	<0.5	<0.5	2.4	<1	4.2J	<1	<0.95	43	<0.73
12MW-13SR	5/24/2005	<1.5	1.2J	<0.91	92	<17	---	<1.1	<0.99	<1.2	<0.5	<0.5	2.4	<1	2.5	<1	<0.95	42	<0.73
12MW-13S	9/12/2005	<2.1	<1.7	<1.6	110	<70	---	<2	<2.3	<1.8	<0.5	<0.5	<0.5	<2.5	---	<1.6	<2.1	30	<2
12MW-13SR	9/12/2005	<2.1	<1.7	<1.6	120	<70	---	<2	<2.3	<1.8	<0.5	<0.5	0.72J	<2.5	---	<1.6	<2.1	33	<2
12MW-13S	1/30/2006	<2.1	<1.7	<1.6	120	<70	---	<2	<2.3	<1.8	<0.5	<0.5	1.2J	3.4J		<1.6	<2.1	30	<2
12MW-13SR	1/30/2006	<2.1	<1.7	<1.6	130	<70	---	<2	<2.3	<1.8	<0.5	<0.5	0.88J	3.4J	---	<1.6	<2.1	32	<2

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-13S	6/22/2006	<1.5	<1.7	<1.7	82	<53	---	<1.6	<1.6	23	<0.4	<0.5	10	<2.4	1.1J	<1.3	<1.4	42	<1.3
12MW-13SR	6/22/2006	<1.5	<1.7	<1.7	87	<53	---	<1.6	<1.6	19	<0.4	<0.5	8.8	<2.4	---	<1.3	<1.4	39	<1.3
12MW-13S	9/11/2006	<1.5	<1.7	<1.7	64	<53	---	<1.6	<1.6	14	<0.4	<0.5	1.2	<2.4	---	<1.3	<1.4	29	<1.3
12MW-13SR	9/11/2006	<1.5	<1.7	<1.7	61	<53	---	<1.6	<1.6	13	<0.4	<0.5	2.3	<2.4	---	<1.3	<1.4	28	<1.3
12MW-13S	5/21/2007	<0.3	0.559J	<0.25	44	---	---	<0.3	<0.25	3.05	<2	<2	6.46J	<2	0.73J	<0.25	<0.25	16.4	<0.5
12MW-13SR	5/21/2007	<0.3	0.489J	<0.25	45.4	---	---	<0.3	<0.25	2.57	<2	<2	<6	<2	---	<0.25	<0.25	16.3	<0.5
12MW-13S	7/16/2007	<0.3	0.436J	<0.25	28.4	---	---	<0.3	<0.25	0.892J	<2	<2	<6	<2	1.2	<0.25	<0.25	9.96	<0.5
12MW-13SR	7/16/2007	<0.3	0.440J	<0.25	28.2	---	---	<0.3	<0.25	0.782J	<2	<2	11.5J	<2	---	<0.25	<0.25	9.69	<0.5
12MW-13S	8/22/2007	<0.3	0.416J	<0.25	23.8	---	---	<0.3	<0.25	1.01	---	---	---	<2	2.4	<0.25	<0.25	10.7	<0.5
12MW-13S	11/27/2007	<0.3	<0.3	<0.25	22.4	---	---	<0.3	<0.25	<0.3	<2	<2	41.6B	<2	1.2	<0.25	<0.25	5.17	<0.5
12MW-13SR	11/27/2007	<0.3	<0.3	<0.25	21.2	---	---	<0.3	<0.25	<0.3	<2	<2	28.0B	<2	1.2	<0.25	<0.25	5.16	<0.5
12MW-13S	5/5/2008	<0.3	0.520J	<0.25	35.8	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.25	<0.25	4.84	<0.5
12MW-13S	8/14/2008	<0.3	<0.3	<0.25	10.8	---	---	<0.3	<0.25	<0.3	<10	<10	<10	<2	1.1	<0.25	<0.25	3.57	<0.5
12MW-13SR	8/14/2008	<0.3	<0.3	<0.25	16.4	---	---	<0.3	<0.25	<0.3	<10.0	<10	<10	<2	---	<0.250	<0.250	5.34	<0.500
12MW-13S	2/11/2009	<0.325	<0.3	<0.25	16.1	---	---	<0.3	<0.25	<0.3	<10	<10	64.2	<2	0.96J	<0.45	<0.25	3.3	<0.5
12MW-13SR	2/11/2009	<0.325	<0.3	<0.25	16	---	---	<0.3	<0.25	<0.3	<10	<10	20.0J	<2	---	<0.45	<0.25	3.04	<0.5
12MW-13S	7/20/2009	<0.5	0.45JH	<0.50H	37	<5.0H	---	0.85	<0.50H	0.10JH	<10	<10	<10	<0.50H	1.3	<0.5	<0.50H	4.2	0.32J
12MW-13SR	7/20/2009	<0.50H	1.2	<0.5	36	<5	---	<0.5	<0.5	<0.50H	<10	<10	<10	<0.50H	1.5	<0.5	<0.50H	1.8H	0.36J
12MW-13S	9/1/2009	<0.5	0.48J	<0.5	31	<5	---	<0.5	<0.5	<0.5	<10	<10	22	<0.5	2.1	<0.5	<0.5	2.8	0.21J
12MW-13SR	9/1/2009	0.030J	0.46J	<0.5	30	<5	---	<0.5	<0.5	0.12J	<10	<10	14	<0.5	3.1	<0.5	<0.5	2.8	0.21J
12MW-14S	8/30/2001	<0.17	<0.64	<0.15	<0.13	---	---	<0.12	<0.15	<0.28	11	<0.5	1.4J	<0.24	2.6J	<0.1	<0.17	<0.13	<0.18
12MW-17S	9/10/2002	2.1	0.98	<0.18	240	<5.4	---	<0.24	<0.24	29J	<10	<10	19	<0.24	1.6J	110	0.32J	690	0.91
12MW-17S	1/7/2003	<0.84	<3.2	<0.76	350	<44	<1	<0.6	<0.75	31	<10	<10	46	<1.2	2.1	100	<0.87	720	<0.88
12MW-17S	4/9/2003	<6.6	<4.2	<5.6	160	<130	---	<4.5	<6.4	16J	<0.5	<0.5	45	<4.6	3	32	<5.8	320	<4.1
12MW-17S	7/15/2003	<11	<12	<14	170	<260	---	<12	<12	<16	<5	<5	73	<17	1.9	35J	<13	420	<4.2
12MW-17S	9/15/2003	<11	<12	<14	160	<260	<0.07	<12	<12	<16	<5	<5	26	<17	<5	30J	<13	370	<4.2
12MW-17S	1/13/2004	<11	<12	<0.68	190	<13	<0.07	<0.58	<0.59	24	<10	<10	35	<0.85		49	<0.67	420	<4.2
12MW-17S	4/26/2004	3.1	1.9	<0.43	280	<6.3	<0.07	<0.36	<0.44	30	<5	<5	39	<0.35	<5	72	<0.42	690	1.3
12MW-17S	8/17/2004	0.44J	0.51J	<0.43	70	<6.3	<0.067	<0.36	<0.44	7.1	<5	<5	41	<0.35	1.7	12	<0.42	230	<0.31
12MW-17S	2/1/2005	<5.8	<4.2	<3.6	150	<70	0.11	<4.4	<4	16J	2.4J	<1	23	<4	<5	33	<3.8	360	<2.9
12MW-17S	5/24/2005	<11	<12	<14	190	<260	---	<12	<12	27J	<25	<25	90	<17	3.2	46	<13	460	<4.2
12MW-17S	9/12/2005	<8.3	<7	<6.5	170	<280	---	<8.1	<9.2	23J	<0.5	<0.5	29	<9.9	1.8	38	<8.2	390	<7.9
12MW-17S	1/31/2006	<12	<8.4	<7.3	220	<140	---	<8.7	<7.9	31J	<0.5	<0.5	23	<8	---	54	<7.6	450	<5.8
12MW-17S	6/20/2006	<1.9	<1.9	<1.9	41	<77	---	<2	<2.1	6.3J	<0.4	<0.5	21	<3.6	1.7	9	<1.9	110	<2
12MW-17S	9/11/2006	<1.9	<2.1	<2.1	64	<66	---	<2.1	<2	10J	<0.4	<0.5	12	<3	---	13	<1.7	160	<1.7
12MW-17S	5/22/2007	<0.3	0.718J	<0.25	68.3	---	---	<0.3	<0.25	9.07	<2	<2	39.9	<2	1.4	9.19	<0.25	136	<0.5
12MW-17S	11/26/2007	<0.6	1.67J	<0.5	125	---	---	<0.6	<0.5	11.1	<2	<2	25.6B	<4	1.6	9.45	<0.5	194	<1
12MW-17S	5/6/2008	<0.3	2.82	0.380J	107	---	---	<0.3	<0.25	17	<2	<2	36.9	<2	1.8	13.1	<0.25	212	0.668J
12MW-17S	2/11/2009	<0.65	1.85J	<0.5	103	---	---	<0.6	<0.5	12.3	<10	<10	53.7	<4	1.4	11.9	<0.5	177	<1
12MW-17S	7/20/2009	2.7	1.4H	<1	45H	<10	---	<1.0H	<1.0H	9.6H	<10	<10	27	<1.0H	1.4	16	<1.0H	180	<1.0H
12MW-18S	4/9/2003	<13	86	<17	550	<320	---	<15	<15	<20	<0.5	<0.5	130	<21	9.4	<15	<17	<12	<5.3
12MW-18S	7/16/2003	<13	64	<17	500	<320	---	<15	<15	<20	<25	<25	62	<21	3.9	<15	<17	<12	<5.3
12MW-18S	9/17/2003	<13	54	<17	490	<320	---	<15	<15	<20	<5	<5	600	<21	4.1	<15	<17	<12	<5.3
12MW-18S	1/14/2004	<11	87	<14	440	<260	---	<12	<12	<16	<10	<10	150	<17	3.9	<12	<13	<9.9	<4.2
12MW-18S	4/27/2004	<6.6	84	<8.5	230	<160	---	<7.3	<7.4	<10	<20	<20	190	<11	7.6	<7.7	<8.4	7.7J	<2.7
12MW-18S	8/19/2004	<4.7	75	<5.4	240	<79	---	<4.5	<5.5	4.4J	<50	<50	510	<4.4	8.8	<5.1	<5.2	22	<3.9

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-18S	2/3/2005	<7.3	47	<4.6	380	<87	---	<5.5	<5	9.1J	---	---	---	7.4J	---	<5.2	<4.8	16J	<3.6
12MW-18S	5/23/2005	<11	71	<14	450	<260	---	<12	<12	<16	---	---	---	<17	---	<12	<13	25J	4.7J
12MW-18S	9/12/2005	<8.3	76	<6.5	390	<280	---	<8.1	<9.2	9.8J	---	---	---	<9.9	---	<6.4	<8.2	18J	<7.9
12MW-18S	1/31/2006	<12	89	<7.3	300	<140	---	<8.7	<7.9	<9.4	---	---	---	<8	---	<8.4	<7.6	19J	<5.8
12MW-18S	6/20/2006	<4.7	84	<5.3	230	<160	---	<5.2	<5.1	<8.5	---	---	---	<7.6	---	<4	<4.3	15J	4.4J
12MW-18S	9/11/2006	<3.7	72	<3.9	250	<150	---	<3.9	<4.1	6.2J	---	---	---	<7.2	---	<3.2	<3.8	15J	4.5J
12MW-18S	5/22/2007	<0.3	63.2	0.559J	235	---	---	<0.3	<0.25	8.59	---	---	---	<2	---	<0.25	<0.25	12.4	2.07
12MW-18S	7/16/2007	<0.3	59.8	0.517J	153	---	---	<0.3	<0.25	7.83	---	---	---	<2	---	<0.25	<0.25	13.9	2.3
12MW-18S	11/26/2007	0.609J	44	<0.5	161	---	---	<0.6	<0.5	8.83	<40	---	2,620B	<4	3.6	<0.5	<0.5	16	<1
12MW-18S	5/5/2008	<1.5	48.8	<1.25	305	---	---	<1.5	<1.25	15.6	<2	<2	3,430	<10	3.4	<1.25	<1.25	33.2	<2.5
12MW-18S	2/10/2009	<1.63	35	<1.25	778	---	---	<1.5	<1.25	25.6	---	---	---	<10	---	2.37J	<1.25	103	7.01
12MW-18S	7/20/2009	14	34	<5.0H	540H	<50H	---	<5.0H	<5	34H	<10	<10	2,600	<5.0H	3.7	2.2JH	<5	110H	17
12MW-19D	4/8/2003	<11	<12	<14	<16	<260	---	<12	<12	<16	3.2	7.4	72	<17	980	<12	<13	<9.9	<4.2
12MW-19D	7/14/2003	<13	<8.4	<11	<14	<250	---	<9	<13	<18	2.8	4.5	1,100	<9.2	670	<14	<12	<9.8	<8.2
12MW-19D	9/17/2003	<6.6	<4.2	<5.6	<6.8	<130	---	<4.5	<6.4	<8.8	<5	<5	2,600	<4.6	510	<6.9	<5.8	<4.9	<4.1
12MW-19D	1/14/2004	<2.1	<2.4	<2.7	<3.3	<51	---	2.6J	<2.4	<3.2	<10	<10	3,900	<3.4	---	<2.4	<2.7	<2	<0.85
12MW-19D	4/27/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	2.4	<0.22	<0.15	<200	<200	5,200	0.24J	220	<0.2	1.1	<0.2	<0.15
12MW-19D	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	2.5	<0.3	<0.4	<500	<500	5,100	<0.43	100	<0.31	20	<0.25	<0.11
12MW-19S	4/8/2003	<13	<15	<17	<21	<320	---	<15	<15	<20	1.9	4.9	130	<21	930	<15	<17	<12	<5.3
12MW-19S	7/14/2003	<13	22J	<11	<14	<250	---	<9	<13	<18	<250	<250	2,900	<9.2	650	<14	<12	<9.8	<8.2
12MW-19S	9/17/2003	<18	<17	<16	<21	<270	---	<18	<17	<17	<5	6	2,900	<19	670	<14	<19	<17	<14
12MW-19S	1/14/2004	<0.82	8.3	<0.7	<0.86	<16	---	1.3J	<0.8	<1.1	<10	<10	2,300	1J	360	<0.86	<0.72	<0.61	<0.52
12MW-19S	4/27/2004	<0.94	7.1	<1.1	<0.91	<16	---	1.3J	<1.1	<0.73	<200	<200	4,200	1.2J	270	<1	<1	<1	<0.77
12MW-19S	8/19/2004	<0.94	4.5	<1.1	<0.91	<16	---	1.7J	<1.1	<0.73	<500	<500	3,300	<0.88	150	<1	<1	<1	<0.77
12MW-19S	2/2/2005	<1.5	5.3	<0.91	<0.85	30J	---	1.3J	<0.99	<1.2	<250	<250	6,600	1.4J	67	<1	<0.95	<1.4	<0.73
12MW-19S	5/25/2005	<0.29	5.7	0.43J	<0.17	30	---	1.3	<0.2	<0.23	2.3	5.1	6,600	<0.2	61	<0.21	<0.19	<0.28	<0.15
12MW-19S	9/13/2005	<0.29	1.7	<0.18	<0.17	9.3J	---	1.3	<0.2	<0.23	<0.5	<0.5	3,200	<0.2	31	<0.21	<0.19	<0.28	<0.15
12MW-19S	1/31/2006	<0.21	0.53J	<0.16	<0.2	<7	---	1.3	<0.23	<0.18	55	0.52J	4,300	<0.25	---	<0.16	<0.21	<0.19	<0.2
12MW-19S	9/12/2006	<0.19	4.7	0.26J	<0.15	17J	---	2	<0.21	<0.19	<0.4	0.91J	3,300	<0.36	---	<0.16	<0.19	<0.3	<0.2
12MW-20D	4/8/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	4.5	<0.43	2	<0.31	<0.34	<0.25	<0.11
12MW-20D	7/15/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<5	<5	35	<0.43	1.8	<0.31	<0.34	<0.25	<0.11
12MW-20D	9/16/2003	<0.16	<0.11	<0.14	<0.17	<3.2	---	<0.11	<0.16	<0.22	<0.5	<0.5	14	<0.12	1.9	<0.17	<0.14	<0.12	<0.1
12MW-20D	1/12/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<10	<10	65	<0.43	2.3	<0.31	<0.34	<0.25	<0.11
12MW-20D	4/26/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<5	<5	250	<0.43	4.7	<0.31	<0.34	<0.25	<0.11
12MW-20D	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<50	<50	400	<0.43	2.9	<0.31	<0.34	<0.25	<0.11
12MW-20D	5/25/2005	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<250	<250	3,800	<0.43	2.1	<0.31	0.63J	<0.25	<0.11
12MW-20D	6/21/2006	<0.19	<0.19	<0.19	0.15J	<7.7	---	<0.2	<0.21	<0.19	<0.4	<0.5	1,100	<0.36	2.2	<0.16	<0.19	<0.3	<0.2
12MW-20D	2/12/2009	<0.325	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<10	<10	3,910	<2	2.2	<0.45	<0.25	<0.25	<0.5
12MW-20S	4/9/2003	<13	67	<17	410	<320	---	<15	<15	<20	<0.5	<0.5	59	<21	3	<15	<17	<12	<5.3
12MW-20S	7/16/2003	<5.3	35	<6.8	220	<130	---	<5.8	<5.9	<8	1.1	2.3	230	<8.5	260	<6.1	<6.7	<4.9	<2.1
12MW-20S	9/16/2003	<2.7	17	<3.4	110	<64	---	<2.9	<3	<4	<5	5.3	5,100	<4.3	500	<3.1	<3.4	<2.5	<1.1
12MW-20S	1/14/2004	<0.66	7.0	<0.85	43	26J	---	3.1	<0.74	<1	<10	<10	7,800	<1.1	310	<0.77	<0.84	<0.62	<0.27
12MW-20S	4/26/2004	<1.1	2.7J	<1.4	38	33J	---	3J	<1.2	<1.6	<200	<200	3,300	<1.7	92	<1.2	46	<0.99	<0.42
12MW-20S	8/19/2004	<0.75	0.88J	<0.86	13	31J	---	3.6	<0.88	<0.58	<500	<500	6,900	<0.7	38	<0.82	51	<0.8	<0.62
12MW-20S	2/2/2005	<0.29	1.5	0.45J	14	23	---	3.3	<0.2	0.34J	<250	<250	8,200	<0.2	7.2	<0.21	2.1	0.37J	0.22J
12MW-20S	5/25/2005	<0.29	0.57J	<0.18	6.9	6.8J	---	5	<0.2	<0.23	<500	<500	7,200	<0.2	6.2	<0.21	2.2	<0.28	<0.15

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-20S	9/13/2005	<0.29	1.2	<0.18	12	11J	---	3.7	<0.2	<0.23	0.86J	<0.5	5,400	<0.2	6.4	<0.21	0.8	<0.28	<0.15
12MW-20S	1/31/2006	<0.42	3.1	<0.33	26	19J	---	3.1	<0.46	0.61J	<500	<500	12,000	<0.49	---	<0.32	0.61J	0.42J	<0.39
12MW-20S	6/22/2006	<0.19	0.76	<0.21	6.5	<6.6	---	2.6	<0.2	<0.34	<0.4	<0.5	3,100	<0.3	6.2	<0.16	0.42J	<0.19	<0.17
12MW-20S	9/11/2006	<0.19	1.3	<0.21	12	10J	---	3	<0.2	<0.34	<0.4	<0.5	8,900	<0.3	---	<0.16	0.46J	<0.19	<0.17
12MW-20S	5/23/2007	<0.3	0.498J	<0.25	4.1	---	---	1.92	<0.25	<0.3	2.34J	<2	14,100	<2	4.5	<0.25	<0.25	<0.25	<0.5
12MW-20S	11/28/2007	<0.3	0.317J	<0.25	2.95	---	---	2.62	<0.25	<0.3	<40	<40	9,610	<2	4.1	<0.25	<0.25	<0.25	<0.5
12MW-20S	2/12/2009	<0.325	<0.3	<0.25	1.33	---	---	1.95	<0.25	<0.3	<10	<10	13,700	<2	4.5	<0.45	<0.25	<0.25	<0.5
12MW-21D	4/7/2003	<1.1	3.4J	<1.4	<1.6	<26	---	2.1J	<1.2	2.3J	4.2	7.7	2,400	<1.7	850	<1.2	<1.3	<0.99	<0.42
12MW-21D	7/15/2003	<0.82	1.1J	<0.7	<0.86	<16	---	2.3	<0.8	1.4J	<500	<500	1,900	<0.58	440	<0.86	<0.72	<0.61	<0.52
12MW-21D	9/16/2003	<0.82	<0.53	<0.7	<0.86	<16	---	1.9J	<0.8	<1.1	<5	<5	3,900	<0.58	360	<0.86	<0.72	<0.61	<0.52
12MW-21D	1/12/2004	<0.82	<0.53	<0.7	<0.86	<16	---	1.8J	<0.8	<1.1	<10	<10	15,000	<0.58	240	<0.86	<0.72	<0.61	<0.52
12MW-21D	4/27/2004	<1.3	<1.5	<1.7	<2.1	<32	318	1.8J	<1.5	<2	<500	<500	5,000	<2.1	130	<1.5	<1.7	<1.2	<0.53
12MW-21D	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	1.8	<0.3	<0.4	<500	<500	4,200	<0.43	97	<0.31	<0.34	<0.25	<0.11
12MW-21S	4/8/2003	<1.3	21	<1.7	<2.1	<32	456.9	<1.5	<1.5	2.9J	110	18	110	<2.1	440	<1.5	<1.7	<1.2	<0.53
12MW-21SR	4/8/2003	---	---	---	---	---	455.4	---	---	---	96	23	95	---	460	---	---	---	---
12MW-21S	7/15/2003	<5.3	25	<6.8	<8.2	<130	117	<5.8	<5.9	<8	39	13	160	<8.5	430	<6.1	<6.7	<4.9	<2.1
12MW-21SR	7/15/2003	---	---	---	---	---	---	---	---	---	41	19	<250	---	---	---	---	---	---
12MW-21S	9/15/2003	<5.3	17J	<6.8	<8.2	<130	321	<5.8	<5.9	<8	15	6.9	1,400	<8.5	430	<6.1	<6.7	<4.9	<2.1
12MW-21SR	9/15/2003	---	---	---	---	---	---	---	---	---	11	6.3	1,100	---	---	---	---	---	---
12MW-21S	1/13/2004	<1.3	47	<1.7	<2.1	<32	316	<1.5	<1.5	11	13	10	2,000	<2.1	370	<1.5	<1.7	<1.2	<0.53
12MW-21SR	1/13/2004	---	---	---	---	---	---	---	---	---	16	13	4,100	---	360	---	---	---	---
12MW-21S	4/27/2004	<0.94	56	2J	<0.91	<16	390	1.5J	<1.1	6.3	40	15	1,400	<0.88	340	<1	<1	<1	<0.77
12MW-21SR	4/27/2004	---	---	---	---	---	---	---	---	---	43	17	2,000	---	---	---	---	---	---
12MW-21S	8/19/2004	<1.9	55	3J	<1.8	<32	288M	2.4J	<2.2	2.2J	<130	<130	1,900	<1.8	100	<2	<2.1	<2	<1.5
12MW-21SR	8/19/2004	<5.3	46	<6.8	<8.2	<130	---	<5.8	<5.9	<8	<130	<130	1,900	<8.5	---	<6.1	<6.7	<4.9	<2.1
12MW-21S	2/1/2005	<2.9	21	<1.8	<1.7	<35	70	<2.2	<2	<2.3	<25	31J	2,000	<2	250	<2.1	<1.9	<2.8	<1.5
12MW-21SR	2/1/2005	---	---	---	---	---	---	---	---	---	25J	33J	2,000	---	---	---	---	---	---
12MW-21S	5/24/2005	<12	24J	<7.3	7.2J	<140	279	<8.7	<7.9	<9.4	11	8.9	2,200	<8	310	<8.4	<7.6	<11	<5.8
12MW-21S	9/13/2005	<12	20J	<7.3	<6.8	<140	---	<8.7	<7.9	<9.4	<0.5	<0.5	43	<8		<8.4	<7.6	<11	<5.8
12MW-21S	1/31/2006	<0.83	12	1.8J	<0.82	43J	---	1.8J	<0.92	<0.72	2.7	2.1	1,500J	1.7J	---	<0.64	<0.82	<0.74	<0.79
12MW-21S	6/22/2006	<0.19	13	1.5	<0.15	<7.7	---	2.2	<0.21	<0.19	6.3	7.4	730	<0.36	---	<0.16	<0.19	<0.3	<0.2
12MW-21S	9/11/2006	<1.9	20	<2.1	<1.4	<66	---	2.5J	<2	<3.4	0.81J	<0.5	640	<3	---	<1.6	<1.7	<1.9	<1.7
12MW-22D	4/9/2003	<0.16	3.1	<0.14	8	<3.2	388.9	0.41J	<0.16	29	1.5	3.4	1,800	0.44	190	<0.17	0.2J	0.21J	0.55
12MW-22D	7/14/2003	<0.41	2.2	<0.35	3.1	<7.9	106	0.93J	<0.4	9.6	5.2	8.6	1,900	0.67J	320	<0.43	0.55J	<0.31	0.58J
12MW-22D	9/17/2003	<0.41	0.96	<0.35	1.8	<7.9	311	0.86J	<0.4	6.6	<5	<5	5,700	<0.29	250	<0.43	100	<0.31	<0.26
12MW-22D	1/12/2004	<2.7	<3	<3.4	<4.1	<64	103	<2.9	<3	5.5J	<10	<10	16,000	<4.3		<3.1	140	<2.5	<1.1
12MW-22D	4/28/2004	<2.4	<2.5	<2.7	<2.3	<40	94.1	<2.3	<2.8	3.9J	<250	<250	4,400	<2.2	47	<2.6	130	<2.5	<1.9
12MW-22D	8/17/2004	<0.94	<0.98	<1.1	1.2J	<16	---	0.99J	<1.1	3.4	---	---	---	<0.88	---	<1	58	<1	<0.77
12MW-22D	5/25/2005	<1.2	<0.84	<0.73	<0.68	<14	51.4	1.4J	<0.79	1.3J	<500	<500	6,600	<0.8	80	<0.84	43	<1.1	<0.58
12MW-22D	6/21/2006	<0.19	<0.19	<0.19	<0.15	<7.7	---	1.3	<0.21	0.33J	<0.4	<0.5	5,500	<0.36	---	<0.16	1.2	<0.3	0.84
12MW-22D	5/22/2007	<0.3	<0.3	<0.25	<0.3	---	---	1.06	<0.25	<0.3	<2	<2	27,000	<2	---	<0.25	0.429J	<0.25	1.58
12MW-22D	11/28/2007	<0.3	<0.3	<0.25	<0.3	---	---	0.773J	<0.25	<0.3	<100	<100	20,100	<2	---	<0.25	0.300J	<0.25	0.852J
12MW-22D	9/1/2009	<0.5	<0.5	<0.5	<0.5	<5	---	1.7	<0.5	<0.5	---	---	---	<0.5	---	<0.5	<0.5	<0.5	0.39J
12MW-22S	4/10/2003	1,100	<300	<340	6,100	<6,400	4.7	<290	<300	1,200J	1.4	1.4	40	1,800	4	790J	<340	15,000	<110
12MW-22S	7/17/2003	650	200J	<170	2,100	<3,200	23.7	<150	<150	5,400	<5	11	400	<210	57	<150	<170	2,500	<53
12MW-22S	9/15/2003	<82	100J	<70	1,300	<1,600	77.3	<57	<80	4,600	1.2	3.2	92	<58	100	<86	<72	420	<52

