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SAMPLING AND ANALYSIS PLAN AREA OF CONCERN 722 (AOC 722) WITH
TRANSMITTAL CNC CHARLESTON SC
1/28/2002
CH2M HILL

AOC 722 Gridwell IGDIQW011, Zone I

SAMPLING PLAN (RO)

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January 28, 2002

CH2M HILL

3011 S W Williston Road

Gainesville, FL

32608-3928

Mailing address

P.O. Box 147009

Gainesville, FL

32614-7009

Tel 352.335.7991

Fax 352.335.2959

Mr. David Scaturo
Division of Hazardous and Infectious Wastes
South Carolina Department of Health and
Environmental Control
Bureau of Land and Waste Management
2600 Bull Street
Columbia, SC 29201

Re: Sampling Plan for Grid Well IGDIGW011, Zone I

Dear Mr. Scaturo:

Enclosed please find two copies of the Sampling Plan for Grid Well IGDIGW011, Zone I of the Charleston Naval Complex (CNC).

The principal author of this document is Sam Naik. Please contact him at (770) 604-9095, extension 255, if you have any questions or comments.

Sincerely,

CH2M HILL



Dean Williamson, P.E.

cc: Tim Frederick/Gannett-Fleming, Inc.
~~Rob Warren/Navy, w/att~~
Gary Foster/CH2M HILL, w/att
Darryl Gates/CH2M HILL, w/att

Sampling and Analysis Plan

Grid Well IGDIGW011, Zone I

**Charleston Naval Complex
North Charleston, SC**

Prepared for
**U.S. Navy Southern Division
Naval Facilities Engineering Command**

Prepared by
CH2M-Jones

January 2002

Contract N62467-99-C-0960

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1 Acronyms and Abbreviations

2	AOC	area of concern
3	BCT	BRAC Cleanup Team
4	BRAC	Base Realignment and Closure Act
5	BRC	background reference concentration
6	CNC	Charleston Naval Complex
7	COC	chemical of concern
8	COPC	chemical of potential concern
9	CSAP	Comprehensive Sampling and Analysis Plan
10	DPT	direct push technology
11	EnSafe	EnSafe Inc.
12	EPA	U.S. Environmental Protection Agency
13	ft bls	feet below land surface
14	MCL	maximum contaminant level
15	µg/L	micrograms per liter
16	mg/kg	milligrams per kilogram
17	OWS	oil/water separator
18	PCB	polychlorinated biphenyl
19	PPE	personal protective equipment
20	RBC	risk-based concentration
21	RCRA	Resource Conservation and Recovery Act
22	RFI	RCRA Facility Investigation
23	SAP	Sampling and Analysis Plan
24	SCDHEC	South Carolina Department of Health and Environmental Control
25	SVOC	semivolatile organic compound
26	SWMU	solid waste management unit
27	TCE	trichloroethene
28	UST	underground storage tank
29	VOC	volatile organic compound

1.0 Introduction

1.1 Background

To characterize background conditions across Zone I of the Charleston Naval Complex (CNC), the *Final Zone I RFI Work Plan, Revision 1* (EnSafe Inc. [EnSafe]/Allen & Hoshall, 1996) required systematic grid-based soil and groundwater sampling. This sampling was performed as part of the Zone I RCRA Facility Investigation (RFI) which was completed during 1999. Shallow and deep groundwater monitoring wells were installed as part of the RFI. Nineteen pairs of shallow and deep wells were installed to provide zone-specific shallow groundwater background information. These grid well pairs are not associated with any Solid Waste Management Units (SWMUs) or Areas of Concern (AOCs).

The RFI sampling in the vicinity of grid well pair IGDIGW011/IGDIGW11D has indicated the presence of trichloroethene (TCE) in groundwater above its MCL. CH2M-Jones has prepared this Sampling and Analysis Plan (SAP) to complete RFI activities and to provide information that can be used to make decisions regarding the need for corrective measures. Figure 1-1 illustrates the location of Zone I within the CNC. Figure 1-2 is an aerial photograph of the area around grid well IGDIGW011.