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-22S	1/14/2004	43	33	<6.8	550	<130	235	<5.8	<5.9	2,100	<10	<10	2,400	<8.5		<6.1	<6.7	13J	<2.1
12MW-22S	4/28/2004	11J	19	<4.2	630	<80	208	<3.6	<3.7	1,500	<500	<500	3,600	<5.3	100	<3.8	<4.2	63	4.5J
12MW-22S	8/17/2004	<24	27J	<27	1,000	<400	29.5	<23	<28	1,600	<500	<500	5,000	<22	20	<26	<26	<25	<19
12MW-22S	2/3/2005	<37	<26	<23	980	<440	0.604	<27	<25	1,200	<250	<250	4,400	38J	8.1	<26	<24	<36	<18
12MW-22S	5/24/2005	4.4J	21	1.8J	820	<35	0.616M	<2.2	<2	860	<250	<250	5,000	<2	11	<2.1	<1.9	58	5.7
12MW-22S	9/13/2005	<8.3	11J	<6.5	440	<280	---	<8.1	<9.2	460	<0.5	<0.5	7.1	17J		<6.4	<8.2	<7.4	61
12MW-22S	1/31/2006	<17	23J	<13	630	<560	---	<16	<18	480	250J	<250	4,500	<20	---	<13	<16	170	280
12MW-22S	6/20/2006	<7.5	11J	<7.7	390	<310	---	<7.8	<8.2	210	0.75J	<0.5	7,700	19J	---	<6.5	<7.6	82	170
12MW-22S	9/11/2006	<7.5	11J	<7.7	450	<310	---	<7.8	<8.2	200	<0.4	<0.5	2,700	<14	---	<6.5	<7.6	89	130
12MW-22S	5/22/2007	<0.3	11.9	1.01	293	---	---	1.38	<0.25	147	<2	<2	16,300	<2	---	1.72	0.252J	54.1	211
12MW-22S	7/17/2007	<1.5	9.63	<1.25	265	---	---	1.85J	<1.25	121	<2	<2	18,100	<10	---	1.65J	<1.25	60	138
12MW-22S	11/27/2007	<0.6	5.4	<0.5	158	---	---	1.17J	<0.5	56.4	<200	<200	11,300B	<4	5.3	1.24J	<0.5	39.6	105
12MW-22S	5/6/2008	<0.6	7.57	<0.5	102	---	---	1.59J	<0.5	44.1	<2	<2	21,600	<4	5.2	2.44	<0.5	42.3	180
12MW-22S	2/11/2009	<0.65	4.56	<0.5	96.3	---	---	1.72J	<0.5	16.4	<10	<10	11,700	<4	4.1	2.15	<0.5	39.1	47.6
12MW-22S	9/1/2009	<0.5	4.4	0.72	100	39	---	1.9	<0.5	15	<10	<10	8,800	<0.5	3.9	1.3	0.34J	39	47
12MW-23D	4/8/2003	<0.16	<0.11	<0.14	0.72	<3.2	---	<0.11	<0.16	<0.22	<0.5	<0.5	9.6	<0.12	1.9	<0.17	<0.14	0.58	<0.1
12MW-23D	7/14/2003	<0.16	<0.11	<0.14	0.4J	<3.2	---	<0.11	<0.16	<0.22	<10	<10	120	<0.12	1.7	<0.17	<0.14	0.35J	<0.1
12MW-23D	9/17/2003	<0.16	<0.11	<0.14	0.22J	<3.2	---	<0.11	<0.16	<0.22	<5	<5	120	<0.12	<0.54	<0.17	0.26J	0.24J	<0.1
12MW-23D	1/12/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<10	<10	2,700	<0.43	2.2	<0.31	<0.34	<0.25	<0.11
12MW-23D	4/27/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<50	<50	680	<0.43	3.2	<0.31	<0.34	<0.25	<0.11
12MW-23D	8/18/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<200	<200	3,200	<0.43	2.8	<0.31	<0.34	<0.25	<0.11
12MW-23D	5/25/2005	<0.29	0.4J	<0.18	<0.17	<3.5	---	<0.22	<0.2	<0.23	<100	<100	1,700	<0.2	1.4J	<0.21	<0.19	<0.28	0.49J
12MW-23D	6/21/2006	<0.19	0.73J	<0.21	<0.14	<6.6	---	<0.21	<0.2	<0.34	<0.4	<0.5	1,700	<0.3	2	<0.16	<0.17	<0.19	1.8
12MW-23S	4/9/2003	<110	<120	<140	2,200	<2,600	<1	<120	<120	370J	1.1	2	65	740	2.8	<120	<130	4,200	<42
12MW-23S	7/16/2003	<110	<120	<140	2,100	<2,600	<0.07	<120	<120	450J	1.2	2.7	99	<170	<5	<120	<130	4,100	<42
12MW-23S	9/17/2003	<53	<60	<68	1,000	<1,300	<0.07	<58	<59	280	<5	5.2	110	<85	<5	<61	<67	1,900	<21
12MW-23S	1/14/2004	<2.1	13	<2.7	390	<51	0.07	<2.3	<2.4	150	<10	<10	31	<3.4	---	14	<2.7	790	<0.85
12MW-23S	4/27/2004	<2.4	16	<2.7	450	<40	<0.07	<2.3	<2.8	150	<5	<5	89	<2.2	<5	19	<2.6	770	<1.9
12MW-23S	8/17/2004	<15	16J	<17	480	<250	0.072J	<14	<18	160	<20	<20	170	38J	1.8	21J	<17	760	<12
12MW-23S	2/1/2005	97	99	<15	690	<280	---	<17	<16	150	<5	<5	89	<16	---	38J	<15	690	<12
12MW-23S	2/3/2005	---	---	---	---	---	0.154	---	---	---	---	---	---	---	<5	---	---	---	---
12MW-23S	5/25/2005	290	420	<15	1,600	<280	0.068JM	<17	<16	260	<10	<10	240	<16	30	100	<15	1,100	13J
12MW-23S	9/12/2005	77	240	<16	950	<700	---	<20	<23	200	<0.5	<0.5	6.9	<25	---	50J	<21	660	<20
12MW-23S	1/30/2006	260	520	<16	1,900	<700	---	<20	<23	360	0.54J	<0.5	570	30J	---	180	<21	890	23J
12MW-23S	6/21/2006	230	700	<27	2,100	<820	---	<26	<25	490	0.57J	<0.5	720	<38	---	190	<21	830	34J
12MW-23S	9/12/2006	99J	500	<39	1,800	<1,500	---	<39	<41	400	<0.4	<0.5	650	<72	---	100J	<38	670	39J
12MW-23S	5/21/2007	148H	956H	13	3,200H	---	---	<0.3	1.33	703H	2.49J	<2	3,010	<2	---	222H	0.748J	972H	61.1
12MW-23S	7/16/2007	151	1,220	14.9	3,240	---	---	<0.3	1.47	737	2.91J	3.53J	4,190	<2	---	221	0.900J	1,050	75.1
12MW-23S	11/27/2007	112	1,010	<12.5	3,180	---	---	<15	<12.5	602	<100	<100	2,650B	<100	2.1	263	<12.5	914	98.8
12MW-23S	5/6/2008	232	1,680	19.7J	4,080	---	---	<15	<12.5	1,030	4.71J	2.25J	5,500	<100	2.5	458	<12.5	1,160	109
12MW-23S	2/11/2009	57.9	876	<6.25	2,490	---	---	<7.5	<6.25	557	<10	<10	3,080	<50	1.9	201	<6.25	582	101
12MW-23S	7/20/2009	70H	1,100	<50H	3,300H	<500H	---	85	<50	810	<10	<10	1,500	<50H	1.8	290H	<50	720H	140H
12MW-23SR	7/20/2009	110	1,100	<10	3,200H	<250H	---	<25H	<25H	850H	<10	<10	1,500	<25H	2.5	290H	<10	760	200
12MW-24D	4/7/2003	<1.3	<1.5	<1.7	<2.1	<32	---	<1.5	<1.5	<2	2.1	4.6	7,700	<2.1	420	<1.5	<1.7	<1.2	<0.53
12MW-24D	7/16/2003	<1.3	<1.5	<1.7	<2.1	<32	---	1.6J	<1.5	<2	0.96	2	1,600	<2.1	260	<1.5	<1.7	<1.2	<0.53
12MW-24D	9/16/2003	<0.66	<0.75	<0.85	<1	<16	---	1.3J	<0.74	<1	<5	<5	7,500	<1.1	160	<0.77	<0.84	<0.62	<0.27

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-24D	1/12/2004	<0.16	<0.11	<0.14	0.29J	<3.2	---	1.6	<0.16	<0.22	<10	<10	14,000	0.25J	280	<0.17	0.53	0.18J	<0.1
12MW-24D	4/27/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	1.8	<0.3	<0.4	<500	<500	4,900	<0.43	120	<0.31	6	<0.25	<0.11
12MW-24D	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	2	<0.3	<0.4	<500	<500	5,800	<0.43	180	<0.31	21	<0.25	<0.11
12MW-24S	4/7/2003	<2.7	<3	<3.4	28	<64	---	<2.9	<3	120	2	5.3	3,500	<4.3	450	<3.1	<3.4	52	<1.1
12MW-24S	7/16/2003	<1.3	<1.5	<1.7	17	<32	---	1.9J	<1.5	75	<500	<500	1,400	<2.1	310	<1.5	<1.7	69	1.4J
12MW-24S	9/16/2003	<0.82	<0.53	<0.7	10	<16	---	2.5	<0.8	47	<5	5.8	4,600	<0.58	370	<0.86	<0.72	37	1.5J
12MW-24S	1/13/2004	<0.82	<0.53	<0.7	22	<16	---	2.7	<0.8	38	<10	<10	11,000	<0.58	85	<0.86	1J	6.1	1.8
12MW-24S	4/27/2004	<0.94	<0.98	<1.1	5.7	<16	---	2.8J	<1.1	54	<5	<5	4,300	<0.88	52	<1	1.1J	1.5J	<0.77
12MW-24S	8/18/2004	<1.3	<1.5	<1.7	5.8J	<32	---	2.7J	<1.5	58	<500	<500	8,700	<2.1	32	<1.5	<1.7	<1.2	<0.53
12MW-24S	2/1/2005	<1.5	<1	<0.91	5.7	<17	---	2.5J	<0.99	60	<250	<250	8,700	<1	27	<1	<0.95	<1.4	1.2J
12MW-24S	5/25/2005	<1.5	1.4J	<0.91	2.8J	30J	---	2.6J	<0.99	40	<500	<500	7,100	<1	29	<1	<0.95	<1.4	11
12MW-24S	9/12/2005	<0.42	13	1.4	1.3J	58	---	2.3	<0.46	18	1.7	7.5	6,000	0.53J	13	<0.32	0.48J	<0.37	17
12MW-24S	1/30/2006	<0.42	2.1	1.1J	0.68J	56	---	1.7	<0.46	7.8	<250	<250	7,800	0.61J	---	<0.32	<0.41	<0.37	12
12MW-24S	6/21/2006	<0.19	0.97	1.6	0.32J	72	---	2	<0.2	5.1	0.52J	0.91J	8,900	<0.3	15	<0.16	0.47J	<0.19	14
12MW-24S	9/11/2006	<0.19	0.36J	0.71J	0.31J	33	---	2	<0.2	4.2	2.3	0.65J	5,800	<0.3	---	<0.16	0.48J	<0.19	8.7
12MW-25D	4/8/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<0.5	<0.5	22	<0.43	1.7J	<0.31	<0.34	0.46J	<0.11
12MW-25D	7/15/2003	<0.27	<0.3	<0.34	1.1J	<6.4	---	<0.29	<0.3	<0.4	<10	<10	180	<0.43	11	<0.31	<0.34	0.76J	<0.11
12MW-25D	9/16/2003	<0.16	0.18J	<0.14	1.3	<3.2	---	0.13J	<0.16	0.35J	<5	<5	920	<0.12	57	<0.17	<0.14	0.83	<0.1
12MW-25D	1/12/2004	<0.27	<0.3	<0.34	1.1J	<6.4	---	<0.29	<0.3	0.59J	<10	<10	2,900	<0.43	87	<0.31	<0.34	<0.25	<0.11
12MW-25D	4/28/2004	<0.19	0.44J	<0.22	1.6	<3.2	---	0.51J	<0.22	0.33J	<500	<500	4,900	0.55J	200	<0.2	0.45J	0.51J	<0.15
12MW-25D	8/16/2004	<0.27	<0.3	<0.34	1J	<6.4	---	<0.29	<0.3	0.48J	<500	<500	6,000	<0.43		<0.31	2.6	<0.25	<0.11
12MW-25D	5/23/2005	<0.29	<0.21	<0.18	1.3	<3.5	---	0.64J	<0.2	0.33J	<250	<250	6,300	0.24J	100	<0.21	58	0.29J	0.29J
12MW-25D	6/21/2006	<0.19	<0.19	<0.19	0.26J	<7.7	---	0.62J	<0.21	0.31J	<0.4	<0.5	5,900	<0.36	7	<0.16	0.61J	<0.3	0.54J
12MW-25S	4/9/2003	<1.3	<1.5	<1.7	25	<32	<1	<1.5	<1.5	24	<0.5	<0.5	21	<2.1	1.2J	<1.5	<1.7	63	<0.53
12MW-25S	7/15/2003	<1.3	<1.5	<1.7	43	<32	<0.07	<1.5	<1.5	36	<5	<5	30	<2.1	<5	<1.5	<1.7	100	0.56J
12MW-25S	9/17/2003	<1.3	<1.5	<1.7	33	<32	4.72	<1.5	<1.5	48	<10	<10	180	<2.1	<5	<1.5	<1.7	58	<0.53
12MW-25S	1/13/2004	<0.82	0.73J	<0.7	25	<16	15.6	<0.57	<0.8	64	<10	<10	1,700	<0.58		<0.86	11	13	<0.52
12MW-25S	4/27/2004	<1.3	<1.5	<1.7	23	<32	11.5	<1.5	<1.5	67	<10	<10	3,500	<2.1	15	<1.5	37	5.6	<0.53
12MW-25S	8/18/2004	<0.94	<0.98	<1.1	23	<16	<0.067	<0.9	<1.1	69	<500	<500	6,500	<0.88	13	<1	41	6.5	<0.77
12MW-25S	2/1/2005	<1.5	<1	<0.91	25	<17	---	<1.1	<0.99	83	<250	<250	6,400	<1	6.8	<1	34	1.4J	1.1J
12MW-25S	5/23/2005	<2.7	<3	<3.4	20	<64	---	<2.9	<3	87	<250	<250	4,700	<4.3	9.9	<3.1	15	4.6J	1.2J
12MW-25S	9/12/2005	<2.1	<1.7	<1.6	16	<70	---	<2	<2.3	78	<0.5	<0.5	6,100	<2.5	5.7	<1.6	3.9J	2.4J	9.7
12MW-25S	1/30/2006	<2.1	<1.7	<1.6	11	<70	---	<2	<2.3	62	<250	<250	6,800	4J	---	<1.6	2.2J	<1.9	28
12MW-25S	6/21/2006	<0.94	<1	<1.1	9	<33	---	<1	<1	53	<0.4	<0.5	5,100	<1.5	6.3	<0.81	2J	1.8J	39
12MW-25S	9/11/2006	<0.94	<1	<1.1	6	<33	---	<1	<1	41	<0.4	<0.5	4,300	<1.5	---	<0.81	2.2J	2J	51
12MW-25S	5/21/2007	<0.3	<0.3	<0.25	0.645J	---	---	1.3	<0.25	10.2	<2	<2	17,900	<2	4.1	<0.25	3.04	0.926J	71.6
12MW-25S	7/16/2007	<0.3	<0.3	<0.25	<0.3	---	---	1.2	<0.25	5.97	<2	<2	22,700	<2	4.4	<0.25	2.16	0.479J	68.4
12MW-25S	11/27/2007	<0.3	<0.3	<0.25	<0.3	---	---	0.877J	<0.25	3.3	<200	<200	11,500B	<2	4.1	<0.25	1.91	0.336J	78.8
12MW-25S	5/6/2008	<0.3	<0.3	<0.25	<0.3	---	---	1.25	<0.25	2.24	<2	<2	22,600	<2	4	<0.25	2.39	<0.25	54.4
12MW-25S	2/11/2009	<0.325	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	1.26	<10	<10	9,980	<2	2.9	<0.45	2.16	<0.25	56.1
12MW-25S	9/1/2009	<0.5	0.12J	<0.5	<0.5	<5	---	1.7	<0.5	1.1	<10	<10	4,900	<0.5	2.5	<0.5	2.7	<0.5	59
12MW-26S	4/8/2003	<0.16	4.6	0.6	150	<3.2	<1	<0.11	<0.16	0.35J	<0.5	<0.5	79	<0.12	3.1	<0.17	<0.14	0.25J	0.41
12MW-26S	7/16/2003	<0.66	4.3	<0.85	140	<16	25	<0.73	<0.74	<1	<130	<130	930	<1.1	51	<0.77	31	<0.62	0.45J
12MW-26S	9/17/2003	<3.3	<3.7	<4.2	140	<80	---	<3.6	<3.7	<5	<5	<5	140	<5.3	---	<3.8	42	<3.1	<1.3
12MW-26S	1/13/2004	<3.3	7J	<4.2	230	<80	2.83	<3.6	<3.7	12J	<10	<10	3,700	<5.3	---	<3.8	13J	32	<1.3
12MW-26S	4/27/2004	47	46	<6.8	900	<130	---	<5.8	<5.9	62	<100	<100	1,200	<8.5	---	18J	<6.7	590	<2.1

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-26S	8/18/2004	780	390	<6.8	2,600	<130	1.1M	<5.8	<5.9	160	<250	<250	3,500	<8.5	2.8	320	<6.7	1,000	9.8
12MW-26S	2/2/2005	2,300	1,700	<46	7,000	<870	---	<55	<50	440	<25	<25	1,300	<50	---	1,100	<48	1,600	73J
12MW-26S	5/25/2005	2,500	2,200	<91	7,300	<1,700	---	<110	<99	650	---	---	---	<100	---	1,500	<95	1,700	130J
12MW-26S	9/28/2005	1,600	2,000	<82	5,800	<3,500	---	<100	<120	810	---	---	---	<120	---	1,300	<100	1,200	140J
12MW-26S	1/31/2006	2,100	3,800	75	8,400	2,000	---	<17	<16	1,500	---	---	---	29J	---	2,100	<15	2,000	280
12MW-26S	7/5/2006	1,300	2,700	<97	5,900	<3,900	---	<98	<100	1,300	---	---	---	<180	---	1,600	<96	1,500	180J
12MW-26S	9/12/2006	380	930	<42	1,900	<1,300	---	<41	<40	510	---	---		<61	---	420	<34	520	130
12MW-26S	5/21/2007	1,500H	4,420H	66.8	9,980H	3,330	---	<0.3	3.86	2,940H	16.6J	25.5	1,950	<2	2.6	3,270H	1.49	3,440H	234H
12MW-26S	7/16/2007	1,270	4,560	42.3	8,820	<20	---	0.367J	2.43	2,840	11.1J	17.5J	7,250	<2	3.8	2,700	1.14	4,410	284
12MW-26S	8/22/2007	1,080	3,710	46.7J	6,910	<2,000	---	<30	<25	2,390	<100	<100	13,000	<200	3.8	3,230	<25	3,940	281
12MW-26SR	8/22/2007	1,480	5,370	72.0J	9,580	<2,000	---	<30	<25	3,470	<100	<100	13,200	<200	4.2	4,290	<25	5,280	379
12MW-26S	11/26/2007	761	2,720	<25	5,890	---	---	<30	<25	1,830	<200	<200	4,260B	<200	3.7	2,250	<25	3,230	216
12MW-26SR	11/26/2007	991	3,370	<25	7,520	---	---	<30	<25	2,240	<100	<100	4,890B	<200	3.8	2,670	<25	3,920	278
12MW-26S	5/6/2008	107	540	6.19J	1,160	---	---	<6	<5	315	7.99J	12.5J	4,890	<40	2.6	567	<5	597	141
12MW-26S	8/14/2008	803	3,030	52.8	7500	---	---	.314J	3.65	2,420	<200	<200	6,760	<2	3	2,890	9.89	4,490	177J
12MW-26S	2/11/2009	655	3,920	55	8,730	---	---	<6	<5	2,700	19.1J	26.7	2,300	<40	3.3	3,840	<5	4,690	381
12MW-26S	7/20/2009	370H	3,000	<50	6,900H	1,000	---	<50H	<50H	2,300	<10	16	710	<50H	2.5	3,200	<50H	3,700	700
12MW-26S	9/1/2009	520	4,200	55	10,000	2,800	---	<25	<25	3,100	<10	17	1,200	<25	4	4,100	<25	5,200	510
12MW-27D	4/8/2003	<0.16	0.15J	<0.14	0.49J	<3.2	---	<0.11	<0.16	<0.22	<0.5	<0.5	8.2	<0.12	3.7	<0.17	<0.14	0.28J	<0.1
12MW-27D	7/15/2003	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<5	<5	22	<0.43	2	<0.31	<0.34	<0.25	<0.11
12MW-27D	9/16/2003	<0.23	<0.22	<0.2	<0.26	<3.4	---	<0.23	<0.21	<0.22	<0.5	<0.5	11	<0.24	---	<0.18	<0.23	<0.22	<0.18
12MW-27D	1/12/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	<10	<10	<10	<0.43	2.5	<0.31	<0.34	<0.25	<0.11
12MW-27D	4/28/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	<1	<1	16	<0.18	3.9	<0.2	<0.21	<0.2	<0.15
12MW-27D	8/18/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	9.6	<1.3	71	<0.18	4.3	<0.2	<0.21	<0.2	<0.15
12MW-27D	5/23/2005	<0.29	<0.21	<0.18	<0.17	<3.5	---	<0.22	<0.2	<0.23	<130	<130	3,700	<0.2	5.9	<0.21	<0.19	<0.28	<0.15
12MW-27D	6/21/2006	<0.19	<0.21	<0.21	0.18J	<6.6	---	<0.21	<0.2	<0.34	<0.4	<0.5	4,100	<0.3	3.5	<0.16	<0.17	<0.19	0.2J
12MW-27S	4/9/2003	<1.3	110	<1.7	290	53J	---	<1.5	<1.5	8.8	<0.5	<0.5	110	<2.1	2.4	<1.5	<1.7	18	4.6
12MW-27S	7/16/2003	<6.6	94	<8.5	400	<160	---	<7.3	<7.4	16J	<25	<25	190	<11	3.3	<7.7	<8.4	45	5.8J
12MW-27S	9/16/2003	<5.7	74	<5	380	<85	---	<5.6	<5.3	<5.4	<5	<5	180	<5.9	3.3	<4.5	<5.9	42	<4.4
12MW-27S	1/14/2004	<0.41	100	1.2	340	56	---	<0.28	<0.4	11	<10	<10	110	<0.29	2.6	<0.43	<0.36	25	4.5
12MW-27S	4/27/2004	<0.47	98	1.1J	380	55	---	<0.45	<0.55	14	<5	<5	140	<0.44	3.2	<0.51	<0.52	36	3.1
12MW-27S	8/18/2004	<0.66	120	1.3J	500	65	---	<0.73	<0.74	14	<50	<50	610	<1.1	3.7	<0.77	<0.84	36	6.1
12MW-27S	2/3/2005	<7.3	65	<4.6	330	<87	---	<5.5	<5	13J	---	---	---	<5	---	<5.2	<4.8	34	3.8J
12MW-27S	5/23/2005	<7.3	61	<4.6	380	<87	---	<5.5	<5	16J	<50	<50	1,100	<5	5	<5.2	12J	34	5.4J
12MW-27S	9/13/2005	<4.2	40	<3.3	240	<140	---	<4	<4.6	15	<0.5	<0.5	750	6.6J	3.8	<3.2	<4.1	25	<3.9
12MW-27S	1/31/2006	<5.2	53	<4.1	200	<170	---	<5.1	<5.8	13J	<0.5	<0.5	1,000	<6.2	---	<4	<5.2	17	<4.9
12MW-27S	6/21/2006	<3.7	50	<4.2	200	<130	---	<4.1	<4	16J	<0.4	<0.5	470	<6.1	5.1	<3.2	<3.4	18	4.3J
12MW-27S	9/12/2006	<3.7	54	<3.9	240	<150	---	<3.9	<4.1	18	<0.4	<0.5	530	<7.2	---	<3.2	<3.8	22	5.5J
12MW-27S	5/23/2007	<0.3	31.6	0.684J	395	---	---	<0.3	<0.25	22	<2	<2	2120	<2	2.9	0.28J	<0.25	40.7	4
12MW-27S	7/17/2007	<3	32.8	<2.5	512	---	---	<3	<2.5	30	<2	<2	2,570	<20	3.7	<2.5	<2.5	71.3	6.12J
12MW-27S	11/27/2007	<3	10.1	<2.5	447	---	---	<3	<2.5	19	<20	<20	1,510B	<20	3.5	<2.5	<2.5	78.8	<5
12MW-27S	5/5/2008	0.624J	24.7	2.03	761	---	---	<0.3	0.268J	38	<2	<2	1,930	<2	3.61	1.99	<0.25	165	5.76
12MW-27S	2/10/2009	<3.3	18	<2.5	860	---	---	<3	<2.5	32	<10	<10	1,690	<20	3.69	<4.5	<2.5	145	21.8
12MW-27S	7/20/2009	<10H	44	<10H	1,000	110	---	<10	<10H	30H	<10	<10	360	24	3.4	30	<10	170	63
12MW-28D	4/8/2003	<0.16	1.7	<0.14	4.2	<3.2	---	<0.11	<0.16	2.3	<0.5	<0.5	9.1	<0.12	1.7J	3.1	<0.14	7.6	<0.1
12MW-28D	7/15/2003	<0.66	7.5	<0.85	14	<16	---	<0.73	<0.74	9.7	<1	<1	13	<1.1	1.1J	10	<0.84	26	0.59J

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-28D	9/17/2003	<0.16	6.1	<0.14	12	<3.2	---	<0.11	<0.16	12	<5	<5	92	<0.12	2	6.7	<0.14	16	0.65
12MW-28D	1/12/2004	<0.27	8.6	<0.34	2.7	<6.4	---	<0.29	<0.3	20	<10	<10	430	<0.43	13	0.58J	<0.34	2.9	23
12MW-28D	4/26/2004	<0.66	5.7	<0.85	<1	<16	---	<0.73	<0.74	<1	<2.5	<2.5	1,100	<1.1	7.2	<0.77	<0.84	<0.62	40
12MW-28D	8/17/2004	<0.75	8.5	<0.86	<0.73	<13	---	<0.72	<0.88	<0.58	<500	<500	3,800	0.76J	3	<0.82	<0.84	<0.8	43
12MW-28D	5/25/2005	<1.2	6.9	<0.73	<0.68	<14	0.076	<0.87	<0.79	<0.94	<250	<250	5,700	<0.8	44	<0.84	<0.76	<1.1	55
12MW-28D	6/22/2006	<0.94	3.4J	<0.97	<0.76	<39	---	<0.98	<1	<0.95	<0.4	0.5J	3,800	<1.8	---	<0.81	<0.96	<1.5	59
12MW-28D	5/22/2007	<0.3	1.64	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<2	<2	15,500	<2	---	<0.25	0.496J	<0.25	41.6
12MW-28D	7/16/2007	<0.3	1.2	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.25	0.309J	<0.25	21.7
12MW-28D	11/28/2007	<0.3	0.93J	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<40	<40	5910	<2	---	<0.25	0.272J	<0.25	24.8
12MW-28D	2/11/2009	<0.32	0.63J	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<10	<10	4,770	<2	1.8	<0.45	<0.25	<0.25	17.5
12MW-28S	4/9/2003	3,700	1,300J	<680	20,000	<13,000	<1	<580	<590	5,300	3.6	6.7	63	<850	5.2	5,300	<670	17,000	350J
12MW-28SR	4/9/2003	3,100	1,100J	<680	18,000	<13,000	---	<580	<590	4,800	3.6	6.5	77	<850	4.7	4,900	<670	16,000	290J
12MW-28S	7/17/2003	3,300	1,300	<280	15,000	<6,300	0.087	<230	<320	4,500	12	15	1,100	<230	<5	5,600	<290	15,000	<210
12MW-28SR	7/17/2003	3,200	1,200	<280	14,000	<6,300	---	<230	<320	4,400	12	15	1,200	<230	---	5,200	<290	14,000	<210
12MW-28S	9/15/2003	3,900	1,600	<280	16,000	<6,300	0.077	<230	<320	5,300	6.6	6.5	520	<230	<5	5,600	<290	15,000	<210
12MW-28SR	9/15/2003	3,900	1,600	<280	16,000	<6,300	---	<230	<320	5,600	7.1	6.7	310	<230	---	5,500	<290	15,000	<210
12MW-28S	1/14/2004	3,200	1,400	<34	12,000	<640	0.084	<29	<30	5,400	12	<10	280	<43	---	5,100	<34	12,000	280
12MW-28SR	1/14/2004	3,000	1,500	<340	11,000	<6,400	---	<290	<300	5,100	<10	<10	280	<430	---	4,700	<340	12,000	<110
12MW-28S	4/28/2004	3,100	1,600	<42	11,000	<800	<0.07	<36	<37	5,300	<25	<25	310	<53	<5	5,500	<42	12,000	290
12MW-28SR	4/28/2004	2,800	1,500	<340	10,000	<6,400	---	<290	<300	4,700	<25	<25	340	<430	---	5,200	<340	12,000	300J
12MW-28S	8/17/2004	3,000	1,700	<27	14,000	<400	<0.067	<23	<28	5,300	<25	<25	370	<22	2.5	5,200	<26	12,000	380
12MW-28SR	8/17/2004	3,100	2,000	<220	14,000	<3,200	---	<180	<220	5,100	<25	<25	360	<180	---	5,500	<210	13,000	360J
12MW-28S	2/2/2005	2,990	2,090	20	10,400	200	0.111	<1	<25	4,410	16J	19J	310	<25	<5	4,750	12.2	13,000	<200
12MW-28SR	2/2/2005	3,400	2,200	<230	13,000	<4,400	---	<270	<250	5,500	17J	18J	330	690J	---	7,400	<240	14,000	420J
12MW-28S	5/24/2005	4,800	3,500	<420	15,000	<8,000	<0.07M	<360	<370	6,000	16	7J	310	<530	7.5	7,900	<420	16,000	440J
12MW-28SR	5/24/2005	4,600	3,400	<420	15,000	<8,000	0.053JM	<360	<370	5,900	17	6.2J	310	<530	8.6	7,800	<420	16,000	410J
12MW-28S	9/13/2005	3,800	3,300	31J	17,000	<440	---	<27	<25	5,200	19	10	410	<25	---	7,200	<24	16,000	340
12MW-28SR	9/13/2005	3,600	3,100	<230	16,000	<4,400	---	<270	<250	4,900	<0.5	<0.5	1.5	<250	---	6,800	<240	15,000	380J
12MW-28S	1/31/2006	3,500	3,900	39J	15,000	<440	---	<27	<25	5,300	16	5.7	490	41J	---	8,600	<24	16,000	330
12MW-28SR	1/31/2006	3,600	4,000	<230	15,000	<4,400	---	<270	<250	5,300	16	5.8	540	<250	---	8,500	<240	16,000	400J
12MW-28S	6/20/2006	4,100	5,100	<240	20,000	140	---	<250	<260	4,800	25	7.9	720	520J	3.8	8,600	<240	17,000	430J
12MW-28SR	6/20/2006	4,200	5,100	<240	20,000	160	---	<250	<260	4,800	28	9	570	570J	3.4	8,500	<240	18,000	420J
12MW-28S	9/12/2006	3,800	5,900	<240	20,000	<9,600	---	<250	<260	4,000	9.6	3.4	610	<450	---	5,900	<240	12,000	370J
12MW-28SR	9/12/2006	4,100	6,300	<270	19,000	<8,200	---	<260	<250	4,100	7.4	2.4	720	<380	---	6,300	<210	14,000	380J
12MW-28S	5/22/2007	2,620	6,720	69.8	18,800	35.1J	---	<0.3	7.31	2,690	34.2	4.23J	3,340	<2	1.8	2,890	0.765J	6,890	281
12MW-28SR	5/22/2007	2,730	6,890	70.5	19,600	37.1J	---	<0.3	7.66	2,750	33.9	4.15J	3,520	<2	1.8	3,030	0.789J	7,080	297
12MW-28S	7/17/2007	2,520	6,480	<62.5	15,100	---	---	<75	<62.5	2,820	22.5J	4.87J	3,530	<500	---	3,350	<62.5	7,570	193J
12MW-28S	11/27/2007	1,530	4,100	<50	11,200	---	---	<60	<50	1,810	<40	<40	2,290B	<400	2.6	1,920	<50	4,890	<100
12MW-28S	5/6/2008	653	3,190	32.9J	5,980	---	---	<15	<12.5	1,710	12.3J	<2	4,680	<100	2.6	<12.5	<12.5	5,000	77.6
12MW-28SR	5/6/2008	569	2,890	31.4	5,360	---	---	<0.3	4.41	1,520	12.1J	<2	4,800	<2	2.5	1,110	0.825J	3,800	58.4J
12MW-28S	2/11/2009	196	1,350	<25	,	---	---	<30	<25	1,130	<10	<10	3,130	<200	3	606	<25	3,030	<50
12MW-28SR	2/11/2009	203	1,350	<25	2,890	---	---	<30	<25	1,170	<10	<10	2,420	<200	3.1	631	<25	3,080	<50
12MW-28S	7/20/2009	150H	1,300	<100H	3,800H	<500	---	<50	<100H	1,300	<10	<10	1,400	<100H	3	780H	<100H	4,300	200H
12MW-29S	8/17/2004	19J	<9.8	<11	570	<160	<0.067	<9	<11	150	<5	<5	54	<8.8	1.3	24J	<10	4,400	12J
12MW-29SR	8/17/2004	<130	<150	<170	560J	<3,200	<0.067	<150	<150	<200	<5	<5	60	<210	1.3	<150	<170	4,900	<53
12MW-29SR	8/17/2004	4.35	3.93	0.755J	429	<25	---	<0.33	<0.36	134	---	---	---	4.20J	---	17.3	0.409J	3,900	2.6

Appendix 3. Concentrations of organic compounds measured in groundwater and surface water at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 12DCA, 1-2-dichloroethane; 11DCE, 1,1-dichloroethene; CF, chloroform; cDCE, cis-1,2-dichloroethene; Meth, methane; MC, methylene chloride; TOC, total organic carbon; PCE, tetrachloroethene;TCE, trichloroethene; VC, vinyl chloride; <, less than; ---, data not measured; J, estimated; R, replicate sample; all concentrations are in micrograms per liter except for acetate and total organic carbon, which are in milligrams per liter; M, poor recovery in laboratory quality-control samples; B, analyte was detected in the associated laboratory blank; H, analyte holding time was exceeded]

Site identification	Sample date	111TCA	11DCA	12DCA	11DCE	1,4-Dioxane	Acetate	Benzene	CF	*c* DCE	Ethane	Ethene	Meth	MC	TOC	PCE	Toluene	TCE	VC
12MW-29S	2/2/2005	36J	8.9J	<7.3	1,900	<140	---	<8.7	<7.9	260	<2	<2	40	130J	<0.54	170	<7.6	5,800	12J
12MW-29S	5/24/2005	<150	<100	<91	2,200	<1,700	---	<110	<99	460	<2.5	<2.5	43	<100	1.8	600	<95	5,300	<73
12MW-29SR	5/24/2005	<150	<100	<91	2,300	<1,700	---	<110	<99	480	<2.5	<2.5	43	<100	5.2	620	<95	5,500	<73
12MW-29S	9/13/2005	24J	<10	<9.1	1,700	<170	---	<11	<9.9	720	<0.5	<0.5	60	<10	1.8	790	<9.5	4,700	44
12MW-29SR	9/13/2005	<100	<87	<82	1,600	<3,500	---	<100	<120	640	<0.5	<0.5	24	200J	1.8	660	<100	4,500	<99
12MW-29S	1/31/2006	<150	<100	<91	1,200	<1,700	---	<110	<99	660	<0.5	<0.5	33	<100	---	740	<95	3,700	<73
12MW-29SR	1/31/2006	<0.29	<0.21	<0.18	1,200	<3.5	---	<0.22	<0.2	540	<0.5	<0.5	27	<0.2	---	690	<0.19	3,300	<0.15
12MW-29S	6/20/2006	<47	<48	<48	1,100	<1,900	---	<49	<52	590	<0.4	<0.5	60J	120J	2	380	<48	3,000	<49
12MW-29SR	6/20/2006	<19	<19	<19	1,100	<770	---	<20	<21	620	<0.4	<0.5	40	<36	1.2J	440	<19	3,100	41J
12MW-29S	9/11/2006	<47	<48	<48	1,200	<1,900	---	<49	<52	520	<0.4	6.4	41	<90	---	250	<48	2,800	<49
12MW-29SR	9/11/2006	<47	<48	<48	1,100	<1,900	---	<49	<52	510	<0.4	<0.5	34	<90	---	220	<48	2,700	<49
12MW-29S	5/22/2007	<12	27.7J	<10	1220	---	---	<12	<10	226	<2	<2	64.5	<80	1.1	110	<10	1,950	<20
12MW-29SR	5/22/2007	2.17	27.4	2.27	1,230	---	---	<0.3	0.565J	221	<2	<2	65.7	<2	1.2	97.1	0.544J	1,980	10.6
12MW-29S	7/17/2007	<7.5	32.1	<6.25	1,280	---	---	<7.5	<6.25	233	<2	<2	77.2	<50	1.8	131	<6.25	2,200	<12.5
12MW-29S	11/27/2007	<7.5	21.5J	<6.25	960	---	---	<7.5	<6.25	121	<2	<2	34.6B	<50	1.3	68.9	<6.25	1,320	<12.5
12MW-29S	5/6/2008	<3	21.3	<2.5	563	---	---	<3	<2.5	112	<2	<2	71.6	<20	1.8	32.1	<2.5	898	<5
12MW-29S	2/11/2009	<1.63	23.4	1.97J	852	---	---	<1.5	<1.25	50.7	<10	<10	275	<10	1.3	23.6	<1.25	462	<2.5
12MW-29SR	2/11/2009	<1.63	22.3	1.71J	826	---	---	<1.5	<1.25	48.3	<10	<10	301	<10	1.2	22.4	<1.25	435	<2.5
12MW-29S	7/20/2009	49	56	<10H	870H	<100H	---	<10	15	73	<10	<10	150	<10H	1.1	42	<10H	480H	<10H
12MW-30S	8/18/2004	18J	<9.8	<11	440	<160	<0.067	<9	<11	110	<5	<5	52	<8.8	1.6	53	<10	3,800	<7.7
12MW-30SR	8/18/2004	<94	<98	<110	470	<1,600	0.078J	<90	<110	100J	<5	<5	47	<88	1.5	<100	<100	3,700	<77
12MW-30S	5/24/2005	<120	<84	<73	1,200	<1,400	---	<87	<79	270J	<1	<1	27	<80	3.3	200J	<76	2,600	<58
12MW-30S	9/13/2005	14J	5.8J	<4.6	1,200	<87	---	<5.5	<5	330	<0.5	<0.5	33	<5	2.1	350	<4.8	3,000	24
12PZ-03D	8/19/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	<20	<20	180	<0.18	---	<0.2	<0.21	<0.2	<0.15
12PZ-03D	2/1/2005	<0.29	<0.21	<0.18	<0.17	<3.5	---	<0.22	<0.2	<0.23	---	---	---	<0.2	---	<0.21	<0.19	<0.28	<0.15
12PZ-03D	5/23/2005	<0.29	<0.21	<0.18	<0.17	<3.5	---	<0.22	<0.2	<0.23	---	---	---	<0.2	---	<0.21	<0.19	<0.28	<0.15
12PZ-03D	1/31/2006	<0.21	<0.17	<0.16	<0.2	<7	---	<0.2	<0.23	<0.18	---	---	---	<0.25	---	<0.16	<0.21	<0.19	<0.2
12PZ-03D	6/22/2006	<0.19	<0.21	<0.21	<0.14	<6.6	---	<0.21	<0.2	<0.34	---	---	---	<0.3	---	<0.16	<0.17	<0.19	<0.17
12PZ-03D	5/21/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.25	<0.25	<0.25	<0.5
12PZ-03D	11/28/2007	<0.3	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	<2	<2	119	<2	---	<0.25	<0.25	<0.25	<0.5
12PZ-03D	2/11/2009	<0.325	<0.3	<0.25	<0.3	---	---	<0.3	<0.25	<0.3	---	---	---	<2	---	<0.45	<0.25	<0.25	<0.5
12PZ-03S	8/19/2004	<0.19	<0.2	<0.22	<0.18	<3.2	---	<0.18	<0.22	<0.15	---	---	---	<0.18	---	<0.2	<0.21	<0.2	<0.15
East Marsh Site 1	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	<0.34	<0.25	<0.11
East Marsh Site 2	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	<0.34	<0.25	<0.11
East Marsh Site 3	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	<0.34	<0.25	<0.11
North Marsh Site 1	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	0.44J	<0.25	<0.11
North Marsh Site 2	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	<0.34	<0.25	<0.11
North Marsh Site 3	8/16/2004	<0.27	<0.3	<0.34	<0.41	<6.4	---	<0.29	<0.3	<0.4	---	---	---	<0.43	---	<0.31	<0.34	<0.25	<0.11

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009.