1.2 Organization of the SAP

This SAP consists of the following sections, including this introductory section:

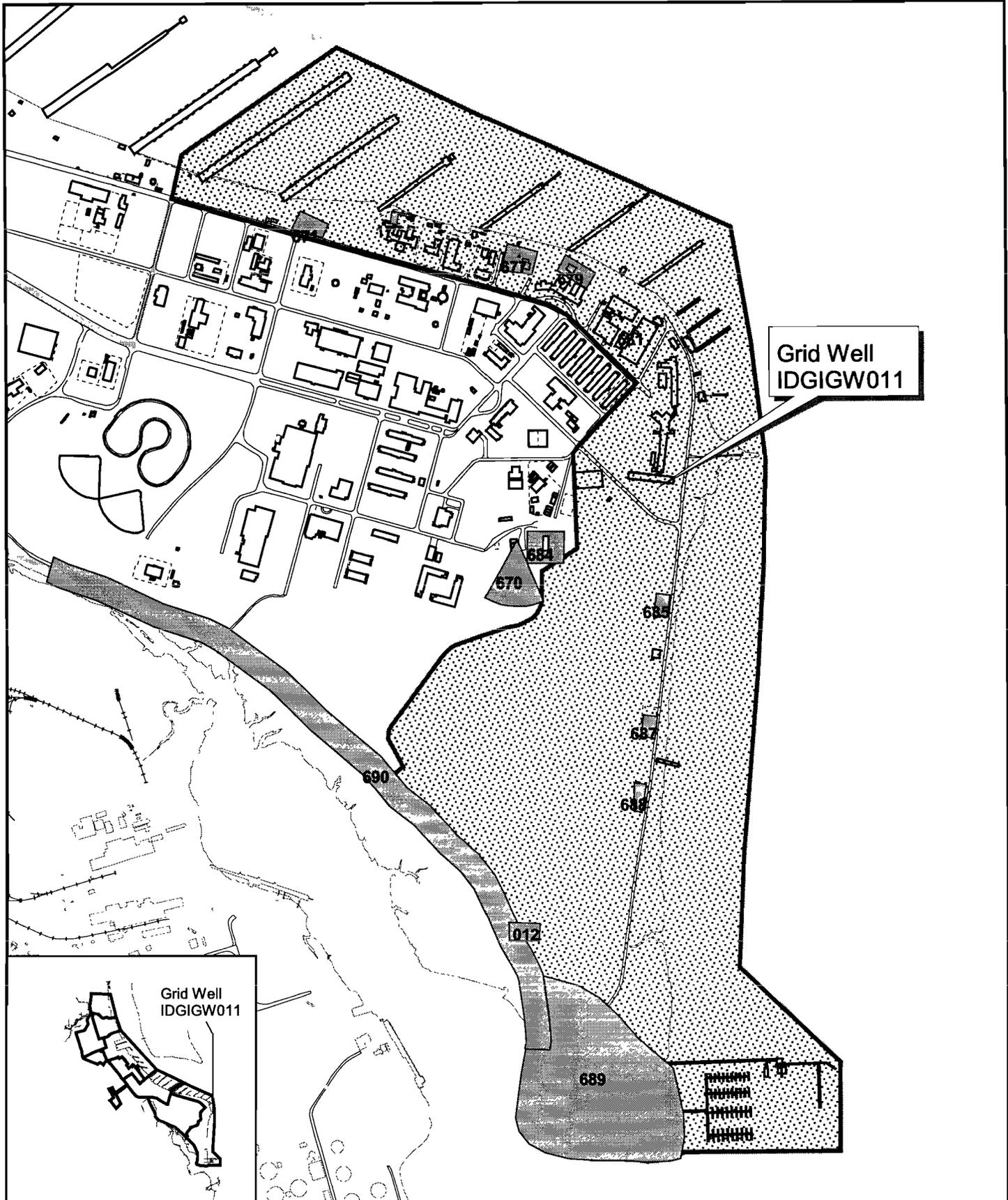
1.0 Introduction — Presents the purpose of the SAP and background information regarding the site.