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-01S	1/30/2006	---	---	---	---	---	---	<0.05	---	---	2.5	4.9	---	---	95	---	---	18.3	---
12MW-02D	8/30/2000	---	---	---	28	---	---	1.5	---	78	0.1	6.9	---	---	841	1.7	<0.05	22.1	---
12MW-02D	11/29/2000	175	---	42	22	180	---	1.5	8.5	110	0.5	7.2	5.3	130	1,100	5.4	<0.05	20.4	---
12MW-02D	2/27/2001	175	---	35	20	130	---	0.30	5.6	45	1.5	6.9	5.2	150	951	<5.0	<0.05	20.2	---
12MW-02D	5/15/2001	150	---	50	15	190	---	1.0	10	140	0.8	7.0	5.7	150	1,160	<10	<0.05	20.9	---
12MW-02D	8/29/2001	200	---	39	25	170	---	0.15	7.7	96	0.3	6.9	4.6	140	1,060	<5.0	<0.05	22.8	---
12MW-02D	12/3/2001	200	<4.0	46	18	200	---	2.5	9.0	110	0.2	7.2	4.5	140	1,190	<10	<0.05	20.2	---
12MW-02D	2/27/2002	150	<2.0	43	13	190	---	0.40	8.6	73	0.8	7.1	5.2	170	1,030	<5.0	<0.05	14.4	---
12MW-02D	6/10/2002	225	0.74	45	19	210	---	1.0	9.3	110	0.3	7.0	6	170	1,210	<10	<0.05	23.1	---
12MW-02D	9/9/2002	178	<2.0	45	23	95	---	0.35	5.3	41	0.7	6.9	2.5	93.0	783	11	<0.05	24.8	---
12MW-02D	1/8/2003	200	<1.6	33	23	130	0.20	0.85	6.0	75	0.5	6.9	4.5	150	978	4.3	<0.05	19.8	---
12MW-02D	4/9/2003	210	<1.6	32	24	110	---	<0.05	5.1	50	0.3	7.1	4	130	820	6.0	<0.05	18.3	---
12MW-02D	7/16/2003	225	<1.0	40	28	180	---	<0.05	8.0	100	0.2	7.0	<0.48	150	1,050	5.3	0.80	23.4	---
12MW-02D	8/16/2004	200	---	---	18	120	---	0.20	---	---	0.5	5.5	---	---	1,110	2.8J	<0.05	22.0	19.2
12MW-02D	5/23/2005	175	---	33	20	140	---	1.0	6.6	79	0.2	7.0	4.8	150	908	2.5J	<0.05	21.9	2.4
12MW-02D	6/20/2006	185	---	---	23	120	---	0.60	---	---	0.2	7.0	---	---	821	3.0	<.05	22.6	---
12MW-02S	8/30/2000	---	---	---	250	---	---	0.50	---	<15	0.5	4.8	---	---	80.6	9.1	<0.05	24.1	---
12MW-02S	11/29/2000	<50	---	0.76	70	9.9	---	<0.05	0.49	7.4	0.7	5.1	<0.41	13.0	76.0	14	<0.05	21.0	---
12MW-02S	2/27/2001	<10	---	0.76	100	11	---	0.10	0.47	6.4	0.9	4.9	<0.54	12.0	77.0	12	<0.05	18.5	---
12MW-02S	5/15/2001	110	---	0.72	95	10	---	<0.05	0.48	5.8	1.6	5.0	<0.54	11.0	87.4	11	<0.05	22.2	---
12MW-02S	8/29/2001	<10	---	0.39	85	<5.0	---	0.10	0.38	3.9	0.5	4.8	<0.54	7.6	50.0	8.5	<0.05	23.9	---
12MW-02S	12/3/2001	<10	<0.20	0.51	60	9.1	0.30	0.10	0.39	3.6	0.9	4.8	<0.54	11.0	63.6	12	<0.05	20.7	---
12MW-02S	2/27/2002	<10	<0.20	0.39	24	5.2	---	<0.05	0.47	4.3	2.5	4.9	<0.54	9.9	49	10	<0.05	13.8	---
12MW-02S	6/10/2002	<10	<0.50	<0.3	80	8.0	0.82	0.10	0.38	3.2	0.3	4.6	<0.39	11.0	54	11	<0.05	23.2	---
12MW-02S	9/9/2002	<10	<0.20	0.48	70	8.1	---	0.10	0.62	6.5	0.9	4.8	<0.39	11.0	61.8	9.9	<0.05	24.9	---
12MW-02S	1/8/2003	<10	<0.20	0.57	35	14	0.10	0.05	0.59	6.9	1.0	5.1	0.51J	15.0	77.8	15	<0.05	18.3	---
12MW-02S	4/9/2003	<10	<0.20	0.95	50	15	4.7	0.40	0.79	27	0.3	4.7	<0.48	19.0	99.5	14	<0.05	16.9	---
12MW-02S	7/15/2003	<10	<0.20	0.65	80	13	2.9	0.30	0.49	6.5	0.2	5.0	<0.48	12.0	77.0	11	<0.05	24.0	---
12MW-02S	9/17/2003	<10	---	0.6	160	15	14	0.50	0.48	4.4	0.2	5.0	<0.48	14.0	78.8	10	<0.05	25.1	8.3
12MW-02S	1/14/2004	<10	---	0.49	100	13	---	<0.05	0.44	4	1.5	5.1	<0.48	8.90	67.6	8.9	<0.05	18.6	7
12MW-02S	4/28/2004	<10	---	1.4	120	28	---	0.10	1.1	9.2	0.2	4.8	<0.53	19.0	87.9	13	<0.05	18.1	212
12MW-02S	8/16/2004	<10	---	<0.15	70	4.7	---	<0.05	0.30	1.8J	1.5	4.8	<0.53	8.1	54.5	9.0	---	24.4	3.4
12MW-02S	2/2/2005	<10	---	0.17J	50	4.4	---	0.10	0.44	---	2.0	5.2	0.57J	9.2	68.7	9.8	<0.05	16.8	23.3
12MW-02S	5/23/2005	<10	---	0.22J	50	4.0	---	<0.05	0.30	2.2	2.0	4.9	<0.36	8.7	50.2	10	<0.05	21.4	3.3
12MW-02S	9/12/2005	<10	---	0.18J	120	5.1	---	<0.05	0.32	1.9J	0.3	4.7	<0.36	9.6	53.9	11	<0.05	24.7	---
12MW-02S	1/30/2006	---	---	---	---	8.6	---	<0.05	---	---	0.7	4.9	---	---	74.0	10	---	19.3	---
12MW-02S	6/20/2006	<10	---	---	95	5.0	---	<0.05	---	---	3.0	4.8	---	---	54.0	11	<0.05	23.6	---
12MW-02S	9/11/2006	<10	---	---	120	7.6	---	<0.05	---	---	2.0	4.4	---	---	56.0	9.0	<0.05	25.2	---
12MW-02S	5/21/2007	<10	---	---	120	9.7	---	<0.05	---	---	0.3	4.7	---	---	247	8.9	<0.05	22.2	---
12MW-02S	11/28/2007	<10	---	0.24	150	10	---	0.07	0.58	3.1J	1.0	5.1	0.372	12.6	80	9.4	0.08	22.6	---
12MW-02S	2/10/2009	<10	---	---	30	9.8	---	<0.05	---	---	1	4.9	---	---	84	11	<0.2	18.4	---
12MW-03D	8/30/2000	---	---	---	21	---	---	1.5	---	84	0.2	7.0	---	---	748	<1.0	<0.05	24.0	---
12MW-03D	11/30/2000	225	---	33	13	110	---	1.5	6.5	80	0.6	7.1	5.2	---	714	<5.0	<0.05	17.9	---
12MW-03D	2/27/2001	150	---	30	18	97	---	0.50	6.0	70	0.6	7.0	4.7	110	682	<5.0	<0.05	19.3	---
12MW-03D	5/15/2001	155	---	34	18	110	---	0.50	6.7	120	0.9	7.0	4.9	100	736	<5.0	<0.05	22.0	---
12MW-03D	8/29/2001	170	---	39	15	120	---	1.0	7.6	89	0.2	7.0	5.2	100	816	<5.0	<0.05	22.7	---
12MW-03D	12/4/2001	175	<2.0	43	17	150	0.20	1.5	8.8	100	0.2	7.2	6.1	110	963	<5.0	0.15	21.5	---
12MW-03D	2/27/2002	200	<1.0	33	10	110	---	0.80	7.0	72	0.8	7.2	5.5	110	768	2.6	<0.05	17.8	---
12MW-03D	6/11/2002	250	0.62	40	16	140	0.15	1.0	7.8	94	0.3	7.0	6.1	120	899	<5.0	<0.05	23.2	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-03D	9/10/2002	200	<1.0	29	19	110	---	1.5	6.3	77	0.05	7.1	5.1	100	748	<2.5	<0.05	23.7	---
12MW-03D	1/9/2003	200	<0.80	26	20	76	0.10	0.10	5.1	46	0.8	7.0	4.7	100	627	2.7	<0.05	18.6	---
12MW-03D	4/9/2003	160	<0.60	27	15	61	---	0.15	5.2	83	0.3	7.1	4.4	98.0	612	3.0	<0.05	18.5	---
12MW-03D	7/15/2003	150	<0.50	28	22	81	---	0.60	5.6	100	0.1	7.0	4.2	92.0	659	2.5J	<0.05	22.2	---
12MW-03D	8/16/2004	150	---	---	14	57	---	1.0	---	---	0.1	7.0	---	---	608	3.2	<0.05	22.7	---
12MW-03D	5/25/2005	50	---	33	13	110	---	0.20	6.6	76	0.2	7.7	5.1	110	742	3.4	<0.05	20.5	---
12MW-03D	6/21/2006	140	---	---	19	110	---	0.20	---	---	0.1	7.1	---	---	749	2.1J	<0.05	23.7	---
12MW-03D	5/21/2007	160	---	---	21	120	---	0.20	---	---	0.05	7.0	---	---	954	2.4	<0.05	21.4	---
12MW-03D	5/6/2008	190	---	---	28	77	---	0.17	---	---	<0.05	7.1	---	---	632	1.6	0.05	21.2	---
12MW-03D	9/1/2009	140	---	---	12	---	---	0.14	---	---	0.1	6.9	---	---	683	---	<0.2	21.6	---
12MW-03S	8/30/2000	---	---	---	250	---	---	7.0	---	<15	0.05	5.3	---	---	331	4.7	<0.05	25.5	---
12MW-03SR	8/30/2000	---	---	---	---	---	---	---	---	<15	---	---	---	---	---	4.7	---	---	---
12MW-03S	11/30/2000	<50	---	4.9	60	110	---	15	3.7	30	0.3	5.3	0.67J	---	416	5.3	<0.05	17.4	---
12MW-03S	2/27/2001	<10	---	1.2	140	62	---	2.0	2.0	7	0.4	4.4	<0.54	37.0	241	5.4	<0.05	17.3	---
12MW-03SR	2/27/2001	---	---	0.5	---	59	---	---	1.7	6.8	---	---	<0.54	38.0	---	5.3	---	---	---
12MW-03S	5/15/2001	<10	---	17	250	210	---	16	12	100	0.2	4.8	0.9J	87.0	733	<10	<0.05	26.6	---
12MW-03S	8/29/2001	<10	---	28	250	260	---	17	16	150	---	4.7	1.4J	95.0	880	<10	<0.05	24.0	---
12MW-03SR	8/29/2001	---	---	28	---	270	---	---	16	150	---	---	1.3J	93.0	---	<10	---	---	---
12MW-03S	12/5/2001	<10	<5.0	40	320	400	1.6	32	25	220	<0.05	4.7	2.3	130	1,310	<13	<0.05	22.5	---
12MW-03SR	12/5/2001	---	<5.0	40	---	410	---	---	25	220	---	---	2.3	120	---	<13	---	---	---
12MW-03S	2/27/2002	<10	<1.0	2.1	160	110	---	3.0	4.0	18	<0.05	4.4	<0.54	55.0	372	3.8	<0.05	16.9	---
12MW-03SR	2/27/2002	---	<1.0	2.1	---	110	---	---	4.0	17	---	---	<0.54	54.0	---	5.2	---	---	---
12MW-03S	6/11/2002	<10	0.98	24	250	230	33	14	14	130	<0.05	4.8	1.8	95.0	822	<10	<0.05	23.1	---
12MW-03SR	6/11/2002	---	0.77	23	---	200	---	---	14	130	---	---	1.8	92.0	---	<10	---	---	---
12MW-03S	9/10/2002	<10	<1.0	8.3	220	160	7.0	6.0	6.4	57	0.05	4.5	0.66J	64.0	367	3.1	<0.05	25.9	---
12MW-03SR	9/10/2002	---	<1.0	8.6	---	170	---	---	6.6	62	---	---	0.79J	63.0	---	2.9	---	---	---
12MW-03S	1/9/2003	<10	<1.6	2.3	190	130	0.20	5.4	3.1	16	0.2	4.2	0.44J	51.0	311	<4.0	<0.05	17.5	---
12MW-03SR	1/9/2003	---	<1.6	2.5	---	130	---	---	3.2	16	---	---	0.52J	51.0	---	5.4	---	---	---
12MW-03S	4/10/2003	38	<20	9.8	60	170	25	38	6.9	56	0.1	5.2	0.7J	62.0	590	<5.0	0.15	16.4	---
12MW-03SR	4/10/2003	---	<20	9.3	---	170	24	---	6.6	53	---	---	0.49J	66.0	---	<5.0	---	---	---
12MW-03S	7/17/2003	<10	<0.50	2.5	160	93	3.6	9.0	2.7	16	<0.05	4.9	<0.48	39.0	213	3.2	0.25	23.4	---
12MW-03SR	7/17/2003	---	<0.50	2.5	---	94	---	---	2.7	17	---	---	<0.48	38.0	---	3.5	---	---	---
12MW-03S	9/16/2003	<10	---	2.6	160	80	3.0	5.0	2.5	17	0.2	5.0	<0.48	39.0	198	3.8	0.05	24.5	29.4
12MW-03S	1/14/2004	<10	---	1.0	140	62	4.0	1.0	2.0	8.3	0.2	4.4	<0.48	28.0	234	8.0	<0.05	19.2	4.9
12MW-03S	4/27/2004	<10	---	8.6	180	110	71	10	5.7	49	<0.05	5.1	1.2J	43.0	385	6.7	<0.05	18.1	---
12MW-03S	8/18/2004	<10	---	0.38	170	33	1.2	3.7	1.2	4.7	0.05	4.6	<0.53	26.0	144	13	0.05	25.5	11.2
12MW-03S	2/2/2005	<10	---	2.4	120	44	1.6	4.0	2.1	---	0.05	4.9	<0.53	29.0	198	13	<0.05	19.1	0
12MW-03S	5/24/2005	<10	---	0.30	140	27	1.6	1.8	0.74	2.8	0.1	5.0	<0.36	22.0	162	19	---	20.6	7.7
12MW-03S	9/13/2005	<10	---	0.46	35	19	---	2.0	0.65	2.7	0.2	5.2	<0.36	19.0	139	18	<0.05	24.2	8.9
12MW-03S	1/31/2006	---	---	---	---	21	---	0.35	---	---	0.2	4.8	---	---	149	18	---	19.5	5.1
12MW-03S	6/21/2006	<10	---	---	110	13	---	0.90	---	---	0.1	5.0	---	---	123	23	<0.05	23.4	---
12MW-03S	9/12/2006	<10	---	---	45	11	---	0.10	---	---	0.2	4.7	---	---	112	23	<0.05	23.0	---
12MW-03S	5/21/2007	<10	---	---	70	17	---	<0.05	---	---	0.3	4.7	---	---	329	20	<0.05	20.4	---
12MW-03S	7/16/2007	<10	---	---	90	7.7	---	<0.05	---	---	3.0	4.7	---	---	103	24	<0.05	22.3	---
12MW-03S	11/27/2007	<10	---	---	30	7.1	---	<1.0	---	---	0.2	4.4	---	---	106	23	0.042	20.6	---
12MW-03S	5/6/2008	<10	---	---	20	8.8	---	<0.05	---	---	0.1	4.8	---	---	105	23	0.08	19.5	---
12MW-03S	2/12/2009	<10	---	---	20	5.2	---	1.3	---	---	0.2	4.9	---	---	90	22	<0.2	18.6	---
12MW-03S	7/20/2009	<10	---	---	20	10	---	0.69	---	---	0.2	5.3	---	---	104	24	<0.2	21.4	---
12MW-04D	8/28/2000	---	---	---	---	---	---	0.90	---	99	0.2	7.1	---	---	632	2.8	<0.05	27.0	---
12MW-04D	11/28/2000	200	---	41	14	79	---	2.0	8.0	110	0.3	7.1	7.5	100	749	<5.0	<0.05	23.5	---
12MW-04D	2/26/2001	145	---	36	<10	67	---	0.35	5.4	58	0.7	8.3	6.4	75.0	571	<5.0	<0.05	22.4	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-04D	5/14/2001	110	---	43	12	88	---	0.20	8.7	97	0.9	7.1	6.8	86.0	730	<5.0	---	23.5	---
12MW-04D	8/27/2001	150	---	46	17	84	---	0.90	9.2	120	0.2	7.2	6.7	79.0	633	<5.0	<0.05	25.2	---
12MW-04D	12/3/2001	200	<1.0	49	15	92	---	1.5	10	120	0.1	7.4	6.2	84.0	791	<5.0	<0.05	21.8	---
12MW-04D	2/26/2002	180	<1.0	44	10	81	---	0.70	8.5	100	0.5	7.1	6.6	94.0	721	<2.5	<0.05	21.7	---
12MW-04D	6/11/2002	225	<0.50	40	16	98	---	0.90	7.8	110	0.5	7.1	7.1	100	781	<5.0	<0.05	23.4	---
12MW-04D	9/9/2002	225	<0.40	43	20	63	---	1.5	8.1	120	0.05	7.0	5.9	75.0	669	<1.0	<0.05	26.3	---
12MW-04D	1/7/2003	200	<0.40	40	18	40	---	1.0	7.1	88	0.7	7.2	5.0	60.0	531	3.4	<0.05	20.3	---
12MW-04D	4/7/2003	100	<0.60	36	18	45	---	<0.05	6.9	30	0.05	7.7	5.4	58.0	479	4.9	<0.05	21.8	---
12MW-04D	7/14/2003	210	0.31J	47	15	69	---	0.60	9.3	120	0.2	7.0	5.0	61.0	682	1.4J	<0.05	24.6	---
12MW-04D	8/18/2004	200	---	---	23	51	---	0.80	---	---	<0.05	6.8	---	---	555	2.1	<0.05	23.0	6
12MW-04S	8/28/2000	---	---	---	---	---	---	3.5	---	43	0.3	4.2	---	---	138	8.8	<0.05	27.9	---
12MW-04S	11/28/2000	<50	---	0.31	300	22	---	1.5	0.96	44	0.4	4.6	<0.41	23.0	144	14	<0.05	22.8	---
12MW-04S	2/26/2001	<10	---	<0.30	270	19	---	3.0	0.89	45	0.3	5.3	<0.54	19.0	80	14	---	18.4	---
12MW-04S	5/14/2001	<10	---	0.44	250	19	---	0.25	0.86	41	2.5	4.4	<0.54	19.0	129	12	<0.05	23.0	---
12MW-04S	8/27/2001	<10	---	0.30	320	17	---	0.15	0.84	37	0.6	4.4	<0.54	18.0	132	12	<0.05	28.4	---
12MW-04S	12/3/2001	<10	0.68	<0.30	300	16	0.20	<0.05	0.81	34	0.3	4.5	<0.54	18.0	120	15	<0.05	22.4	---
12MW-04S	2/26/2002	<10	0.68	<0.30	300	16	---	0.35	0.83	37	1.0	4.7	<0.54	21.0	121	17	<0.05	19.9	---
12MW-04S	6/11/2002	<10	0.74	<0.30	320	17	0.40	0.05	0.67	32	3.5	4.5	<0.39	21.0	125	15	<0.05	24.0	---
12MW-04S	9/9/2002	<10	0.45	<0.30	260	14	---	2.5	0.67	29	0.3	4.5	<0.39	19.0	124	14	<0.05	28.7	---
12MW-04S	1/7/2003	<10	0.61	<0.30	250	17	---	3.1	0.73	36	0.2	4.7	<0.39	22.0	132	18	<0.05	17.7	---
12MW-04S	4/7/2003	<10	0.67	<0.30	300	16	---	3.5	0.73	41	0.1	4.8	<0.48	20.0	130	16	<0.05	20.4	---
12MW-04S	7/14/2003	<10	0.67	0.26J	300	15	---	1.5	0.63	39	0.3	4.3	<0.48	13.0	113	17	<0.05	25.9	---
12MW-04S	9/16/2003	<10	---	0.24J	270	14	---	3.0	0.63	27	0.2	4.6	<0.48	18.0	123	16	<0.05	26.7	13
12MW-04S	1/12/2004	<10	---	0.78	200	17	---	0.70	0.80	38	0.3	4.4	<0.48	16.0	124	16	<0.05	18.8	32.6
12MW-04S	4/26/2004	<10	---	0.15J	220	14	---	2.5	0.75	39	0.8	4.5	<0.53	15.0	118	21	<0.05	20.5	48.4
12MW-04S	8/18/2004	<10	---	9.1	220	12	---	0.80	0.80	25	0.2	4.6	1.0J	18.0	170	29	<0.05	25.3	54.1
12MW-04S	2/1/2005	<10	---	0.27J	220	12	---	1.0	0.85	---	0.7	4.8	<0.53	18.0	126	18	<0.05	19.3	27.6
12MW-04S	5/23/2005	<10	---	0.36	300	13	---	0.50	0.68	36	0.3	4.6	<0.36	16.0	117	18	<0.05	24.0	19.2
12MW-04S	9/12/2005	<10	---	0.40	260	12	---	4.5	0.62	26	0.2	4.7	<0.36	16.0	127	18	<0.05	27.2	---
12MW-04S	1/30/2006	---	---	---	---	9.7	---	2.5	---	---	0.2	4.8	---	---	125	20	---	19.8	---
12MW-04S	6/21/2006	<10	---	---	250	11	---	1.0	---	---	0.2	4.6	---	---	140	56	<0.05	26.0	---
12MW-04S	9/11/2006	<10	---	---	300	16	---	4.0	---	---	0.2	4.7	---	---	125	19	<0.05	28.9	---
12MW-04S	5/22/2007	<10	---	---	250	9.2	---	1.0	---	---	0.2	4.7	---	---	112	19	<0.05	22.9	---
12MW-04S	11/28/2007	<10	---	0.20	30	9.8	---	1.6	0.60	26	0.1	5.5	0.19	20.0	129	19	0.14	22.8	---
12MW-04S	2/10/2009	<10	---	---	45	8.4	---	2	---	---	0.03	4.8	---	---	132	23	<0.2	19.3	---
12MW-05D	8/30/2000	---	---	---	19	---	---	0.50	---	84	0.6	7.3	---	---	1,240	11	<0.05	21.5	---
12MW-05D	11/30/2000	250	---	41	15	180	---	1.0	9.7	73	0.6	7.3	12	---	1,390	13	<0.05	17.8	---
12MW-05D	2/28/2001	350	---	46	22	180	---	0.50	11	91	0.4	7.2	12	210	1,300	7.6	0.80	17.0	---
12MW-05D	5/15/2001	250	---	43	18	92	---	0.50	9.8	80	0.3	7.4	9.9	200	1,290	8.2	0.35	20.2	---
12MW-05D	8/28/2001	350	---	39	17	---	---	0.40	9.4	63	0.8	7.3	11	220	1,280	---	0.40	22.2	---
12MW-05D	12/4/2001	350	<2.0	35	18	130	0.50	0.90	9.0	58	0.3	7.5	10	210	1,220	<5.0	0.10	20.0	---
12MW-05D	2/28/2002	300	<1.0	33	11	150	---	0.70	8.8	48	0.8	7.2	11	230	1,170	14	0.10	12.3	---
12MW-05D	6/11/2002	375	0.65	32	13	130	---	0.50	7.8	41	0.2	7.3	11	230	1,170	14	<0.05	22.6	---
12MW-05D	9/10/2002	375	<2.0	31	18	130	---	0.70	7.8	47	0.3	7.4	9.6	210	1,300	12	0.05	21.8	---
12MW-05D	1/8/2003	300	<2.0	39	18	170	0.30	0.60	9.0	68	0.2	7.4	11	220	1,250	13	<0.05	18.0	---
12MW-05D	4/7/2003	325	<1.6	42	18	180	---	0.80	9.7	78	0.2	7.8	12	210	1,230	10	<0.05	19.2	---
12MW-05I	8/30/2000	---	---	---	19	---	---	0.70	---	49	0.4	7.0	---	---	637	1.1	<0.05	20.9	---
12MW-05I	11/30/2000	120	---	17	13	100	---	1.0	3.5	42	0.6	7.2	3.3	---	634	<5.0	<0.05	18.6	---
12MW-05I	2/28/2001	120	---	15	16	93	---	0.15	3.3	40	0.4	6.9	3.2	100	597	<5.0	<0.05	17.9	---
12MW-05I	5/16/2001	100	---	16	16	98	---	0.40	3.4	46	0.8	6.8	3.0	97.0	618	5.9	<0.05	18.9	---
12MW-05I	8/29/2001	125	---	20	20	120	---	0.70	4.0	48	0.05	6.9	3.4	110	665	<5.0	<0.05	21.7	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-05I	12/4/2001	150	<2.0	22	16	130	1.5	1.5	4.4	53	0.05	7.0	3.7	110	760	<5.0	<0.05	20.2	---
12MW-05I	2/27/2002	150	<1.0	22	10	130	---	0.50	4.9	55	0.6	7.2	4.0	130	773	4.7	<0.05	15.1	---
12MW-05I	6/11/2002	137	0.64	24	15	150	---	0.50	4.7	55	0.2	6.9	4.1	130	826	5.5	<0.05	22.6	---
12MW-05I	9/10/2002	110	<1.0	18	18	130	---	0.60	4.0	47	0.05	7.0	3.3	120	740	2.9	<0.05	21.2	---
12MW-05I	1/8/2003	140	<1.0	13	18	87	0.30	3.0	2.7	32	0.7	6.9	3.1	97.0	562	<2.5	<0.05	17.2	---
12MW-05I	4/7/2003	---	<1.0	14	---	92	1.5	---	3.1	48	---	6.8	2.9	98.0	570	<2.5	---	19.2	---
12MW-05I	7/14/2003	<10	<0.50	16	15	100	7.2	0.50	3.4	44	0.2	6.6	2.7	89.0	617	1.9J	<0.05	20.3	---
12MW-05I	8/18/2004	100	---	---	17	110	---	0.40	---	---	<0.05	6.9	---	---	678	2.3J	<0.05	21.0	---
12MW-05I	5/25/2005	110	---	19	10	110	---	<0.05	3.8	51	0.2	7.1	3.4	120	666	2.2	<0.05	18.5	---
12MW-05I	6/22/2006	125	---	---	18	120	---	0.40	---	---	0.1	6.8	---	---	695	3.1	<0.05	20.8	---
12MW-05S	8/30/2000	---	---	---	260	---	---	3.5	---	34	0.2	5.3	---	---	578	2.8	<0.05	21.7	---
12MW-05S	11/30/2000	<50	---	8.1	100	130	---	2.0	4.4	40	0.3	5.3	1.4J	---	527	5.5	<0.05	18.9	---
12MW-05SR	11/30/2000	---	---	8.3	---	130	---	---	4.5	41	---	---	1.5J	---	---	5.6	---	---	---
12MW-05S	2/28/2001	25	---	9.0	90	120	---	0.90	4.6	35	0.6	5.4	1.5J	85.0	500	<5.0	<0.05	16.5	---
12MW-05SR	2/28/2001	---	---	9.0	---	120	---	---	4.5	35	---	---	1.8J	83.0	---	<5.0	---	---	---
12MW-05S	5/16/2001	19	---	8.8	200	130	---	4.5	4.5	32	0.4	5.3	1.2J	73.0	529	<5.0	<0.05	18.4	---
12MW-05SR	5/16/2001	---	---	8.5	---	130	---	---	4.4	32	---	---	1.3J	71.0	---	<5.0	---	---	---
12MW-05S	8/29/2001	<10	---	9.2	220	140	---	3.5	4.8	34	0.1	5.2	1.3J	75.0	543	<5.0	<0.05	22.4	---
12MW-05SR	8/29/2001	---	---	9.5	---	140	---	---	4.9	35	---	---	1.4J	73.0	---	<5.0	---	---	---
12MW-05S	12/4/2001	<10	<2.0	7.4	250	130	5.5	2.5	4.3	30	0.2	5.2	1.1J	67.0	526	<5.0	<0.05	20.0	---
12MW-05SR	12/4/2001	---	<2.0	7.3	---	110	---	---	4.2	29	---	---	1.3J	68.0	---	<5.0	---	---	---
12MW-05S	2/28/2002	<10	<1.0	7.9	120	120	---	1.5	4.6	31	0.7	5.8	1.3J	78.0	505	<5.0	<0.05	12.9	---
12MW-05S	6/11/2002	<10	1.1	7.3	250	130	---	2.5	4.1	28	0.1	5.1	1.3J	76.0	529	<5.0	<0.05	21.4	---
12MW-05SR	6/11/2002	---	1.2	7.5	---	120	---	---	4.1	28	---	---	1.3J	77.0	---	<5.0	---	---	---
12MW-05S	9/10/2002	<10	<1.0	6.4	270	130	0.62	2.5	4.0	28	0.3	5.0	1.2J	74.0	546	3.0	<0.05	22.0	---
12MW-05SR	9/10/2002	---	<1.0	6.3	---	120	---	---	3.8	27	---	---	1.1J	74.0	---	2.8	---	---	---
12MW-05S	1/8/2003	<10	<1.6	6.6	160	120	3.7	1.5	3.9	25	0.3	5.2	1.1J	77.0	493	4.0	<0.05	16.3	---
12MW-05SR	1/8/2003	---	<1.6	6.5	---	130	---	---	4.0	25	---	---	1.2J	77.0	---	4.6	---	---	---
12MW-05S	4/10/2003	<10	<1.6	6.0	180	120	3.1	2.5	3.7	22	0.3	5.1	1.1J	75.0	473	5.3	<0.05	15.9	---
12MW-05SR	4/10/2003	---	1.8	6.0	---	120	---	---	3.7	23	---	---	0.96J	66.0	---	4.2	---	---	---
12MW-05S	7/17/2003	<10	<0.8	6.6	170	130	8.4	2.5	3.9	25	<0.05	5.4	0.91J	69.0	489	4.5	<0.05	21.5	---
12MW-05SR	7/17/2003	---	1J	7.3	---	130	---	---	4.0	25	---	---	1.1J	65.0	---	5.1	---	---	---
12MW-05S	9/16/2003	<10	---	5.7	---	110	2.7	2.0	3.5	22	0.2	4.9	1.3J	71.0	459	4.4	<0.05	20.9	1.9
12MW-05SR	9/16/2003	---	---	5.7	---	110	---	---	3.4	21	---	---	1.2J	72.0	---	4.0	---	---	---
12MW-05S	1/14/2004	<10	---	6.2	40	120	2.0	1.0	3.4	25	0.4	5.1	1.3J	56.0	464	3.7J	<0.05	17.5	3.9
12MW-05SR	1/14/2004	---	---	6.1	---	120	---	---	3.4	25	---	---	1.4J	55.0	---	4.0J	---	---	---
12MW-05S	4/27/2004	<10	---	---	130	---	3.0	2.0	---	---	<0.05	5.3	---	---	470	---	<0.05	17.8	---
12MW-05SR	4/27/2004	---	---	5.6	---	110	---	---	3.5	21	---	---	1.7J	57.0	---	5.0	---	---	---
12MW-05S	8/18/2004	---	---	6.0	<10	110	1.8	1.5	3.7	23	0.3	5.0	<0.53	26.0	450	4.2	<0.05	21.7	2.7
12MW-05SR	8/18/2004	---	---	6.1	---	110	---	---	3.7	23	---	---	1.9	67.0	---	4.9	---	---	---
12MW-05S	2/2/2005	<10	---	5.8	180	110	1.9	1.5	3.4	---	0.05	5.3	1.4J	62.0	454	4.0	<0.05	18.0	---
12MW-05SR	2/2/2005	---	---	5.8	---	100	---	---	3.4	---	---	---	1.4J	63.0	---	7.2	---	---	---
12MW-05S	5/24/2005	<10	---	5.9	180	96	1.5	1.25	3.0	22	0.05	6.2	1.1J	59.0	399	4.2	<0.05	17.8	1.5
12MW-05SR	5/24/2005	---	---	5.6	---	95	---	---	3.0	22	---	---	1.1J	59.0	---	4.3	---	---	---
12MW-05S	9/13/2005	<10	---	5.0	80	97	---	1.5	2.7	20	0.1	5.6	1.1J	54.0	378	4.2	<0.05	21.8	7.9
12MW-05SR	9/13/2005	---	---	5.3	---	91	---	---	2.8	20	---	---	1.1J	59.0	---	4.2	---	---	---
12MW-05S	1/31/2006	---	---	---	---	76	---	1.0	---	---	0.2	5.2	---	---	353	4.3	---	18.4	0.3
12MW-05SR	1/31/2006	---	---	---	---	77	---	---	---	---	---	---	---	---	---	4.4	---	---	---
12MW-05S	6/20/2006	<10	---	---	100	83	---	3.0	---	---	0.05	5.2	---	---	346	4.6	<0.05	20.1	---
12MW-05SR	6/20/2006	---	---	---	---	83	---	---	---	---	---	---	---	---	---	4.5	---	---	---
12MW-05S	9/12/2006	<10	---	---	70	75	---	1.5	---	---	0.1	5.2	---	---	343	5.6	<0.05	21.4	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-05SR	9/12/2006		---	---	---	75	---	---	---	---			---	---	---	4.3	---	---	---
12MW-05S	5/22/2007	<10	---	---	50	63	---	2.0	---	---	0.05	5.3	---	---	327	4.5	<0.05	19.0	---
12MW-05SR	5/22/2007	---	---	---	---	63	---	---	---	---	---	---	---	---	---	4.6	---	---	---
12MW-05S	7/17/2007	<10	---	---	60	64	---	1.4	---	---	0.1	6.0	---	---	337	4.3	<0.05	20.3	---
12MW-05SR	7/17/2007	---	---	---	---	63	---	---	---	---	---	---	---	---	---	4.4	---	---	---
12MW-05S	11/27/2007	<10	---	---	35	57	---	0.62	---	---	0.1	6.0	---	---	313	4.5	0.10	18.8	---
12MW-05S	5/6/2008	<10	---	---	40	62	---	1.3	---	---	0.05	5.2	---	---	317	3.8	<0.60	18.4	---
12MW-05SR	5/6/2008	---	---	---	---	61	---	---	---	---	---	---	---	---	---	3.9	---	---	---
12MW-05S	2/11/2009	<10	---	---	27	70	---	0.89	---	---	<0.02	5.3	---	---	332	4.2	0.37	18.5	---
12MW-05S	7/20/2009	<10	---	---	35	81	---	2.4	---	---	0.1	5	---	---	344	6.9	0.27	20.6	---
12MW-06D	8/29/2000	---	---	---	65	---	---	14	---	810	0.2	6.4	---	---	2,250	22	<0.05	20.3	---
12MW-06D	11/29/2000	225	---	110	45	530	---	16	21	750	0.2	6.8	9.8	230	2,280	22	0.05	16.6	---
12MW-06D	2/27/2001	240	---	95	70	540	---	12	19	650	0.2	6.5	9.9	280	2,310	<25	<0.05	15.9	---
12MW-06D	5/14/2001	225	---	110	40	470	---	10	22	800	1.0	6.6	8.1	280	2,340	21	<0.05	18.8	---
12MW-06D	8/28/2001	275	---	34	50	460	---	15	17	280	<0.05	6.5	1.9J	250	2,180	<25	<0.05	23.8	---
12MW-06D	7/16/2007	220	---	---	30	---	---	10	---	---	<0.05	6.3	---	---	2,200	---	<0.05	21.0	---
12MW-06D	11/28/2007	120	---	100	14	500	---	9.4	22	750	0.1	7.7	9.59	298	2,180	19	0.12	17.0	---
12MW-06D	2/11/2009	<10	---	---	40	---	---	37	---	---	<0.02	4.4	---	---	2,580	---	<0.2	18.7	---
12MW-06S	8/29/2000	---	---	---	200	---	---	26	---	270	0.05	5.4	---	---	1,730	17	0.25	21.9	---
12MW-06S	11/29/2000	<50	---	29	85	470	---	32	14	250	0.1	5.7	2.3	190	1,710	19	0.25	16.2	---
12MW-06S	2/27/2001	<10	---	29	180	500	---	22	15	250	0.3	5.0	2.0	260	1,810	30	0.25	13.8	---
12MW-06S	5/14/2001	<10	---	32	170	270	---	30	16	270	0.3	5.3	1.4J	230	1,690	22	0.15	18.9	---
12MW-06S	8/28/2001	50	---	120	100	580	---	30	23	840	<0.05	5.7	8.6	280	1,690	<25	0.20	24.4	---
12MW-06S	12/4/2001	100	<5.0	33	75	480	---	23	19	280	<0.05	6.2	1.8J	280	1,900	<13	0.60	17.1	---
12MW-06S	2/26/2002	<10	<1.0	67	90	1,000	---	75	55	550	<0.05	4.8	2.6	570	3,880	130	0.25	18.1	---
12MW-06S	6/11/2002	<10	3.2	61	320	980	---	75	45	480	<0.05	4.6	2.8	500	3,640	100	0.25	20.7	---
12MW-06S	9/9/2002	<10	<1.00	55	310	970	---	65	46	460	<0.05	4.5	3.0	730	3,870	100	0.15	22.7	---
12MW-06S	1/7/2003	<10	<5.0	38	200	570	---	38	19	320	<0.05	5.1	2.1	310	2,150	63	0.05	13.9	---
12MW-06S	4/8/2003	<10	<6.0	35	210	530	---	25	18	300	0.05	5.4	1.7J	260	1,860	30	<0.05	15.3	---
12MW-06S	8/19/2004	<10	---	---	150	510	---	20	---	---	<0.05	5.4	---	---	1,840	22	---	22.0	33.2
12MW-06S	5/23/2005	30	---	---	70	---	---	20	---	---	<0.05	6.6	---	---	1,800	---	0.30	18.9	---
12MW-06S	6/22/2006	<10	---	---	50	---	---	35			<0.05	5.2	---	---	1,780	---	0.10	19.7	---
12MW-06S	5/21/2007	<10	---	---	50	---	---	35	---	---	<0.05	5.2	---	---	1,780	---	<0.05	18.6	---
12MW-06S	5/6/2008	<10	---	---	40		---	49	---	---	<0.05	4.8	---	---	2,090	---	<0.6	18.0	---
12MW-06S	2/11/2009	160	---	---	18	---	---	4.1	---	---	0.2	5.4	---	---	2,280	---	<0.2	18.7	---
12MW-07D	8/28/2000	---	---	---	<100	---	---	4.8	---	190	0.2	6.6	---	---	1,620	26	<0.05	20.5	---
12MW-07D	11/29/2000	85	---	73	32	370	---	6.0	15	200	---	6.6	8.8	130	1,560	32	<0.05	18.1	---
12MW-07D	2/26/2001	120	---	65	35	290	---	5.5	13	190	0.5	6.7	8.1	150	1,327	22	<0.05	18.7	---
12MW-07D	5/14/2001	125	---	69	24	320	---	3.0	14	180	1.5	6.7	7.0	140	1,359	28	<0.05	19.7	---
12MW-07S	2/26/2001	100	---	12	37	94	---	1.5	3.3	84	0.1	6.1	1.5J	82.0	81	<5.0	0.15	17.2	---
12MW-07S	5/14/2001	80	---	15	25	67	---	2.0	4.2	110	0.5	6.4	1.4J	69.0	492	<5.0	<0.05	18.5	---
12MW-07S	8/29/2001	100	---	15	40	87	---	2.0	4.2	100	0.07	6.5	1.5J	76.0	490	<5.0	<0.05	23.0	---
12MW-07S	1/13/2004	---	---	---	---	---	---	---	---	---	---	7.0	---	---	516	---	---	16.7	---
12MW-07S	8/19/2004	45	---	---	27	---	---	2.0	---	---	<0.05	6.3	---	---	531	---	<0.05	22.4	3.3
12MW-07S	5/22/2007	100	---	---	50	---	---	2.0	---	---	0.1	---	---	---	557	---	<0.05	---	---
12MW-07S	11/28/2007	30	---	15	11	110	---	0.85	4.8	110	0.1	---	1.7	89.5	575	0.74	0.09	18.3	---
12MW-07S	2/12/2009	35	---	---	18	---	---	1.9	---	---	0.1	6.5	---	---	565	---	0.44	18.0	---
12MW-08D	8/29/2000	---	---	---	32	---	---	2.5	---	130	0.2	7.0	---	---	1,470	11	<0.05	22.9	---
12MW-08D	11/28/2000	200	---	50	18	260	---	3.5	8.6	140	0.2	6.6	7.9	170	1,410	13	<0.05	18.5	---
12MW-08D	2/26/2001	225	---	48	30	230	---	1.5	8.4	130	1.5	7.1	8.1	220	1,420	10	<0.05	17.7	---
12MW-08D	5/14/2001	225	---	55	26	210	---	0.70	9.3	170	1.0	7.0	7.3	240	1,450	11	<0.05	19.9	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-08D	8/27/2001	300	---	52	27	250	---	2.5	9.3	150	0.2	7.0	7.5	240	1,430	10	<0.05	26.3	---
12MW-08S	8/28/2000	---	---	---	---	---	---	6.5	---	69	0.2	4.4	---	---	1,310	7.6	<0.05	24.9	---
12MW-08S	11/28/2000	<50	---	50	50	390	---	4.0	5.2	67	0.6	4.3	0.88J	59	1,270	<5.0	<0.05	17.9	---
12MW-08S	2/26/2001	<10	---	45	---	360	---	3.0	4.8	58	0.4	5.4	1.1J	160	218	<10	<0.05	16.9	---
12MW-08S	5/14/2001	<10	---	46	160	340	---	4.0	4.9	59	0.3	4.3	0.68J	150	1,240	<10	<0.05	18.6	---
12MW-08S	8/27/2001	<10	---	44	210	360	---	4.0	5.0	55	0.05	4.7	0.73J	140	1,030	<10	<0.05	23.9	---
12MW-09D	8/29/2000	---	---	---	70	---	---	12	---	600	0.1	6.4	---	---	3,770	5.4	<0.05	22.2	---
12MW-09D	11/29/2000	225	---	200	50	1,000	---	17	41	530	0.2	6.6	14	430	3,450	<5	<0.05	18.3	---
12MW-09D	2/27/2001	260	---	200	100	960	---	14	40	560	0.2	6.5	14	430	3,800	<25	<0.05	18.1	---
12MW-09D	5/15/2001	200	---	230	90	800	---	18	47	620	0.6	6.6	12	370	3,640	<25	<0.05	18.4	---
12MW-09D	8/29/2001	250	---	250	110	1,000	---	15	52	630	0.1	6.4	<0.54	390	3,490	<50	<0.05	22.5	---
12MW-09D	12/3/2001	250	<1.00	240	40	950	---	18	49	580	0.05	6.7	12	390	3,620	<25	<0.05	18.9	---
12MW-09D	2/26/2002	350	<1.00	250	70	1,000	---	23	50	620	<0.05	6.5	11	430	3,740	<25	<0.05	18.6	---
12MW-09D	6/10/2002	350	3.7	220	70	990	---	12	46	570	0.1	6.5	13	440	3,710	<50	<0.05	20.3	---
12MW-09D	9/10/2002	---	<4.0	210	112	920	---	15	45	560	0.05	6.5	<0.39	400	3,720	<10	<0.05	20.6	---
12MW-09D	1/7/2003	---	<1.00	220	100	960	---	17	44	560	0.1	6.2	13	420	---	<25	<0.05	17.7	---
12MW-09D	4/9/2003	---	<8.0	210	100	810	---	9.0	43	520	0.3	6.6	13	400	3,630	<20	<0.05	16.9	---
12MW-09D	7/16/2003	250	<5.0	220	120	1,000	---	13	47	570	0.1	6.5	12	420	3,620	<13	<0.05	21.6	---
12MW-09D	8/16/2004	260	---	---	120	1,100	---	8.8	---	---	---	5.9	---	---	3,670	<13	<0.05	20.0	23.7
12MW-09S	8/29/2000	---	---	---	80	---	---	2.5	---	20	0.2	5.2	---	---	172	21	<0.05	21.3	---
12MW-09S	11/29/2000	<50	---	1.5	50	15	---	3.5	0.90	15	0.3	6.2	<0.41	34.0	196	23	<0.05	18.5	---
12MW-09S	2/27/2001	13	---	1.1	100	13	---	2.5	0.60	14	0.2	5.2	<0.54	290	166	22	<0.05	16.9	---
12MW-09S	5/15/2001	44	---	1.0	70	12	---	3.0	0.76	14	0.4	5.7	<0.54	33.0	200	17	0.10	17.8	---
12MW-09S	8/29/2001	37	---	1.3	130	12	---	3.0	0.79	15	0.1	5.6	<0.54	27.0	171	20	<0.05	22.4	---
12MW-09S	12/3/2001	19	<0.20	1.2	150	14	---	3.5	0.8	15	<0.05	5.4	<0.54	23.0	161	26	<0.05	19.9	---
12MW-09S	2/26/2002	40	<0.20	1.2	130	10	---	4.0	0.88	15	0.2	5.6	<0.54	28.0	154	24	---	18.2	---
12MW-09S	6/10/2002	<10	<0.50	0.96	150	11	---	3.5	0.71	12	0.05	5.2	<0.39	25.0	141	27	<0.05	20.5	---
12MW-09S	9/10/2002	32	<0.40	1.1	130	8.4	---	2.5	0.77	16	0.05	5.8	<0.39	29.0	187	18	0.08	23.1	---
12MW-09S	1/7/2003	65	<0.40	2.1	140	47	0.5	8.9	2.2	33	<0.05	6.0	0.52J	72.0	411	8.7	2.5	16.3	---
12MW-09S	4/8/2003	70	<0.40	1.8	120	26	---	6.0	2.2	33	<0.05	6.1	<0.48	55.0	346	20	0.90	15.7	---
12MW-09S	7/15/2003	45	<0.20	1.0	160	16	---	5.5	1.1	18	<0.05	5.6	<0.48	35.0	219	20	0.05	20.0	---
12MW-09S	9/17/2003	70	---	1.2	140	16	---	7.0	1.2	19	0.2	5.7	0.49J	48.0	312	19	0.30	22.2	---
12MW-09S	1/13/2004	20	---	0.96	35	12	---	6.0	0.87	14	0.1	5.5	<0.48	18.0	172	24	<0.05	15.7	4.9
12MW-09S	4/28/2004	20	---	1.3	110	12	2.1	5.0	1.1	24	0.1	5.2	0.73J	20.0	150	26	<0.05	16.9	42
12MW-09S	8/16/2004	---	---	1.8	130	10	---	6.3	2.5	45	---	4.9	1.4J	25.0	145	26	<0.05	20.5	429
12MW-09S	5/25/2005	<10	---	0.74	32	11	---	2.0	0.63	8.8	0.1	5.7	<0.36	20.0	143	29	<0.05	17.4	3.4
12MW-09S	1/31/2006	---	---	---	---	24	---	1.4	---	---	0.5	5.2	---	---	169	30	---	16.5	19.8
12MW-09S	6/22/2006	<10	---	---	120	10	---	1.5	---	---	0.1	5.0	---	---	120	23	<0.05	19.5	---
12MW-09S	9/12/2006	<10	---	---	110	10	---	2.0	---	---	0.1	4.8	---	---	124	23	<0.05	20.5	---
12MW-09S	5/22/2007	<10	---	---	120	7.5	---	1.5	---	---	0.3	---	---	---	114	22	<0.05	---	---
12MW-09S	11/28/2007	<10	---	0.60	14	8.1	---	0.50	0.55	8.8J	0.2	5.0	0.31	19.5	112	20	0.25	18.5	---
12MW-09S	2/12/2009	<10	---	---	25	19	---	1.7	---	---	0.2	5.1	---	---	114	20	<0.2	17.8	---
12MW-10S	11/30/2000	<50	---	3.1	300	120	---	38	8.5	49	0.4	4.5	<0.41	---	496	<5.0	<0.05	22.5	---
12MW-10S	2/28/2001	<10	---	4.3	300	100	---	60	13	110	<0.05	4.4	1.4J	35.0	613	<5.0	0.20	17.9	---
12MW-10SR	5/16/2001	---	---	2.5	---	89	---	---	6.8	33	---	---	<0.54	32.0	---	<5.0	---	---	---
12MW-10SR	8/29/2001	---	---	2.2	---	92	---	---	5.8	34	---	---	<0.54	32.0	---	<5.0	---	---	---
12MW-10SR	12/5/2001	---	<2.0	2.6	---	110	---	---	7.1	40	---	---	0.66J	44.0	---	<5.0	---	---	---
12MW-10S	2/27/2002	<10	<1.0	2.6	250	100	---	23	6.4	28	<0.05	4.6	<0.54	38.0	357	3.4	0.80	15.4	---
12MW-10SR	2/27/2002	---	<1.0	2.6	---	100	---	---	6.3	29	---	---	<0.54	36.0	---	4.1	---	---	---
12MW-10S	6/11/2002	<10	<0.50	1.4	250	73	2.4	2.5	3.8	15	0.4	3.9	<0.39	32.0	250	<5.0	<0.05	26.6	---
12MW-10S	9/10/2002	<10	<1.0	1.1	250	64	2.9	18	3.2	21	<0.05	4.5	<0.39	28.0	259	3.9	0.20	27.0	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-10S	1/8/2003	<10	<1.0	1.9	275	95	4.4	27	4.8	40	<0.05	4.6	<0.39	28.0	325	8.2	0.80	18.2	---
12MW-10S	4/10/2003	<10	<0.80	1.4	245	69	---	12	3.1	16	0.1	4.7	<0.48	27.0	193	10	0.90	15.5	---
12MW-10S	7/16/2003	<10	<0.40	2.1	260	67	5.8	12	4.3	14	0.1	4.7	<0.48	30.0	275	7.8	0.50	25.0	---
12MW-10S	9/16/2003	<10	---	1.2	270	53	3.9	5.0	2.6	15	0.1	4.7	<0.48	24.0	193	7.7	0.80	25.8	53
12MW-10S	1/14/2004	<10	---	1.7	130	41	2.8	8.0	2.5	14	0.1	4.7	<0.48	16.0	186	10	0.40	18.4	12.4
12MW-10S	4/27/2004	---	---	---	---	---	16	---	---	---	---	4.9	---	---	171	---	---	18.6	---
12MW-10S	8/18/2004	<10	---	1.1	20	40	3.1	8.1	2.6	12	0.1	4.6	0.62J	22.0	162	9.9	0.05	24.6	12.4
12MW-10S	2/2/2005	<10	---	1.1	90	32	---	5.5	2.4	---	0.2	4.8	<0.53	19.0	147	11	0.70	15.4	9.1
12MW-10S	2/3/2005	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12MW-10S	5/24/2005	<10	---	2.9	240	75	3.5	10	5.7	12	0.05	4.6	<0.36	31.0	303	10	0.35	21.2	---
12MW-10S	9/13/2005	<10	---	2.7	270	77	---	7.6	5.5	12	0.05	4.7	<0.36	29.0	249	7.3	0.90	25.4	2.9
12MW-10S	1/31/2006	---	---	---	---	29	---	3.7	---	---	<0.05	---	---	---	159	11	---	19.4	9.2
12MW-10S	6/21/2006	<10	---	3.8	270	80	---	10	7.2	---	0.1	4.6	---	---	342	9.2	0.25	24.4	---
12MW-10S	9/12/2006	<10	---	---	70	33	---	5.0	---	---	0.2	4.7	---	---	163	10	0.80	24.0	---
12MW-10S	5/22/2007	<10	---	---	70	130	---	20	---	---	0.05	4.7	---	---	723	6.2	0.90	20.9	---
12MW-10S	7/16/2007	<10	---	---	160	23	---	1.5	---	---	1.0	4.8	---	---	138	22	<0.05	24.4	---
12MW-10S	11/27/2007	<10	---	---	25	46	---	3.9	---	---	0.4	5.0	---	---	242	11	1.3	18.4	---
12MW-10S	5/6/2008	<10	---	---	50	24	---	5.0	---	---	0.2	4.7	---	---	151	15	0.33	22.7	---
12MW-10S	9/1/2009	25	---	---	40	14	---	1.8	---	---	>1	5.3	---	---	150	16	5.5	23.0	---
12MW-11D	8/29/2000	---	---	---	120	---	---	16	---	370	0.05	6.1	---	---	3,070	38	<0.05	19.9	---
12MW-11D	11/29/2000	150	---	150	55	880	---	18	33	520	<0.05	6.3	7.4	330	3,050	47	<0.05	18.6	---
12MW-11D	2/27/2001	135	---	160	60	910	---	12	33	440	0.7	6.1	6.7	400	3,170	38	<0.05	17.4	---
12MW-11D	5/15/2001	130	---	160	90	780	---	13	37	530	0.3	6.3	6.5	390	3,290	<25	<0.05	21.4	---
12MW-11D	8/28/2001	130	---	170	160	900	---	17	39	590	<0.05	6.2	6.2	360	3,240	<40	<0.05	25.1	---
12MW-11D	12/4/2001	115	<1.0	180	120	920	---	23	43	710	<0.05	6.3	6.7	350	3,520	57	<0.05	18.9	---
12MW-11D	2/27/2002	135	<1.0	180	30	940	---	16	44	680	0.05	6.2	7.3	430	3,370	57	<0.05	14.8	---
12MW-11D	6/10/2002	130	3.7	170	75	1,000	---	23	41	720	0.5	6.0	7.3	400	3,600	68	<0.05	21.8	---
12MW-11D	9/9/2002	175	<8.0	160	60	840	---	18	36	520	---	6.1	7.1	410	3,320	37	---	22.4	---
12MW-11D	1/8/2003	125	<8.0	150	32	840	0.10	10	31	420	0.1	6.1	6.9	430	3,130	39	<0.05	15.8	---
12MW-11D	4/9/2003	150	<8.0	150	70	800	---	5.5	31	410	0.3	6.4	6.4	400	3,010	41	<0.05	16.8	---
12MW-11D	7/16/2003	165	<5.0	160	13	940	---	15	35	500	0.05	6.2	5.6	390	3,230	43	<0.05	22.8	---
12MW-11S	8/29/2000	---	---	---	70	---	---	3.5	---	80	0.2	5.8	---	---	1,100	5.6	---	21.3	---
12MW-11S	11/29/2000	175	---	35	70	330	---	3.5	11	130	0.8	6.3	2.5	160	1,630	8.4	<0.05	18.5	---
12MW-11SR	11/29/2000	---	---	32	---	330	---	---	10	120	---	---	2.6	230	---	9.2	---	---	---
12MW-11S	2/27/2001	90	---	46	75	380	---	3.5	14	160	0.4	5.9	2.9	240	1,670	<25	<0.05	16.7	---
12MW-11S	5/15/2001	110	---	47	100	360	---	6.5	15	170	0.9	6.1	2.3	230	1,840	<25	<0.05	19.9	---
12MW-11S	8/28/2001	105	---	34	70	310	---	3.0	11	120	0.05	6.1	2.3	190	1,470	<10	<0.05	23.5	---
12MW-11S	1/8/2003	90	---	---	50	---	1.0	0.50	---	---	0.3	5.9	---	---	1,650	---	<0.05	15.2	---
12MW-11S	8/19/2004	125	---	---	50	380	---	5.0	---	---	0.2	6.1	---	---	1,680	8.1J	<0.05	22.7	85.5
12MW-11S	5/23/2005	100	---	---	30	---	---	4.0	---	---	0.2	7.1	---	---	1,350	---	<0.05	19.3	---
12MW-11S	6/20/2006	65	---	---	40	---	---	4.5	---	---	0.2	6.1	---	---	1,600	---	<0.05	20.7	---
12MW-11S	5/22/2007	90	---	---	22	---	---	3.0	---	---	0.1	6.1	---	---	1,260	---	<0.05	19.3	---
12MW-11S	7/20/2009	80	---	---	20	---	---	6.1	---	---	<0.02	---	---	---	---	---	0.32	---	---
12MW-12D	8/28/2001	175	---	100	12	490	---	0.20	22	290	0.4	7.2	5.9	260	2,030	70	<0.05	24.6	---
12MW-12D	8/18/2004	150	---	---	35	860	---	10	---	---	0.1	6.3	---	---	3,070	49	<0.05	22.8	3.3
12MW-12D	7/16/2007	150	---	---	30	---	---	10	---	---	0.1	6.3	---	---	2,200	---	<0.05	21.0	---
12MW-12S	8/28/2001	80	---	20	150	190	---	1.5	6.4	78	0.2	5.8	1.6J	130	919	<10	<0.05	23.5	---
12MW-12S	12/4/2001	85	<4.0	19	150	220	1.4	0.80	7	71	0.4	6.2	1.8J	140	976	<10	<0.05	19.6	---
12MW-12S	2/27/2002	95	<4.0	36	35	290	---	0.20	11	130	0.3	6.3	2.7	200	1,380	11	<0.05	13.6	---
12MW-12S	6/10/2002	120	1.1	32	75	290	1.9	1.5	9.4	110	0.2	6.1	2.2	180	1,190	<10	<0.05	21.8	---
12MW-12S	9/9/2002	125	<2.0	32	60	290	---	1.5	9.6	120	0.2	6.1	2.3	180	1,180	8.4	<0.05	22.5	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-12S	1/8/2003	115	<2.0	28	50	230	2.4	0.35	8.3	97	0.7	6.3	2.5	180	1,200	7.6	<0.05	13.3	---
12MW-12S	4/10/2003	110	<2.0	27	60	220	1.6	0.25	7.9	93	0.4	5.8	1.9	160	1,080	16	<0.05	14.7	---
12MW-12S	4/26/2004	125	---	---	40	---	2.6	2.0	---	---	0.3	6.3	---	---	1,250	---	<0.05	18.3	---
12MW-12S	8/17/2004	110	---	29	40	250	---	1.0	8.6	100	<0.05	6.1	2.5	170	1,120	6.7	<0.05	21.7	---
12MW-12S	2/1/2005	100	---	31	22	260	2.4	1.0	9.1	---	0.4	5.8	2.1	190	1,170	6.7J	<0.05	16.5	31.2
12MW-12S	5/24/2005	120	---	27	110	220	2.1	0.90	7.9	92	0.1	6.0	1.7	180	964	5.9	<0.05	17.6	40.7
12MW-12S	9/12/2005	---	---	24	---	220	---	---	7.4	83	---	---	2.1	140	---	6.4	---	---	---
12MW-12S	9/16/2005	100	---	---	24	---	---	0.75	---	---	0.2	6.3	---	---	1,020	---	<0.05	21.7	3.8
12MW-12S	1/30/2006	---	---	---	---	200	---	0.30	---	---	0.5	6.5	---	---	968	5.1J	---	17.8	11.7
12MW-12S	6/20/2006	105	---	---	45	230	---	1.0	---	---	0.1	6.2	---	---	1,050	6.7	<0.05	20.5	---
12MW-12S	9/11/2006	100	---	---	32	200	---	1.0	---	---	0.1	6.2	---	---	1,000	6.8	<0.05	22.0	---
12MW-12S	5/22/2007	125	---	---	35	200	---	2.0	---	---	0.2	6.3	---	---	1,050	6.8	<0.05	19.3	---
12MW-12S	7/16/2007	110	---	---	23	190	---	1.7	---	---	0.05	6.3	---	---	1,050	6.8	<0.05	20.6	---
12MW-12S	11/26/2007	80	---	---	25	190	---	0.07	---	---	0.4	6.1	---	---	964	6.3	0.065	20.7	---
12MW-12S	5/6/2008	70	---	---	20	180	---	0.64	---	---	0.1	6.1	---	---	900	6.0	<0.6	18.0	---
12MW-12S	2/11/2009	70	---	---	15	180	---	1.3	---	---	0.1	6.3	---	---	897	6.2	0.345	17.9	---
12MW-12S	7/20/2009	100	---	---	25	190	---	0.9	---	---	0.1	6.0	---	---	916	6.9	<0.2	21.1	---
12MW-13S	8/28/2001	<10	---	24	100	320	---	9.0	14	150	0.2	4.9	1.9J	140	1,140	18	<0.05	23.1	---
12MW-13S	12/4/2001	<20	<4.0	32	160	370	0.6	12	18	190	<0.05	5.5	2.2	160	1,390	22	<0.05	17.6	---
12MW-13S	2/26/2002	<10	<5.0	35	140	400	---	8.0	20	190	1.50	4.9	2.4	200	1,400	34	<0.05	17.6	---
12MW-13S	6/11/2002	<10	1.5	30	190	370	0.5	11	17	170	<0.05	5.2	2.4	180	1,460	28	<0.05	20.3	---
12MW-13S	9/10/2002	<10	<4.0	26	200	360	0.46	12	16	160	<0.05	5.0	2.1	170	1,420	26	<0.05	21.8	---
12MW-13S	1/7/2003	<10	<4.0	19	150	310	0.9	4.4	12	120	1.5	4.7	1.7	170	1,110	27	<0.05	14.7	---
12MW-13S	4/8/2003	<10	<2.0	18	150	280	8.0	6.0	11	120	0.2	5.0	1.5J	150	1,070	16	<0.05	15.5	---
12MW-13S	7/15/2003	<10	1.1J	16	210	280	4.4	7.0	10	110	0.1	5.1	1.2J	110	1,010	18	<0.05	21.1	---
12MW-13S	9/15/2003	<10	---	4.8	180	280	1.4	8.0	9.7	99	0.05	4.9	1.8	140	1,030	20	<0.05	22.7	---
12MW-13S	1/13/2004	<10	---	20	160	300	5.9	5.5	12	130	0.7	4.8	2.2	140	1,130	20	<0.05	15.9	8.5
12MW-13S	4/28/2004	<10	---	18	40	270	180	8.0	11	120	<0.05	4.8	1.9	120	1,050	17	<0.05	16.7	2.8
12MW-13S	8/17/2004	<10	---	18	170	290	1.5	7.0	12	120	<0.05	4.8	1.9	150	1,070	18	<0.05	21.8	---
12MW-13S	2/2/2005	<10	---	20	30	300	1.3	6.0	12	---	0.3	5.0	1.4J	170	1,080	17	<0.05	16.4	---
12MW-13S	5/24/2005	<10	---	19	170	300	1.1	4.5	11	120	0.1	4.8	1.5	160	1,060	17	<0.05	19.9	---
12MW-13SR	5/24/2005	---	---	19	---	300	---	---	11	120	---	---	1.4	160	---	17	---	---	---
12MW-13S	9/12/2005	---	---	17	---	230	---	---	9.9	100	---	---	1.6	130	---	12	---	---	---
12MW-13SR	9/12/2005	---	---	17	---	190	---	---	10	110	---	---	1.6	120	---	14	---	---	---
12MW-13S	9/16/2005	<10	---	---	70	---	---	6.6	---	---	0.1	5.2	---	---	1,020	---	<0.05	22.0	20
12MW-13S	1/30/2006	---	---	---	---	270	---	5.5	---	---	0.6	5.1	---	---	1,010	13	---	17.0	16
12MW-13SR	1/30/2006		---	---	---	270	---	---	---	---	---	---	---	---	---	14	---	---	---
12MW-13S	6/22/2006	<10	---	19	45	270	---	10	12	120	<0.05	5.1	---	120	1,090	16	0.05	20.1	---
12MW-13S	9/11/2006	25	---	---	45	300	---	8.0	---	---	0.2	5.1	---	---	2,230	16	<0.05	22.2	---
12MW-13SR	9/11/2006		---	---	---	310	---		---	---	---	---	---	---	---	19	---	---	---
12MW-13S	5/21/2007	<10	---	---	50	310	---	9.0	---	---	0.1	5.0	---	---	1,210	21	<0.05	19.2	---
12MW-13SR	5/21/2007	---	---	---	---	310	---	---	---	---	---	---	---	---	---	21	---	---	---
12MW-13S	7/16/2007	<10	---	---	50	310	---	8.7	---	---	0.2	5.0	---	---	1,250	21	<0.05	30.2	---
12MW-13SR	7/16/2007	---	---	---	---	310	---	---	---	---	---	---	---	---	---	21	---	---	---
12MW-13S	8/22/2007	---	---	---	---	320	---	---	---	---	---	---	---	---	---	22	---	---	---
12MW-13S	11/27/2007	<10	---	---	25	310	---	7.5	---	---	0.05	4.4	---	---	1,240	22	0.184	18.5	---
12MW-13SR	11/27/2007	---	---	---	---	310	---	---	---	---	---	---	---	---	---	22	---	---	---
12MW-13S	5/5/2008	<10	---	22	40	300	---	6.3	14	141	0.2	4.8	2.0	164	1,210	20	<0.6	17.7	---
12MW-13S	8/14/2008	<10	---	---	28	390	---	7.1	---	---	0.05	4.9	---	---	1,320	26	0.07	21.4	---
12MW-13SR	8/14/2008	---	---	---	---	390	---	---	---	---	---	---	---	---	---	26	---	---	---
12MW-13S	2/11/2009	<10	---	---	30	340	---	6.6	---	---	0.2	4.9	---	---	1,290	24	<0.2	17.6	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-13SR	2/11/2009	---	---	---	---	340	---	---	---	---			---	---	---	24	---	---	---
12MW-13S	7/20/2009	110	---	---	<10	350	---	5.4	---	---	<0.02	4.7	---	---	1,220	6.6	<0.2	20.8	---
12MW-13SR	7/20/2009	---	---	---	---	360	---	---	---	---	---	---	---	---	---	28	---	---	---
12MW-13S	9/1/2009	<10	---	---	50	400	---	8.9	---	---	<0.02	5.2	---	---	1,260	32	0.7	21.1	---
12MW-13SR	9/1/2009	---	---	---	---	390	---	---	---	---	---	---	---	---	---	32	---	---	---
12MW-14S	8/30/2001	30	---	54	100	830	---	12	41	940	1.5	---	4.4	490	---	29	<0.05	---	---
12MW-17S	9/10/2002	112	<2.0	63	100	420	1.1	5.5	18	220	<0.05	6.2	3	220	1,820	15	<0.05	21.4	---
12MW-17S	1/7/2003	125	<2.0	69	33	450	0.9	3.5	19	240	0.3	6.0	3.5	250	1,920	22	<0.05	15.7	---
12MW-17S	4/9/2003	125	<2.0	74	75	470	1.9	5.1	19	250	0.2	6.0	3.1	250	1,980	20	<0.05	16.0	---
12MW-17S	7/15/2003	140	<2.5	79	90	490	2.0	7.5	21	270	0.1	6.6	3.4	260	2,000	23	<0.05	20.6	---
12MW-17S	9/15/2003	115	---	75	70	450	1.8	---	20	260	0.2	6.2	3.6	250	1,990	18	<0.05	21.5	2.6
12MW-17S	1/13/2004	120	---	75	30	480	1.9	6.0	20	270	0.7	6.2	3.7	200	1,840	18	<0.05	17.3	5.7
12MW-17S	4/26/2004	130	---	75	1,100	480	2.9	6.0	20	260	0.1	6.3	3.4	200	1,820	19	<0.05	17.0	---
12MW-17S	8/17/2004	135	---	85	110	570	1.2	7.6	23	300	<0.05	6.1	4.1	280	2,080	20J	<0.05	20.6	---
12MW-17S	2/1/2005	100	---	77	20	490	---	8.0	21	---	0.4	6.4	3.2	290	1,990	21	<0.05	16.6	11.6
12MW-17S	5/24/2005	---	---	---	---	---	2.5	---	---	---	---	---	---	---	---	---	---	---	---
12MW-17S	5/24/2005	110	---	75	120	490	---	9.0	21	270	0.1	6.5	3.4	290	1,870	21	<0.05	18.0	32.5
12MW-17S	9/12/2005	---	---	67	---	470	---	---	20	240	---	---	3.5	210	---	20	---	---	---
12MW-17S	9/16/2005	100	---	---	35	---	---	6.2	---	---	<0.05	6.3	---	---	1,830	---	<0.05	21.3	39.5
12MW-17S	1/31/2006	---	---	---	---	410	---	6.0	---	---	0.2	6.4	---	---	1,720	19	---	17.8	15.9
12MW-17S	6/20/2006	110	---	---	25	530	---	9.0	---	---	0.2	6.2	---	---	2,050	21	<0.05	19.7	---
12MW-17S	9/11/2006	120	---	---	27	500	---	10	---	---	<0.05	6.2	---	---	1,990	22	<0.05	21.2	---
12MW-17S	5/22/2007	100	---	---	32	470	---	0.8	---	---	0.1	6.2	---	---	1,990	21	<0.05	18.6	---
12MW-17S	11/26/2007	130	---	---	100	410	---	7.7	---	---	0.1	6.2	---	---	1,740	19	0.08	20.9	---
12MW-17S	5/6/2008	70	---	---	17	380	---	6.0	---	---	0.05	6.3	---	---	1,690	18	<0.6	18.3	---
12MW-17S	2/11/2009	100	---	---	15	400	---	3.9	---	---	<0.02	6.3	---	---	1,770	19	<0.2	18.8	---
12MW-17S	7/20/2009	---	---	---	---	420	---	---	---	---	---	6.1	---	---	1,660	18	---	20.3	---
12MW-18S	4/9/2003	70	<0.60	6.7	250	38	---	5.9	2.1	50	0.2	5.1	0.49J	52.0	303	7.9	2.5	16.6	---
12MW-18S	7/16/2003	50	0.42J	5.2	250	36	---	3.5	1.8	29	<0.05	5.5	0.63J	42.0	283	15	0.60	22.2	---
12MW-18S	9/17/2003	45	---	4.3	220	32	---	2.5	1.6	22	<0.05	5.3	0.77J	46.0	246	13	0.50	21.6	0.7
12MW-18S	1/14/2004	35	---	4	180	33	---	1.5	1.5	20	0.3	6.1	0.48J	32.0	266	16	0.15	18.0	---
12MW-18S	4/27/2004	50	---	4.1	220	31	---	2.5	1.6	19	0.1	5.5	0.95J	38.0	284	18	0.05	19.9	14.5
12MW-18S	8/19/2004	<10	---	4.9	350	26	---	2.5	1.9	21	0.05	5.2	1.2J	48.0	277	15	0.15	22.9	---
12MW-18S	2/3/2005	50	---	7.5	300	30	---	1.5	2.7	---	0.3	5.6	1.3J	55.0	341	11	0.05	17.2	5.6
12MW-18S	5/23/2005	70	---	---	270	38	---	2.0	---	---	0.1	5.4	---	---	328	12	0.10	21.6	2.7
12MW-18S	9/12/2005	65	---	---	220	42	---	1.5	---	---	0.1	5.6	---	---	351	9.9	0.10	23.4	---
12MW-18S	1/31/2006	---	---	---	---	43	---	1.0	---	---	0.2	5.9	---	---	332	10	---	15.8	---
12MW-18S	6/20/2006	40	---	---	210	51	---	1.5	---	---	0.2	5.5	---	---	329	10	<0.05	24.2	---
12MW-18S	9/11/2006	45	---	---	250	53	---	1.5	---	---	0.1	5.2	---	---	317	11	<0.05	25.1	---
12MW-18S	5/22/2007	<10	---	---	350	56	---	2.5	---	---	0.2	5.4	---	---	341	8.1	<0.05	20.8	---
12MW-18S	7/16/2007	40	---	---	300	55	---	2.0	---	---	0.1	5.4	---	---	333	7.7	<0.05	23.2	---
12MW-18S	11/26/2007	<10	---	---	350	54	---	1.9	---	---	0.05	5.6	---	---	336	7.0	0.07	22.9	---
12MW-18S	5/5/2008	<10	---	6.9	350	56	---	2.5	3.0	29	0.05	5.4	1.1	51.3	354	7.6	0.048	20.5	---
12MW-18S	2/10/2009	<10	---	---	350	56	---	1.1	---	---	0.1	5.3	---	---	359	8	<0.2	19.4	---
12MW-18S	7/20/2009	50	---	9.1	---	58	---	1.1	<5	33	0.05	---	---	---	---	9.4	<0.2	---	---
12MW-19D	4/8/2003	200	<0.80	120	10	75	---	14	11	2,400	0.2	6.6	11	390	1,920	<2.0	<0.05	17.4	---
12MW-19D	4/27/2004	150	---	27	<10	140	---	1.0	0.80	73	<0.05	8.4	5.3	230	1,220	<2.5	<0.05	20.6	30.2
12MW-19D	8/16/2004	135	---	16	<10	140	43,000	0.2	0.30	24	<0.05	9.2	3.8	190	969	<2.0	<0.05	23.2	3.6
12MW-19S	4/8/2003	190	<0.80	130	<10	70	---	13	12	2,700	<0.05	7.0	11	330	1,890	<2.0	<0.05	16.8	---
12MW-19S	7/14/2003	130	1.7	120	<10	28	300,000	1.5	10	370	0.05	8.2	7.1	380	1,780	0.5	<0.05	22.5	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-19S	9/17/2003	300	---	130	<10	31	310,000	0.7	9.1	260	0.05	7.8	10	320	1,870	2.8	<0.05	23.8	3.4
12MW-19S	1/14/2004	110	---	66	<10	37	290,000	0.05	4.1	130	0.1	8.9	5.4	140	991	<0.5	<0.05	18.6	2.3
12MW-19S	4/27/2004	60	---	50	<10	33	---	<0.05	2.7	70	0.05	9.2	4.6	100	778	<0.75	<0.05	19.5	7
12MW-19S	8/19/2004	50	---	35	<10	33	---	<0.05	1.7	61	<0.05	9.3	3.6	66.0	503	<0.50	<0.05	23.8	5.1
12MW-19S	2/2/2005	33	---	16	<10	44	250,000	<0.05	0.52	---	<0.05	10.0	2	52.0	400	<0.5	<0.05	16.5	---
12MW-19S	5/25/2005	30	---	14	<10	45	260,000	<0.05	0.56	17	0.05	8.9	1.8	42.0	326	<0.75	<0.05	18.7	---
12MW-19S	9/13/2005	21	---	9.4	<10	51	---	<0.05	0.40	15	0.1	9.3	1.9	34.0	272	1.0J	<0.05	23.4	---
12MW-19S	1/31/2006	---	---	---	---	45	---	<0.05	---	---	0.1	9.5	---	---	255	<0.75	---	18.2	---
12MW-19S	9/12/2006	22	---	---	<10	40	---	0.10	---	---	0.1	9.4	---	---	199	<0.75	<0.05	23.2	---
12MW-20D	4/8/2003	200	<2.0	31	14	200	---	1.5	6.5	90	0.2	7.1	4.8	170	1,050	<5.0	<0.05	17.5	---
12MW-20D	7/15/2003	200	<1.0	45	25	290	---	1.5	9.1	100	0.3	6.9	5.3	210	1,320	4.4J	0.05	22.3	---
12MW-20D	9/16/2003	175	---	46	30	300	---	1.5	9.3	99	0.05	6.8	5.8	220	1,390	<5.0	0.10	22.2	1.4
12MW-20D	1/12/2004	175	---	52	25	380	---	1.5	10	120	0.1	6.8	6.3	200	1,440	<6.3	<0.05	18.5	2
12MW-20D	4/26/2004	200	---	55	30	320	---	1.5	11	120	0.2	6.9	6.6	180	1,460	<5.0	0.05	20.8	5.5
12MW-20D	8/16/2004	150	---	59	20	340	---	1.0	12	130	0.2	6.9	7	220	1,570	4.0J	0.30	23.0	---
12MW-20D	5/25/2005	250	---	47	24	280	---	0.90	9.3	96	0.2	7.0	5.8	250	1,360	<5	0.10	20.3	---
12MW-20D	6/21/2006	185	---	44	30	250	---	0.70	8.7	91	0.1	6.8	---	170	1,280	<2.5	<0.05	22.9	---
12MW-20D	2/12/2009	200	---	27	20	180	---	0.3	6	58	0.15	7.0	4.5	172	1,010	0.53	<0.2	18.9	---
12MW-20S	4/9/2003	40	<0.60	7.5	250	45	---	0.85	2.6	36	0.1	5.1	0.93J	54.0	310	15	0.05	16.8	---
12MW-20S	7/16/2003	50	0.85	43	320	41	---	18	16	230	<0.05	5.4	1.4J	100	835	2.2	0.60	21.5	---
12MW-20S	9/16/2003	<10	---	62	320	39	---	35	26	340	<0.05	5.2	2.0	170	1,100	2.0	0.80	22.9	5.5
12MW-20S	1/14/2004	180	---	44	250	40	---	38	19	250	<0.05	5.9	1.3J	160	1,030	<0.5	<0.05	18.2	13.8
12MW-20S	4/26/2004	260	---	26	270	41	---	23	11	150	0.1	6.2	0.98J	130	793	1.0J	0.60	19.0	19.8
12MW-20S	8/19/2004	225	---	16	200	45	---	15	6.9	91	0.1	6.0	1.0J	130	700	<0.75	0.15	22.4	24.5
12MW-20S	2/2/2005	175	---	8.4	35	53	---	7.5	3.4	---	0.05	6.5	<0.53	100	527	4.6	<0.05	16.9	24.1
12MW-20S	5/25/2005	130	---	9.7	50	68	---	5.5	3.1	44	0.05	6.4	<0.36	96.0	572	1.0J	<0.05	20.0	---
12MW-20S	9/13/2005	102	---	8.0	50	61	---	4.0	3.2	43	<0.05	6.4	0.39J	85.0	448	2.4	0.10	22.8	---
12MW-20S	1/31/2006	---	---	---	---	47	---	2.0	---	---	0.1	6.1	---	---	314	8.7	---	18.8	---
12MW-20S	6/22/2006	35	---	2.8	25	44	---	2.5	1.1	16	<0.05	6.2	---	47.0	296	2.7	<0.05	21.3	---
12MW-20S	9/11/2006	60	---	---	30	57	---	2.5	---	---	---	6.0	---	---	327	4.4	<0.05	23.3	---
12MW-20S	5/23/2007	50	---	2.1	27	49	---	2.2	1.0	13	<0.05	6.3	0.33	52.2	269	2.3	<0.05	19.7	---
12MW-20S	11/28/2007	30	---	3.4	0.21	82	---	2.4	1.5	20	<0.05	6.6	0.46	64.1	379	2.9	0.14	20.5	---
12MW-20S	2/12/2009	32	---	3.6	17	78	---	1.9	1.58	20	0.02	7.0	0.4	65.8	1,020	3	<0.2	19.0	---
12MW-21D	4/7/2003	150	<0.80	100	40	79	---	48	15	1,900	0.1	6.7	10	370	1,950	<2.0	0.10	19.9	---
12MW-21D	7/15/2003	500	0.70J	95	60	71	4,100	18	15	750	<0.05	7.0	9.2	380	1,950	<1.0	<0.05	23.2	---
12MW-21D	9/16/2003	350	---	88	50	65	12,000	15	12	570	<0.05	7.2	9.8	370	1,850	<1.0	<0.05	23.8	18.8
12MW-21D	1/12/2004	250	---	71	33	71	46,000	9	9.3	320	<0.05	7.4	9.3	260	1,670	<1.3	<0.05	18.6	28.9
12MW-21D	4/27/2004	325	---	68	27	69	14,000	7.5	8.7	330	<0.05	7.4	9.9	270	1,650	<1.3	<0.05	19.0	27.1
12MW-21D	8/16/2004	500	---	49	25	74	4,900	3.5	7.4	170	0.05	7.6	9.0	300	1,380	<0.75	<0.05	23.1	23.1
12MW-21S	4/8/2003	110	<0.80	57	<10	87	---	4.5	7.0	320	<0.05	7.6	18	220	1,200	7.7	<0.05	17.3	---
12MW-21SR	4/8/2003	---	---	54	---	---	---	---	6.6	300	---	---	16	210	---	---	---	---	---
12MW-21S	7/15/2003	112	1.2	77	<10	93	380,000	6.5	8.1	400	<0.05	7.3	16	230	1,290	3.5	<0.05	22.4	---
12MW-21SR	7/15/2003	---	1.0	75	---	93	---	---	7.9	380	---	---	17	220	---	3.5	---	---	---
12MW-21S	9/15/2003	125	---	76	<10	94	500,000	3.0	7.7	330	<0.05	8.0	17	210	1,280	<1.5	<0.05	25.0	1.4
12MW-21SR	9/15/2003	---	---	74	---	97	---	---	7.5	320	---	---	16	200	---	<1.5	---	---	---
12MW-21S	1/13/2004	50	---	71	<10	90	410,000	2.0	4.7	140	0.1	8.4	15	170	1,150	<1.3	<0.05	16.3	9.9
12MW-21S	4/27/2004	75	---	76	<10	91	560,000	1.5	4.8	130	0.1	9.2	14	160	1,240	<1.5	<0.05	19.3	8.4
12MW-21S	8/18/2004	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12MW-21S	8/19/2004	65	---	62	<10	110	400,000	0.30	4.8	94	<0.05	8.0	11	130	923	<1.3	<0.05	24.0	---
12MW-21S	2/1/2005	50	---	68	<10	110	580,000	0.40	3.9	---	0.05	9.7	10	150	951	<1.3	<0.05	16.9	---
12MW-21SR	2/1/2005	---	---	68	---	110	---	---	4.0	---	---	---	10	150	---	<1.3	---	---	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-21S	2/3/2005	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12MW-21S	5/24/2005	---	---	---	---	---	220,000	---	---	---	---	---	---	---	---	---	---	---	---
12MW-21S	5/24/2005	70	---	84	<10	90	---	0.15	3.0	71	0.05	9.6	12	160	1,120	<1.3	<0.05	20.6	7.3
12MW-21S	9/13/2005	70	---	81	<10	94	---	0.5	2.5	93	0.05	9.5	12	110	1,050	<1.3	<0.05	24.1	4
12MW-21S	1/31/2006	---	---	---	--	86	---	0.35	---	---	<0.05	9.4	---	---	889	<1.3	---	19.3	0.1
12MW-21S	6/22/2006	50	---	60	<10	85	---	0.30	1.7	68	0.1	9.2	---	94.0	768	<1.3	<0.05	23.1	---
12MW-21S	9/11/2006	50	---	---	<10	96	---	0.15	---	---	0.05	9.4	---	---	750	<1.3	<0.05	24.7	---
12MW-22D	4/9/2003	205	<1.6	79	21	140	59	3.0	14	200	<0.05	6.5	7.6	170	1,180	<4.0	0.80	18.2	---
12MW-22D	7/14/2003	250	0.80J	100	60	130	14	3.0	21	280	<0.05	6.7	6.9	270	1,530	<1.5	0.50	21.6	---
12MW-22D	9/17/2003	375	---	99	70	120	8.8	3.5	20	270	0.2	6.3	8.8	250	1,660	<0.5	0.20	22.6	---
12MW-22D	1/12/2004	350	---	83	50	140	6.4	2.0	17	210	0.1	6.8	8.5	180	1,440	<2.0	0.20	19.1	11.8
12MW-22D	4/28/2004	550	---	88	60	130	120	1.9	18	220	0.2	7.1	8.5	200	1,550	<2.0	0.15	17.7	---
12MW-22D	8/17/2004	500	---	79	50	140	---	2.0	16	210	0.3	6.9	8.1	220	1,530	<1.8	<0.05	23.5	12.9
12MW-22D	5/25/2005	550	---	71	60	110	---	1.4	15	200	0.1	7.1	7.5	260	1,380	<1.5	<0.05	20.7	27.7
12MW-22D	6/21/2006	375	---	58	35	150	---	1.1	11	160	0.2	6.9	---	150	1,100	<1.8	0.05	22.7	---
12MW-22D	5/22/2007	300	---	41	50	150	---	0.95	8.7	110	0.1	7.1	6.0	141	1,110	<0.10	<0.05	21.6	---
12MW-22D	11/28/2007	350	---	51	35	150	---	1.1	11	140	0.1	7.4	6.8	159	1,100	0.37J	0.13	21.7	---
12MW-22D	9/1/2009	250	---	---	11	---	---	0.61	---	---	0.1	7.0	---	---	910	---	<0.2	22.1	---
12MW-22S	4/10/2003	60	<1.0	14	60	96	2,100	7.5	5.3	94	0.3	5.8	1.7J	73.0	518	8	<0.05	16.2	---
12MW-22S	7/17/2003	70	<0.50	16	240	96	1,200	14	6.5	110	<0.05	5.8	1.7J	68.0	536	1.4J	0.6	22.3	---
12MW-22S	9/15/2003	<10	---	19	270	86	410	28	7.6	120	<0.05	5.9	2.1	79.0	---	1.3J	0.05	23.3	---
12MW-22S	1/14/2004	80	---	29	220	82	6.7	23	12	170	<0.05	6.6	2.1	78.0	741	<1.5	0.20	18.6	6.2
12MW-22S	4/28/2004	150	---	43	270	90	10	27	17	250	<0.05	6.3	2.1	85.0	924	<1.3	0.20	17.5	---
12MW-22S	8/17/2004	250	---	38	300	98	5.7	30	14	210	0.05	6.1	1.9J	100	918	<1.3	<0.05	23.5	8.5
12MW-22S	2/3/2005	250	---	42	---	99	2.7	20	15	---	<0.05	6.4	1.9	110	884	<1.3	0.20	17.0	1.5
12MW-22S	5/24/2005	250	---	41	250	96	2.9	25	14	220	0.05	6.3	2.9	120	954	<1.3	0.10	19.1	40.8
12MW-22S	9/13/2005	225	---	33	250	100	---	20	12	160	0.05	6.3	1.5	81.0	846	<1.5	0.10	23.9	3.4
12MW-22S	1/31/2006	---	---	---	---	91	---	---	---	---	0.05	6.0	---	---	691	2.3J	---	19.1	65.8
12MW-22S	6/20/2006	225	---	30	160	99	2.6	16	11	150	0.05	6.2	---	89.0	821	<1.3	<0.05	23.0	---
12MW-22S	9/11/2006	200	---	---	170	90	---	14	---	---	<0.05	6.4	---	---	756	<1.3	0.05	24.1	---
12MW-22S	5/22/2007	175	---	22	140	92	---	13	8.1	100	<0.05	6.5	1.45	103	743	1.09	<0.05	21.4	---
12MW-22S	7/17/2007	167	---	22	130	90	---	11	7.8	99	<0.05	6.4	1.39	115	699	1.2	<0.05	23.2	---
12MW-22S	11/27/2007	175	---	20	100	85	---	8.3	7.0	91	<0.05	6.6	1.36	104	672	0.98	0.09	23.0	---
12MW-22S	5/6/2008	160	---	17	65	90	---	8.8	6.3	78	<0.05	6.6	1.23	99.8	651	0.73	0.075	20.8	---
12MW-22S	2/11/2009	110	---	14	40	98	---	3.6	5.02	64	<0.02	6.6	1.1	98.5	577	0.67	<0.2	19.6	---
12MW-22S	9/1/2009	85	---	9.1	40	120	---	6	3.5J	42	<0.02	6.6	---	---	541	<1	<0.2	23.0	---
12MW-23D	4/8/2003	140	<0.80	27	17	83	---	0.85	5.5	66	0.2	6.8	4.8	83.0	572	<2.0	<0.05	17.9	---
12MW-23D	7/14/2003	180	<0.50	33	18	99	---	1.0	6.7	84	0.2	6.7	4.5	74.0	682	3.3	<0.05	22.3	---
12MW-23D	9/17/2003	160	---	32	17	89	---	1.5	6.1	76	0.3	7.0	5.0	88.0	654	2.1J	<0.05	22.1	---
12MW-23D	1/12/2004	130	---	42	20	150	---	1.0	8.2	110	0.3	7.1	6.5	98.0	897	4	<0.05	19.2	1.8
12MW-23D	4/27/2004	185	---	32	15	93	---	1.3	6.3	79	0.2	7.1	5.7	98.0	655	2.4J	<0.05	20.3	7.4
12MW-23D	8/18/2004	140	---	39	16	140	---	1.5	8.0	98	0.2	7.0	6.1	110	815	2.7J	<0.05	23.9	6.9
12MW-23D	5/25/2005	175	---	36	25	110	---	0.60	7.2	87	0.2	7.2	5.7	100	773	<1.5	<0.05	20.1	---
12MW-23D	6/21/2006	200	---	42	22	130	---	0.7	8.4	100	0.2	7.0	---	95.0	848	<1.8	<0.05	22.7	---
12MW-23S	4/9/2003	145	0.97	12	60	66	3.8	2.5	3.6	73	0.2	5.9	1.9	130	705	56	<0.05	18.1	---
12MW-23S	7/16/2003	200	0.60J	15	150	71	2.4	5.0	4.4	94	0.2	6.3	2.0	120	735	55	<0.05	23.0	---
12MW-23S	9/17/2003	175	---	17	130	60	4.3	6.0	4.2	82	0.05	6.2	2.4	98.0	609	33	<0.05	24.4	8.4
12MW-23S	1/14/2004	130	---	15	55	52	2.8	1.3	3.8	70	0.9	6.9	2.4	60.0	474	13	<0.05	18.7	2.7
12MW-23S	4/27/2004	175	---	15	60	53	---	0.85	3.9	83	0.4	6.4	2.2	71.0	495	11	<0.05	20.2	9.3
12MW-23S	8/17/2004	160	---	16	85	51	2.2	4.5	4.0	71	0.05	6.2	2.4	72.0	472	5.9	<0.05	23.3	8.6
12MW-23S	2/1/2005	---	---	16	---	55	---	---	4.0	---	---	---	2.3	65.0	---	4.4	---	---	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-23S	2/3/2005	---	---	---	---	---	1.8	---	---	---	---	---	---	---	---	---	---	---	---
12MW-23S	2/5/2005	110	---	---	40	---	---	1.7	---	---	0.7	6.4	---	---	452	---	<0.05	18.7	4.3
12MW-23S	5/25/2005	120	---	15	100	61	42	1.8	4.0	92	0.05	6.3	2.2	74.0	502	4.4	<0.05	18.9	1.5
12MW-23S	9/12/2005	120	---	17	120	58	---	5.0	4.2	75	0.05	6.3	2.5	72.0	465	2.4	<0.05	23.9	4.6
12MW-23S	1/30/2006	---	---	---	---	59	---	2.1	---	---	0.50	6.2	---	---	449	2.9	---	19.7	1.4
12MW-23S	6/21/2006	110	460	16	110	58	---	4.0	4.3	97	---	6.0	---	66.0	476	2.3	<0.05	22.5	---
12MW-23S	9/12/2006	115	---	---	160	58	---	4.8	---	---	0.05	6.1	---	---	455	2.0	<0.05	22.7	---
12MW-23S	5/21/2007	112	---	14	170	61	---	4.7	4.1	73	0.05	6.2	2.2	67.7	499	2.29	<0.05	21.1	---
12MW-23S	7/16/2007	90	---	15	190	64	---	5.3	4.5	87	0.1	6.0	2.3	72.9	494	2.86	<0.05	22.5	---
12MW-23S	11/27/2007	112	---	15	190	60	---	5.1	4.5	92	0.1	6.2	2.4	70.1	478	2.4	0.06	22.4	---
12MW-23S	5/6/2008	100	---	14	170	66	---	4.9	4.4	125	0.05	6.0	2.2	71.2	488	2.94	0.04	19.6	---
12MW-23S	2/11/2009	110	---	18	150	61	---	4	5.32	80	0.07	6.2	2.5	73.7	467	2.9	<0.2	19.2	---
12MW-23S	7/20/2009	<10	---	19	140	63	---	6.4	5.4	95	0.05	6.3	---	---	480	2.1	<0.2	22.5	---
12MW-23SR	7/20/2009	---	---	20	---	62	---	---	5.5	98	---	---	---	---	---	2.5	---	---	---
12MW-24D	4/7/2003	180	<0.80	120	100	86	---	40	21	1,400	0.12	6.5	8.7	130	1,300	<2	0.10	20.8	---
12MW-24D	7/16/2003	450	0.70J	170	140	92	400	45	23	1,900	<0.05	6.6	10	120	1,590	<1.3	<0.05	22.4	---
12MW-24D	9/16/2003	500	---	160	130	84	18	35	21	1,400	<0.05	7.0	12	130	1,580	<1.3	<0.05	23.3	---
12MW-24D	1/12/2004	400	---	180	60	78	89	28	30	1,300	0.03	6.5	12	120	1,640	<1.3	<0.05	18.0	18.3
12MW-24D	4/27/2004	500	---	130	45	79	---	15	22	710	0.05	7.3	12	100	1,310	<1.3	<0.05	19.0	18.1
12MW-24D	8/16/2004	400	---	150	65	79	1,600	23	25	940	0.03	7.0	12	140	1,410	1.7J	<0.05	23.0	5.2
12MW-24S	4/7/2003	125	<0.60	100	100	65	---	44	22	1,400	0.2	5.9	5.5	91.0	1,090	<1.5	0.30	20.6	---
12MW-24S	7/16/2003	425	0.91	160	190	53	8,600	50	30	1,600	<0.05	6.5	6.8	100	1,430	<0.75	0.20	22.6	---
12MW-24S	9/16/2003	325	---	170	150	46	24,000	35	26	1,300	0.1	6.8	9.9	110	1,510	<0.75	<0.05	24.0	---
12MW-24S	1/13/2004	400	---	110	70	42	5,000	15	17	710	<0.05	7.2	8.7	80.0	1,100	<0.75	<0.05	17.2	25
12MW-24S	4/27/2004	500	---	79	80	38	---	13	15	470	<0.05	6.9	7.4	80.0	972	0.87J	<0.05	19.8	10.3
12MW-24S	8/18/2004	325	---	62	60	39	---	15	12	350	<0.05	6.8	6.5	79.0	801	<0.75	<0.05	24.4	31.2
12MW-24S	2/1/2005	225	---	45	40	37	---	6.4	9.1	---	<0.05	7.0	5.2	75.0	674	<0.5	<0.05	17.0	15.3
12MW-24S	1/30/2006	---	---	---	---	48	---	2.6	---	---	<0.05	7.2	---	---	494	2.8	---	18.9	3.2
12MW-24S	6/21/2006	125	380	23	16	50	---	2.6	3.9	96	<0.05	6.9	---	58.0	466	<0.75	<0.05	22.8	---
12MW-24S	9/11/2006	110	---	---	15	56	---	1.8	---	---	<0.05	7.2	---	---	430	<0.75	<0.05	23.4	---
12MW-25D	7/15/2003	125	<1.0	40	14	140	---	1.5	6.3	90	0.2	7.2	5.0	110	861	5.6	0.30	21.4	---
12MW-25D	9/16/2003	190	---	50	18	140	10	1.5	8.4	120	0.1	7.1	5.9	130	460	<2.0	0.60	21.9	---
12MW-25D	1/12/2004	130	---	56	16	150	---	1.2	11	140	0.1	6.4	7.2	120	1,060	<2.0	0.90	17.8	---
12MW-25D	4/28/2004	125	---	89	25	150	---	2.5	18	220	0.05	6.7	8.4	120	1,210	<2.5	0.50	19.1	17.3
12MW-25D	8/16/2004	200	---	56	33	180	---	1.5	11	140	0.2	6.9	7.4	150	1,090	<2.3	0.15	22.1	14.5
12MW-25D	5/23/2005	250	---	90	70	150	---	2.5	19	350	0.1	6.9	8.4	160	1,200	<1.8	0.25	21.5	15.3
12MW-25D	6/21/2006	275	---	63	45	130	---	2.1	13	270	0.1	6.8	---	110	1,050	<1.8	0.10	21.1	---
12MW-25S	4/9/2003	100	<0.60	18	30	48	2.6	2.0	4.3	66	0.1	6.3	2.3	62.0	410	2.7	<0.05	17.4	---
12MW-25S	7/15/2003	105	0.35J	16	45	49	5.5	2.0	4.1	59	0.1	6.8	2.3	58.0	405	1.7	<0.05	21.3	---
12MW-25S	9/17/2003	110	---	16	30	47	10	2.0	3.9	55	0.1	6.3	2.5	59.0	412	1.0J	0.10	21.3	5.5
12MW-25S	1/13/2004	115	---	17	30	49	8.5	1.6	4.1	59	0.1	6.7	2.5	47.0	420	<0.75	<0.05	16.2	1
12MW-25S	4/27/2004	120	---	21	40	48	---	1.8	5.1	72	0.3	6.5	3.0	57.0	469	<0.75	<0.05	18.7	19.7
12MW-25S	8/18/2004	160	---	25	40	49	3,100	2.0	6.2	85	0.2	6.3	3.3	69.0	506	<0.75	<0.05	22.7	28.9
12MW-25S	2/1/2005	225	---	30	60	48	---	2.2	7.3	---	0.05	6.4	3.0	79.0	588	<0.75	<0.05	17.8	5.3
12MW-25S	5/23/2005	210	---	34	85	48	---	2.3	8.4	110	0.05	6.5	3.1	87.0	630	<0.75	0.05	21.3	18.4
12MW-25S	9/12/2005	240	---	34	110	52	---	2.4	8.8	110	0.1	6.5	3.6	93.0	670	0.84J	<0.05	23.2	12.2
12MW-25S	1/30/2006	---	---	---	---	44	---	2.3	---	---	0.2	6.6	---	---	683	<0.75	---	18.8	7.7
12MW-25S	6/21/2006	260	560	42	100	47	---	2.6	10	130	0.1	6.4	---	90.0	697	1.3J	0.05	21.6	---
12MW-25S	9/11/2006	260	---	---	140	98	---	2.6	---	---	0.05	6.5	---	---	686	1.8J	<0.05	22.1	---
12MW-25S	5/21/2007	225	---	33	120	51	---	2.2	8.6	110	0.05	6.4	3.4	77.4	653	0.67	<0.05	20.5	---
12MW-25S	7/16/2007	200	---	36	110	50	---	2.3	9.2	110	0.05	6.5	3.6	81.5	629	0.66	0.05	22.1	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-25S	11/27/2007	225	---	33	80	50	---	1.9	8.4	100	0.05	6.6	3.6	76.4	594	0.48	0.09	21.1	---
12MW-25S	5/6/2008	225	---	31	85	52	---	2.2	7.7	94	0.05	6.6	3.3	71.1	561	0.32J	0.06	19.6	---
12MW-25S	2/11/2009	150	---	29	40	68	---	1.5	7.36	89	0.07	6.6	3.3	69.6	525	<0.1	<0.2	19.8	---
12MW-25S	9/1/2009	125	---	27	35	92	---	1.7	7.4	82	0.05	6.5	---	---	507	<1	<0.2	21.8	---
12MW-26S	4/8/2003	85	<0.60	20	30	51	---	1.9	4.7	67	0.1	6.6	2.8	56.0	403	<1.5	0.05	16.8	---
12MW-26S	7/16/2003	85	<0.30	33	45	50	---	4.0	7.9	120	<0.05	6.3	2.5	48.0	508	<0.75	0.30	22.3	---
12MW-26S	9/17/2003	125	---	25	60	48	---	2.5	5.7	83	<0.05	6.4	3.2	58.0	466	<0.75	0.05	23.8	8.9
12MW-26S	1/13/2004	110	---	24	60	52	---	3.1	5.5	85	<0.05	7.1	3.2	44.0	462	<0.75	0.05	17.7	---
12MW-26S	4/27/2004	110	---	21	60	53	---	3.2	4.9	72	---	6.4	2.8	48.0	423	<1	<0.05	18.5	4.7
12MW-26S	8/18/2004	70	---	20	120	68	---	3.5	5	71	<0.05	6.2	2.7	58.0	441	<1	0.05	24.3	8.3
12MW-26S	2/2/2005	100	---	21	110	79	---	4.5	5.5	---	0.05	5.9	2.6	61.0	486	1.1J	<0.05	15.8	12
12MW-26S	5/25/2005	40	---	---	25	84	---	7.0	---	---	0.05	7.1	---	---	509	<1	<0.05	19.7	---
12MW-26S	1/31/2006	---	---	---	---	110	---	6.5	---	---	0.1	6.0	---	---	590	<1.3	---	18.6	---
12MW-26S	7/5/2006	65	---	---	70	---	---	4.0	---	---	0.1	6.1	---	---	574	---	<0.05	22.3	'---
12MW-26S	9/12/2006	110	---	---	85	67	---	2.0	---	---	0.05	6.4	---	---	432	<1	<0.05	21.8	---
12MW-26S	5/21/2007	85	---	21	150	89	---	4.1	6.5	79	0.05	6.1	2.6	68.4	535	1.0	<0.05	20.6	---
12MW-26S	7/16/2007	80	---	21	140	100	---	4.7	6.5	81	<0.05	6.0	2.6	70.1	534	1.2	<0.05	21.5	---
12MW-26S	8/22/2007	---	---	21	---	120	---	---	6.7	80	---	---	2.6	75.8	---	1.5	---	---	---
12MW-26SR	8/22/2007	---	---	21	---	120	---	---	6.4	76	---	---	2.6	71.0	---	1.4	---	---	---
12MW-26S	11/26/2007	50	---	20	110	110	---	4.7	6.3	77	0.05	6.1	2.8	70.4	508	1.3	0.15	22.1	---
12MW-26SR	11/26/2007	---	---	20	---	110	---	---	6.1	75	---	---	2.7	68.7	---	1.3	---	---	---
12MW-26S	5/6/2008	95	---	21	140	94	---	4.9	6.0	74	<0.05	6.1	2.7	65.5	584	1.1	0.05	19.1	---
12MW-26S	8/14/2008	75	---	21	150	100	---	5.0	6.5	81	0.1	5.9	2.5	73.3	533	1.4	<0.20	22.0	---
12MW-26S	2/11/2009	90	---	23	160	110	---	2	7.26	87	0.05	6.0	2.8	78.4	558	1.4	<0.2	18.4	---
12MW-26S	7/20/2009	<10	---	26	65	110	---	4.8	7.1	84	0.05	6.2	---	---	572	2	<0.2	22.51	---
12MW-26S	9/1/2009	80	---	23	160	120	---	4.8	7.4	87	0.03	5.9	---	---	574	1.1	<0.2	22.31	---
12MW-27D	4/8/2003	200	<2.0	47	33	220	---	2.2	9.5	110	0.2	6.8	6.4	170	1,190	6.2	<0.05	17.2	---
12MW-27D	7/15/2003	175	<1.0	52	22	280	---	2.0	11	120	0.2	6.9	6.0	190	1,300	7.9	<0.05	22.4	---
12MW-27D	9/16/2003	175	---	51	21	260	---	2.0	10	110	0.1	6.9	6.1	190	1,340	5.8J	<0.05	22.8	4
12MW-27D	1/12/2004	150	---	52	21	290	---	1.0	10	110	0.3	6.8	6.6	180	1,400	<6.3	<0.05	18.1	2.7
12MW-27D	4/28/2004	150	---	50	19	250	---	0.90	10	130	0.1	6.9	6.3	150	1,330	5J	<0.05	18.5	17.9
12MW-27D	8/18/2004	200	---	42	30	220	---	1.6	8.8	98	0.1	6.8	5.4	170	1,150	<2.5	0.10	24.1	---
12MW-27D	5/23/2005	225	---	1.6	37	270	---	1.5	1.4	11	0.1	7.0	<0.36	25.0	1,340	<5	<0.05	22.9	0.2
12MW-27D	6/21/2006	100	---	63	45	190	---	1.5	13	130	0.1	6.7	---	170	1,370	<2.5	<0.05	23.4	---
12MW-27S	4/9/2003	<10	<0.60	4.3	150	32	---	1.4	1.8	33	0.3	4.7	0.67J	28.0	195	18	<0.05	16.2	---
12MW-27S	7/16/2003	<10	0.35J	3.2	200	37	---	3.5	1.6	29	<0.05	5.0	0.62J	24.0	195	17	<0.05	22.4	---
12MW-27S	9/16/2003	<10	---	2.8	200	34	---	5.5	1.5	25	0.05	5.0	0.63J	28.0	240	<2.5	<0.05	24.3	---
12MW-27S	1/14/2004	<10	---	3.1	---	37	---	0.80	1.5	25	0.6	5.4	0.48J	20.0	196	14	<0.05	17.2	---
12MW-27S	4/27/2004	<10	---	2.5	140	37	---	0.50	1.5	23	0.2	4.9	0.79J	22.0	193	16	<0.05	19.4	6.7
12MW-27S	8/18/2004	<10	---	2.2	190	36	---	2.5	1.4	17	0.1	4.7	0.94J	28.0	190	14	<0.05	24.6	---
12MW-27S	2/3/2005	<50	---	---	22	---	---	4.0	---	---	0.4	4.9	---	---	175	---	<0.05	16.9	8
12MW-27S	5/23/2005	<10	---	59	210	38	---	2.5	12	120	0.1	4.9	6.6	230	189	13	<0.05	21.6	---
12MW-27S	9/13/2005	<10	---	1.2	240	39	---	3.5	1.5	11	0.2	4.7	0.51J	25.0	202	12	<0.05	24.1	---
12MW-27S	1/31/2006	---	---	---	---	43	---	2.0	---	---	0.2	4.7	---	---	223	12	---	20.0	---
12MW-27S	6/21/2006	<10	---	2.1	350	46	---	2.5	2.1	15	0.05	4.6	---	29.0	237	10	<0.05	23.4	---
12MW-27S	9/12/2006	<10	---	---	350	47	---	3.0	---	---	0.1	4.5	---	---	241	9.9	<0.05	23.6	---
12MW-27S	5/23/2007	<10	---	1.6	420	45	---	2.0	2.1	14	0.05	4.5	0.62	35.4	229	9.6	<0.05	20.4	---
12MW-27S	7/17/2007	<10	---	2.0	420	45	---	3.0	2.2	14	0.1	4.6	0.71	35.9	231	9.6	<0.05	23.1	---
12MW-27S	11/27/2007	<10	---	1.7	350	47	---	2.7	2.1	14	0.1	4.7	0.69	34.4	234	8.5	0.06	21.7	---
12MW-27S	5/5/2008	<10	---	1.2	370	45	---	1.6	1.9	9.9J		4.6	0.57	34.0	222	9.0	0.047	20.5	---
12MW-27S	2/10/2009	<10	---	2.2	330	47	---	1.5	2.5	15	0.5	4.6	0.66	39.2	235	8.6	<0.2	18.5	---

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-27S	7/20/2009	<10	---	<5	---	47	---	2.5	1.8J	8.7J	0.05	4.7	---	---	215	20	<0.2	23.1	---
12MW-28D	4/8/2003	50	<0.80	20	16	85	---	0.65	4.3	48	0.2	6.9	3.5	96.0	588	3	<0.05	18.5	---
12MW-28D	7/15/2003	100	0.55J	23	18	100	---	1.5	4.9	64	<0.05	6.9	4	95.0	647	3.8	<0.05	23.0	---
12MW-28D	9/17/2003	150	---	24	19	98	---	2.0	5	64	0.1	6.9	4.2	100	688	4.1	<0.05	22.8	5
12MW-28D	1/12/2004	175	---	36	17	150	---	1.3	7.5	96	0.2	6.6	5.6	110	888	<2	0.20	18.8	---
12MW-28D	4/26/2004	180	---	34	25	130	---	1.7	7.2	95	0.05	7.0	5.5	95.0	831	<2	0.10	21.0	12.1
12MW-28D	8/17/2004	240	---	41	30	150	---	2.0	8.8	110	0.2	6.9	6.3	140	928	<1.8	<0.05	23.4	15.2
12MW-28D	5/25/2005	200	---	52	40	120	---	1.5	11	140	0.1	6.7	6.5	160	1,030	<1.5	0.05	21.7	9.1
12MW-28D	6/22/2006	350	---	64	100	120	---	1.4	14	170	0.2	6.5	---	120	1,070	<1.8	0.10	21.7	---
12MW-28D	5/22/2007	275	---	46	100	130	---	1.0	11	130	0.1	6.6	6.8	129	947	<0.1	0.05	21.3	---
12MW-28D	7/16/2007	225	---	---	65		---	0.85	---	---	0.1	6.6	---	---	915	---	0.05	22.6	---
12MW-28D	11/28/2007	250	---	42	70	100	---	0.81	9.6	120	0.05	7.1	6.5	121	840	0.39J	0.14	21.8	---
12MW-28D	2/11/2009	260	---	41	50	90	---	0.73	9.5	110	0.1	6.8	6.6	121	793	<0.1	<0.2	20.6	---
12MW-28S	4/9/2003	250	<1.6	110	70	130	2.3	4.5	12	140	0.2	6.1	2.3	70.0	1,050	15	<0.05	17.7	---
12MW-28SR	4/9/2003	---	<1.6	120	---	130	---	---	13	140	---	---	2.5	70.0	---	15	---	---	---
12MW-28SR	7/17/2003	---	<0.80	73	---	120	---	---	9.3	120	---	---	1.8	70.0	---	12	---	---	---
12MW-28SR	9/15/2003	---	---	42	---	120	---	---	7.2	81	---	---	1.7J	70.0	---	7.9	---	---	---
12MW-28SR	1/14/2004	---	---	32	---	120	---	---	5.8	61	---	---	1.7J	49.0	---	6.5	---	---	---
12MW-28S	4/28/2004	<10	---	24	220	110	18	0.80	6.3	60	0.2	5.6	1.6J	59.0	528	6.8	<0.05	18.6	---
12MW-28SR	4/28/2004	---	---	24	---	120	---	---	6.3	60	---	---	1.5J	59.0	---	7.2	---	---	---
12MW-28S	8/17/2004	35	---	20	250	110	3.0	4.5	5.8	64	0.3	5.3	64	64.0	521	5.5	<0.05	23.8	12.8
12MW-28SR	8/17/2004	---	---	20	---	110	---	---	5.9	64	---	---	63	63.0	---	5.9	---	---	---
12MW-28S	2/2/2005	60	---	21	180	110	0.82	1.3	5.5	---	0.4	5.7	1.4J	61.0	511	4.5	<0.05	18.5	---
12MW-28SR	2/2/2005	---	---	22	---	120	---	---	5.7	---	---	---	1.5J	64.0	---	5.4	---	---	---
12MW-28S	5/24/2005	<10	---	20	210	120	0.98J	0.7	5.5	53	0.05	5.4	1.6	64.0	538	5.9	<0.05	21.2	12.6
12MW-28SR	5/24/2005	---	---	20	---	120	---	---	5.6	54	---	---	1.2J	65.0	---	5.8	---	---	---
12MW-28S	9/13/2005	<10	---	18	250	130	---	2.6	5.5	52	0.2	5.2	1.3J	69.0	533	8.6	<0.05	23.7	11.4
12MW-28SR	9/13/2005	---	---	18	---	130	---	---	5.6	53	---	---	1.6	71.0	---	8	---	---	---
12MW-28S	1/31/2006	---	---	---	---	120	---	---	---	---	---	---	---	---	---	5.4	---	---	---
12MW-28SR	1/31/2006	---	---	---	---	120	---	---	---	---	---	---	---	---	---	5.4	---	---	---
12MW-28S	6/20/2006	<10	---	18	250	140	1.2	0.95	5.9	54	0.1	5.1	---	68.0	553	7	<0.05	22.9	---
12MW-28SR	6/20/2006	---	---	18	---	140	---	---	5.7	53	---	---	---	66.0	---	5.4	---	---	---
12MW-28S	9/12/2006	<10	---	---	270	120	---	2.4	---	---	0.2	5.2	---	---	538	4.1	<0.05	24.1	---
12MW-28SR	9/12/2006		---	---	---	120	---	---	---	---	---	---	---	---	---	4.1	---	---	---
12MW-28S	5/22/2007	<10	---	13.5	270	120	---	1.0	4.9	43	0.2	5.1	1.5	65.6	503	5.6	<0.05	20.3	---
12MW-28SR	5/22/2007	---	---	12.9	---	120	---	---	4.6	41	---	---	1.4	63.1	---	5.5	---	---	---
12MW-28S	7/17/2007	<10	---	13.8	260	120	---	2.0	5.0	44	0.1	5.2	1.6	71.7	485	4.5	<0.05	23.6	---
12MW-28S	11/27/2007	<10	---	13.2	270	100	---	1.9	4.7	44	0.5	5.3	1.7	63.9	466	4.0	0.07	22.6	---
12MW-28S	5/6/2008	<10	---	10.4	250	95	---	0.69	3.9	34	0.05	5.2	1.4	57.7	435	5.1	0.04	20.9	---
12MW-28SR	5/6/2008	---	---	10.5	---	94	---	---	4.0	35	---	---	1.4	58.7	---	5.1	---	---	---
12MW-28S	2/11/2009	<10	---	11	280	92	---	1.9	4.56	40	0.1	5.1	1.5	65.2	432	5.8	<0.2	19.6	---
12MW-28SR	2/11/2009	---	---	12	---	92	---	---	4.61	40	---	---	1.5	65.9	---	5.8	---	---	---
12MW-28S	7/20/2009	<10	---	11	260	96	---	5	4.4J	36	0.05	5.5	---	---	439	12	<0.2	23.1	---
12MW-29S	8/17/2004	50	---	4.2	40	90	2.0	0.80	2.3	17	0.05	5.7	1.5J	82.0	463	2.0J	<0.05	20.9	38.4
12MW-29SR	8/17/2004	---	---	4.4	---	89	---	---	2.3	17	---	---	1.6J	82.0	---	2.2	---	---	---
12MW-29S	2/2/2005	50	---	6.2	20	94	1.8	0.80	2.5	---	0.2	6.1	1.2J	88.0	478	1.4J	<0.05	17.4	---
12MW-29S	5/24/2005	65	---	6.5	70	86	1.0J	0.60	2.6	23	0.05	---	1.2J	85.0	478	1.8J	<0.05	18.1	9.2
12MW-29SR	5/24/2005	---	---	6.6	---	87	---	---	2.6	23	---	---	1.1J	85.0	---	1.7J	---	---	---
12MW-29S	9/13/2005	<10	---	5.9	150	80	---	0.50	2.5	22	0.1	6.1	1.7	85.0	460	2J	<0.05	21.5	34.9
12MW-29SR	9/13/2005	---	---	6.1	---	84	---	---	2.6	23	---	---	1.5	86.0	---	1.9J	---	---	---
12MW-29S	1/31/2006	---	---	---	---	76	---	0.30	---	---	---	6.1	---	---	449	1.8J	---	17.3	6.3

Appendix 4. Concentrations of inorganic constituents measured in groundwater at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2000 to September 2009 (continued).

[mg/L, milligrams per liter; nM, nanomoles; µg/L, micrograms per liter; S.U., standard units, µS/cm, microsiemens per centimeter at 25 degrees Celsius; NTU, Nephelometric turbidity units; ---, Data not collected; <, less than; J, estimated; R, replicate sample]

Well number	Sampling date	Alkalinity (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Carbon Dioxide (mg/L)	Chloride (mg/L)	Hydrogen (nM)	Iron(II) (mg/L)	Magnesium (mg/L)	Manganese (µg/L)	Dissolved Oxygen (mg/L)	pH (S.U.)	Potassium (mg/L)	Sodium (mg/L)	Specific Cond. (µS/cm at 25° C)	Sulfate (mg/L)	Sulfide (mg/L)	Temperature (Celsius)	Turbidity (NTU)
12MW-29SR	1/31/2006	---	---	---	---	76	---	---	---	---	---	---	---	---	---	1.6J	---	---	---
12MW-29S	6/20/2006	70	---	---	110	80	---	0.50	---	---	0.2	6.0	---	---	476	1.9J	<0.05	20.0	---
12MW-29SR	6/20/2006	---	---	---	---	79	---	---	---	---	---	---	---	---	---	1.7J	---	---	---
12MW-29S	9/11/2006	65	---	---	30	77	---	0.80	---	---	0.1	6.0	---	---	471	1.8J	<0.05	21.3	---
12MW-29SR	9/11/2006	---	---	---	---	77	---	---	---	---	---	---	---	---	---	1.7J	---	---	---
12MW-29S	5/22/2007	90	---	---	35	71	---	0.40	---	---	0.1	6.0	---	---	463	1.8	<0.05	19.0	---
12MW-29SR	5/22/2007	---	---	---	---	70	---	---	---	---	---	---	---	---	---	1.7	---	---	---
12MW-29S	7/17/2007	90	---	---	25	71	---	0.30	---	---	0.05	5.8	---	---	470	1.8	<0.05	19.3	---
12MW-29S	11/27/2007	50	---	---	12	67	---	<0.05	---	---	2.0	7.4	---	---	486	1.7	0.12	18.6	---
12MW-29S	5/6/2008	70	---	---	25	68	---	0.09	---	---	0.2	6.2	---	---	470	2.0	<0.6	19.6	---
12MW-29S	2/11/2009	75	---	---	20	71	---	1.1	---	---	0.3	6.0	---	---	451	1.7	0.28	18.1	---
12MW-29S	7/20/2009	70	---	---	23	77	---	0.26	---	---	0.2	5.9	---	---	458	2.5	0.21	20.8	---
12MW-30S	8/18/2004	100	---	6.2	50	100	2.6	---	2.3	45	0.05	5.6	1.2J	81.0	500	6.9	<0.05	20.6	21.6
12MW-30SR	8/18/2004	---	---	6.2	---	97	---	---	2.3	46	---	---	1.4J	83.0	---	6.3	---	---	---
12MW-30S	5/24/2005	70	---	9.4	50	96	17	0.40	2.6	37	0.1	---	1.2J	88.0	505	1.7J	<0.05	19.8	11.4
12MW-30S	9/13/2005	65	---	11	40	88	---	0.40	2.6	38	0.2	6.0	1.5	89.0	494	2.5	<0.05	21.5	27.6
12PZ-03D	8/19/2004	90	---	46	80	580	---	24	19	370	0.1	5.6	4.6	310	2,200	58	<0.05	22.8	---
12PZ-03D	2/1/2005	65	---	---	70	---	---	18	---	---	0.05	5.8	---	---	2,050	---	<0.05	14.6	190
12PZ-03D	5/23/2005	100	---	---	100	---	---	24	---	---	0.1	6.1	---	---	2,060	---	<0.05	---	---
12PZ-03D	6/22/2006	45	---	---	160	---	---	25	---	---	0.05	5.7	---	---	2,060	---	<0.05	22.0	---
12PZ-03D	5/21/2007	---	---	---	---	---	---	---	---	---	---	5.8	---	---	2,080	---	---	18.8	---
12PZ-03D	11/28/2007	35	---	39.1	25	550	---	9.9	18	290	0.3	6.5	3.3	333	---	50	0.13	---	---
12PZ-03D	2/11/2009	---	---	---	20	---	---	4.3	---	---	---	5.7	---	---	2,520	---	0.60	18.0	---

Appendix 5. Concentrations of selected volatile organic compounds detected in groundwater from temporary wells at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August to October 2009.

[111TCA, 1,1,1-trichloroethane; 11DCA, 1,1-dichloroethane; 11DCE, 1,1-dichloroethene; 14Diox, 1,4-dioxane; cDCE, *cis*-1,2-dichloroethene; PCE, tetrachloroethene; TCE, trichloroethene; VC, vinyl chloride; <, less than; J, estimated value; all concentrations are in micrograms per liter]

Well name	Sample date (month/day/year)	111TCA	11DCA	11DCE	14Diox	cDCE	PCE	TCE	VC
12TW-2009-01	08/18/2009	<1.0	1	170	<10	22	20	540	<1.0
12TW-2009-02	08/18/2009	<0.5	1	87	<5.0	11	6	390	<0.5
12TW-2009-03	08/18/2009	<0.5	13	140	11	1	<0.5	1	<0.5
12TW-2009-04	08/18/2009	<0.5	18	160	16	1	<0.5	1	<0.5
12TW-2009-05	08/18/2009	<0.5	16	100	8	1	<0.5	1	<0.5
12TW-2009-06	08/18/2009	<1.0	3	260	<10	22	23	560	<1.0
12TW-2009-07	08/18/2009	<0.5	5	260	<5.0	7	7	170	<0.5
12TW-2009-08	08/18/2009	<0.5	5	260	<5.0	4	4	87	<0.5
12TW-2009-09	08/18/2009	<0.5	3	110	<5.0	1	1	14	<0.5
12TW-2009-10	08/18/2009	<0.5	4	350	<5.0	2	1	160	<0.5
12TW-2009-11	08/18/2009	<2.5	3	310	<25	6	8	460	<2.5
12TW-2009-12	08/18/2009	<0.5	1	110	<5.0	7	22	370	<0.5
12TW-2009-13	08/18/2009	<2.5	<2.5	100	<25	6	15	670	<2.5
12TW-2009-14	08/18/2009	<0.5	<0.5	45	<5.0	2	2	340	<0.5
12TW-2009-15	08/18/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-16	08/18/2009	43	87	1,100	<25	120	100	1,000	<2.5
12TW-2009-17	08/18/2009	9	15	510	<50	510	330	2,600	<5.0
12TW-2009-18	08/18/2009	<0.5	4	40	<5.0	7	<0.5	32	<0.5
12TW-2009-19	08/18/2009	<0.5	43	86	11	2	<0.5	3	<0.5
12TW-2009-20	08/18/2009	<0.5	9	340	<5.0	23	5	240	<0.5
12TW-2009-21	08/18/2009	<0.5	2	96	<5.0	3	<0.5	47	<0.5
12TW-2009-22	08/18/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-23	08/18/2009	<2.5	8	150	<25	480	69	640	3
12TW-2009-24	08/18/2009	1,100	4,600	12,000	1,400	2,600	3,200	4,400	68
12TW-2009-25	08/18/2009	43	84	1,900	<50	76	130	690	<5.0
12TW-2009-26	08/18/2009	<0.5	2	71	<5.0	1	<0.5	7	<0.5
12TW-2009-27	08/18/2009	<0.5	<0.5	7	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-28	08/18/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-29	08/18/2009	<0.5	2	67	8	210	3	190	<0.5
12TW-2009-30	08/18/2009	<0.5	3	210	13	280	<0.5	150	4
12TW-2009-31	08/18/2009	<0.5	2	21	18	1	<0.5	2	<0.5
12TW-2009-32	08/18/2009	<2.5	42	1,100	<25	8	<2.5	33	<2.5
12TW-2009-33	08/18/2009	1,400	6,500	18,000	2,500	3,900	6,200	6,700	<50
12TW-2009-34	08/18/2009	<2.5	15	360	<25	<2.5	<2.5	<2.5	<2.5
12TW-2009-35	08/18/2009	1,400	4,800	15,000	<1,000	2,500	4,900	5,700	<100
12TW-2009-36	08/18/2009	390	2,500	8,600	<500	2,100	1,300	2,800	<50
12TW-2009-37	08/18/2009	<0.5	6	64	120	200	7	270	11
12TW-2009-38	08/18/2009	<0.5	1	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-39	08/18/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	7	<0.5
12TW-2009-40	08/18/2009	<0.5	<0.5	11	<5.0	1	<0.5	78	<0.5
12TW-2009-40R	08/18/2009	<0.5	<0.5	11	<5.0	1	<0.5	77	<0.5
12TW-2009-41	08/18/2009	<0.5	<0.5	26	<5.0	1	<0.5	15	<0.5
12TW-2009-41R	08/18/2009	<0.5	<0.5	28	<5.0	1	<0.5	15	<0.5
12TW-2009-42	08/18/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-42R	08/18/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-43	10/30/2009	<0.5	0.11J	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-43R	10/30/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-44	10/30/2009	<0.5	0.41J	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-45	10/30/2009	<0.5	0.16J	1.7J	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-46	10/30/2009	<0.5	0.26J	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5
12TW-2009-47	10/30/2009	<0.5	<0.5	<0.5	<5.0	<0.5	<0.5	<0.5	<0.5

TERRY ENVIRONMENTAL SERVICES
Clients First Always™
WWW.TERRYENVIRONMENTAL.COM

WELL LOG

MONITORING WELL #: 12PZ - 07
TERRY PROJECT: USGS/NWS
PROJECT LOCATION: GOOSE CREEK, SC

TERRY PROJECT #: 2370	HOLE DIAMETER: 6.25"
SCDHEC SITE ID #: N/A	CASING DIAMETER: 2"
CLIENT: USGS	SCREEN DIAMETER: 2"
FIELD PERSONNEL: S. DEMAR, R. BRAND	TOP OF CASING ELEVATION: 0
START DATE: 8/20/2009 FINISH DATE: 8/20/2009	WATER LEVEL: 4 FT BGS
DRILLING COMPANY: TERRY EXPLORATION	EASTING: 0
DRILLER: RANDY BRAND (CERT #1485-B)	NORTHING: 0
DRILLING METHOD: HOLLOW STEM AUGER	DEVELOPMENT: PUMP/SURGE

Casing Interval 0-11 FT BGS Bentonite Interval 8-9 FT BGS Filter Interval 9-16 FT BGS
Screen Interval 11-16 FT BGS Grout Interval 0-8 FT BGS Filter Material SAND

Depth Scale	Sample Zone	Odor (1=none, 2=slight, 3=strong)	PID/OVA	Moisture (1=dry, 2=moist, 3=wet)	Lithology (SAND: color, moisture, gradation, grain size, fines content, additional comments. CLAY: density, color, moisture, % fines, % coarse, plasticity, additional comments.)	Water Level	Well Construction
0		1	N/A	1	TOPSOIL: Topsoil		WELLCAP
		1	N/A	1	CLAYEY SAND: Light brown fine to medium grained clayey sand, poorly sorted		
		1	N/A	1	CLAYEY SAND: Light brown-orange fine grained clayey sand, poorly sorted		GROUTED ANNULUS
		1	N/A	1	SANDY CLAY: Orange-brown sandy clay, 15-20%fine grained sand, low plasticity, medium density		SCH 40 PVC CASING
5		1	N/A	1	SANDY CLAY: Light brown sandy clay, 0-5% very fine grained sand, low plasticity, very high density		BENTONITE
		1	N/A	2	CLAY: Grey-green clay, 0-5% silt, high plasticity, very high density		
10		1	N/A	2	SANDY CLAY: Grey-green sandy clay, 10-15% very fine grained sand, high plasticity, very high density		GRAVEL PACK
		1	N/A	2	SANDY CLAY: Tan-green sandy clay, 10-15% fine to medium grained sand, high plasticity, very high density		
		1	N/A	3	SAND: Tan fine to medium grained sand, well sorted, 0-5% fines		SCH 40 WELLSCREEN
15							

Total Depth = 16 FT BGS 1 of 1

Appendix 6. Lithologic log and well-construction diagram of well 12PZ-07 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 (Randy Brand, Terry Environmental Services, written commun., 2009).

TERRY ENVIRONMENTAL SERVICES
Clients First Always™
WWW.TERRYENVIRONMENTAL.COM

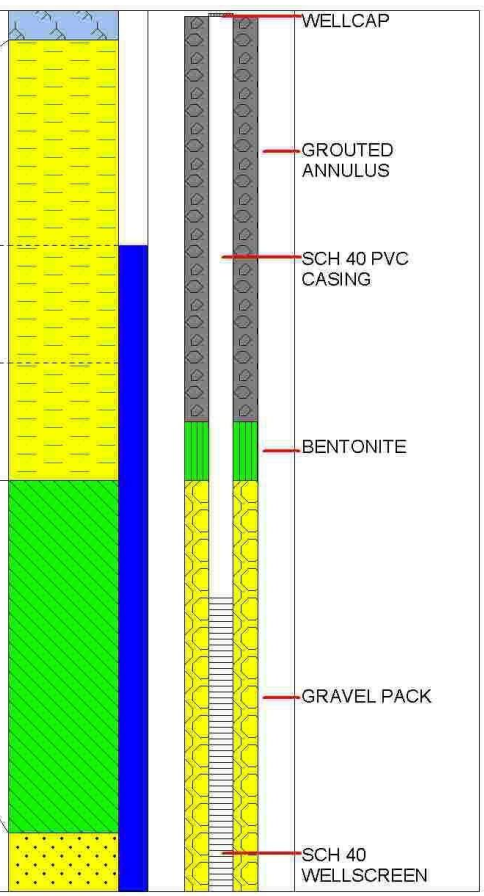
WELL LOG

MONITORING WELL #: 12PZ - 08
TERRY PROJECT: USGS/NWS
PROJECT LOCATION: GOOSE CREEK, SC

TERRY PROJECT #: 2370	HOLE DIAMETER: 6.25"
SCDHEC SITE ID #: N/A	CASING DIAMETER: 2"
CLIENT: USGS	SCREEN DIAMETER: 2"
FIELD PERSONNEL: S. DEMAR, R. BRAND	TOP OF CASING ELEVATION: 0
START DATE: 8/20/2009 FINISH DATE: 8/20/2009	WATER LEVEL: 4 FT BGS
DRILLING COMPANY: TERRY EXPLORATION	EASTING: 0
DRILLER: RANDY BRAND (CERT #1485-B)	NORTHING: 0
DRILLING METHOD: HOLLOW STEM AUGER	DEVELOPMENT: PUMP/SURGE

Casing Interval 0-10 FT BGS Bentonite Interval 7-8 FT BGS Filter Interval 8-15 FT BGS
Screen Interval 10-15 FT BGS Grout Interval 0-7 FT BGS Filter Material SAND

Depth Scale	Sample Zone	Odor (1=none, 2=slight, 3=strong)	PID/OVA	Moisture (1=dry, 2=moist, 3=wet)	Lithology (SAND: color, moisture, gradation, grain size, fines content, additional comments. CLAY: density, color, moisture, % fines, % coarse, plasticity, additional comments.)	Water Level	Well Construction
0		1	N/A	1	TOPSOIL: Topsoil		WELLCAP
		1	N/A	1	CLAYEY SAND: Light brown fine to medium grained clayey sand, poorly sorted		GROUTED ANNULUS
		1	N/A	1	CLAYEY SAND: Tan-orange fine to medium grained clayey sand, poorly sorted		SCH 40 PVC CASING
5					CLAYEY SAND: Tan-green fine grained clayey sand, well sorted		BENTONITE
					CLAY: Grey-green clay, 0-5% silt, 0-5% very fine sand, high plasticity, high density		
10		1	N/A	2			GRAVEL PACK
		1	N/A	3	SAND: Grey-green fine grained sand, poorly sorted, 10-15% fines		SCH 40 WELLSCREEN
15							



Total Depth = 15 FT BGS 1 of 1

Appendix 7. Lithologic log and well-construction diagram of well 12PZ-08 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 (Randy Brand, Terry Environmental Services, written commun., 2009).

TERRY ENVIRONMENTAL SERVICES
Clients First Always™
WWW.TERRYENVIRONMENTAL.COM

WELL LOG

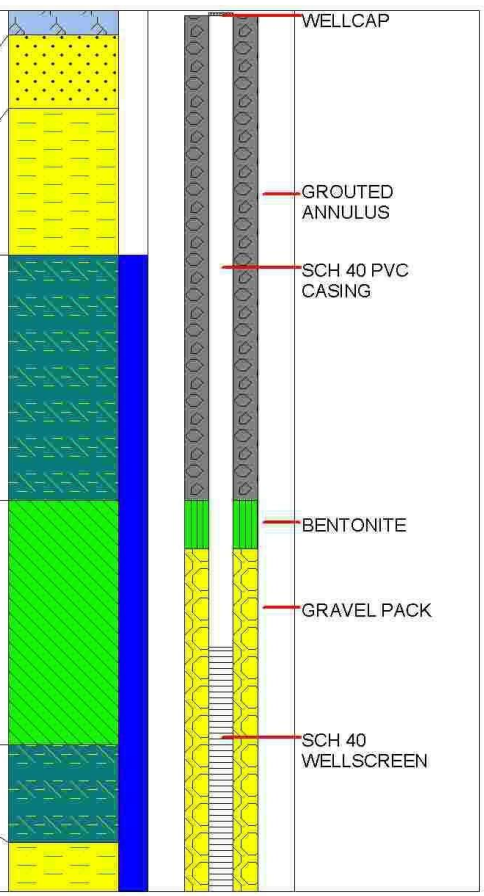
MONITORING WELL #: 12PZ - 09
TERRY PROJECT: USGS/NWS
PROJECT LOCATION: GOOSE CREEK, SC

TERRY PROJECT #: 2370
SCDHEC SITE ID #: N/A
CLIENT: USGS
FIELD PERSONNEL: S. DEMAR, R. BRAND
START DATE: 8/20/2009 FINISH DATE: 8/20/2009
DRILLING COMPANY: TERRY EXPLORATION
DRILLER: RANDY BRAND (CERT #1485-B)
DRILLING METHOD: HOLLOW STEM AUGER

HOLE DIAMETER: 6.25"
CASING DIAMETER: 2"
SCREEN DIAMETER: 2"
TOP OF CASING ELEVATION: 0
WATER LEVEL: 5 FT BGS
EASTING: 0
NORTHING: 0
DEVELOPMENT: PUMP/SURGE

Casing Interval 0-13 FT BGS Bentonite Interval 10-11 FT BGS Filter Interval 11-18 FT BGS
Screen Interval 13-18 FT BGS Grout Interval 0-10 FT BGS Filter Material SAND

Depth Scale	Sample Zone	Odor (1=none, 2=slight, 3=strong)	PID/OVA	Moisture (1=dry, 2=moist, 3=wet)	Lithology (SAND: color, moisture, gradation, grain size, fines content, additional comments. CLAY: density, color, moisture, % fines, % coarse, plasticity, additional comments.)	Water Level	Well Construction
0		1	N/A	1	TOPSOIL: Topsoil		WELLCAP
		2	N/A	1	SAND: Brown medium to coarse grained sand, poorly sorted, 5-10% fines, slight organic odor		
		1	N/A	1	CLAYEY SAND: Light orange-brown fine to medium grained clayey sand, poorly sorted		GROUTED ANNULUS
5		1	N/A	1	SANDY CLAY: Orange-brown sandy clay, 10-15% very fine grained sand, medium plasticity, medium density		SCH 40 PVC CASING
10		1	N/A	1	CLAY: Grey-green clay, 0-5% silt, high plasticity, very high density		BENTONITE GRAVEL PACK
15		1	N/A	2	SANDY CLAY: Grey-green sandy clay, 10-15% very fine grained sand, high plasticity, very high density		SCH 40 WELLSCREEN
		1	N/A	3	CLAYEY SAND: Tan-green fine to medium grained clayey sand.		



Total Depth = 18 FT BGS 1 of 1

Appendix 8. Lithologic log and well-construction diagram of well 12PZ-09 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina August 2009 (Randy Brand, Terry Environmental Services, written commun., 2009).

TERRY ENVIRONMENTAL SERVICES
Clients First Always™
WWW.TERRYENVIRONMENTAL.COM

WELL LOG

MONITORING WELL #: 12PZ - 10
TERRY PROJECT: USGS/NWS
PROJECT LOCATION: GOOSE CREEK, SC

TERRY PROJECT #: 2370	HOLE DIAMETER: 6.25"
SCDHEC SITE ID #: N/A	CASING DIAMETER: 2"
CLIENT: USGS	SCREEN DIAMETER: 2"
FIELD PERSONNEL: S. DEMAR, R. BRAND	TOP OF CASING ELEVATION: 0
START DATE: 8/20/2009 FINISH DATE: 8/20/2009	WATER LEVEL: 4 FT BGS
DRILLING COMPANY: TERRY EXPLORATION	EASTING: 0
DRILLER: RANDY BRAND (CERT #1485-B)	NORTHING: 0
DRILLING METHOD: HOLLOW STEM AUGER	DEVELOPMENT: PUMP/SURGE

Casing Interval 0-10 FT BGS Bentonite Interval 7-8 FT BGS Filter Interval 8-15 FT BGS
Screen Interval 10-15 FT BGS Grout Interval 0-7 FT BGS Filter Material SAND

Depth Scale	Sample Zone	Odor (1=none, 2=slight, 3=strong)	PID/OVA	Moisture (1=dry, 2=moist, 3=wet)	Lithology (SAND: color, moisture, gradation, grain size, fines content, additional comments. CLAY: density, color, moisture, % fines, % coarse, plasticity, additional comments.)	Water Level	Well Construction
0		1	N/A	1	TOPSOIL: Topsoil		WELLCAP
		1	N/A	1	CLAYEY SAND: Brown fine grained clayey sand, poorly sorted		
		1	N/A	1	SANDY CLAY: Orange sandy clay, 5-10% very fine to fine grained sand, medium plasticity, medium density		GROUTED ANNULUS; SCH 40 PVC CASING
5					SANDY CLAY: Tan-green sandy clay, 0-5% very fine grained sand, high plasticity, high density		BENTONITE
		1	N/A	2	CLAY: Grey-green clay, 0-5% silt, 0-5% very fine sand, high plasticity, high density		
10					SANDY CLAY: Grey-green sandy clay, 10-15% silt, high plasticity, medium density		GRAVEL PACK
					CLAYEY SAND: Tan-green fine to medium grained clayey sand, poorly sorted		
15		1	N/A	3	SAND: Tan fine to medium grained sand, 5-10% fines, poorly sorted		SCH 40 WELLSCREEN

Total Depth = 15 FT BGS 1 of 1

Appendix 9. Lithologic log and well-construction diagram of well 12PZ-10 at Solid Waste Management Unit 12, Naval Weapons Station Charleston, North Charleston, South Carolina, August 2009 (Randy Brand, Terry Environmental Services, written commun., 2009).