2.0 Site Background and Conditions — Provides a brief description of the Grid Well IGDIGW011 area and the findings of previous RFI activities.

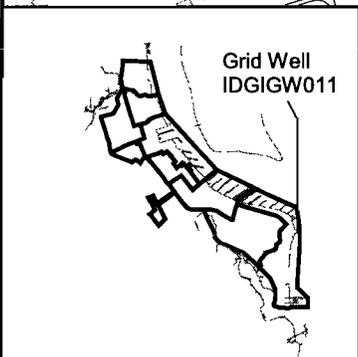
3.0 Proposed Sampling and Analysis — Describes the investigative approach and program for delineation of COPCs for the RFI.

4.0 References — Lists the references used in this document.

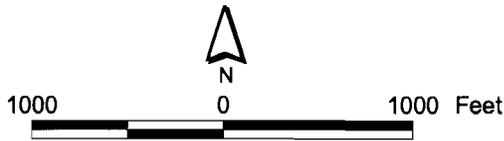
All tables and figures appear at the end of their respective sections.



Grid Well
IDGIGW011



-  Zone I
-  SWMU/AOC Within Zone I Boundary



1 inch = 250 feet

Figure 1-1
Zone I Within CNC
Gridwell IDGIGW011
Charleston Naval Complex

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NOTE: Aerial Photo Date is 1997
 NOTE: Original figure created in color



<ul style="list-style-type: none"> ● Gridwell IGDIGW011 ▤ Fence ▤ Railroads ▤ Shoreline ▭ AOC Boundary ▭ Buildings ▭ SWMU Boundary ▭ Zone Boundary 		 <p>0 200 400 Feet</p> <p>1 inch = 200 feet</p>	<p>Figure 1-2 Aerial View of Grid Well IGDIGW001 Zone I Charleston Naval Complex</p>
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1 **2.0 Site Background and Conditions**

2 **2.1 Site Background and Setting**

3 Grid well IGDIGW011 is located at the south end of Building 28, which is a block
4 construction building with a red brick exterior. The building was originally constructed in
5 the 1940s with three wings. Wing 4 was built in 1958 and consists of two floors of officers'
6 quarters. Wing 5 was built in 1963 and is a three-story dwelling. Wing 6 was built in 1971
7 and is also three stories. Building 28 also includes the Blue Water Cafe and game rooms.
8 (Navy, 1994.)

9 There are two underground storage tanks (USTs) which store fuel oil for boiler use and an
10 oil/water separator (OWS) associated with the building.

11 The area is zoned for business use (B-2).

12 **2.2 RFI Investigation Results**

13 **2.2.1 Soil Investigation**

14 During one sampling event of the RFI field investigation, a surface soil grid sample (0 to 1
15 foot below land surface [ft bls]) was collected in the vicinity of IGDIGW011. The sample was
16 analyzed for volatile organic compounds (VOCs), semivolatile organic compounds
17 (SVOCs), metals, cyanides, and pesticides/polychlorinated biphenyls (PCBs). Figure 2-1
18 shows the RFI soil sampling location.

19 **Surface Soil**

20 In the *Zone I RFI Report, Revision 0* (EnSafe, 1999), surface soil sample analytical results were
21 evaluated relative to the U.S. Environmental Protection Agency (EPA) Region III risk-based
22 concentration (RBC) criteria. Based on the analysis presented in the RFI report, one metal,
23 arsenic at 0.46 milligrams per kilogram (mg/kg), exceeded the residential RBC of 0.43
24 mg/kg. This detection of arsenic is below the Zone I background reference concentration
25 (BRC) for arsenic (21.1 mg/kg) and at the low end of the Zone I surface soil background
26 concentration range for arsenic.

27 No other constituents exceeded their respective screening criteria.

1 **Subsurface Soil**

2 No subsurface soil samples were taken during the RFI in the vicinity of grid well
3 IGDIGW011.

4 **2.2.2 Groundwater Investigation**

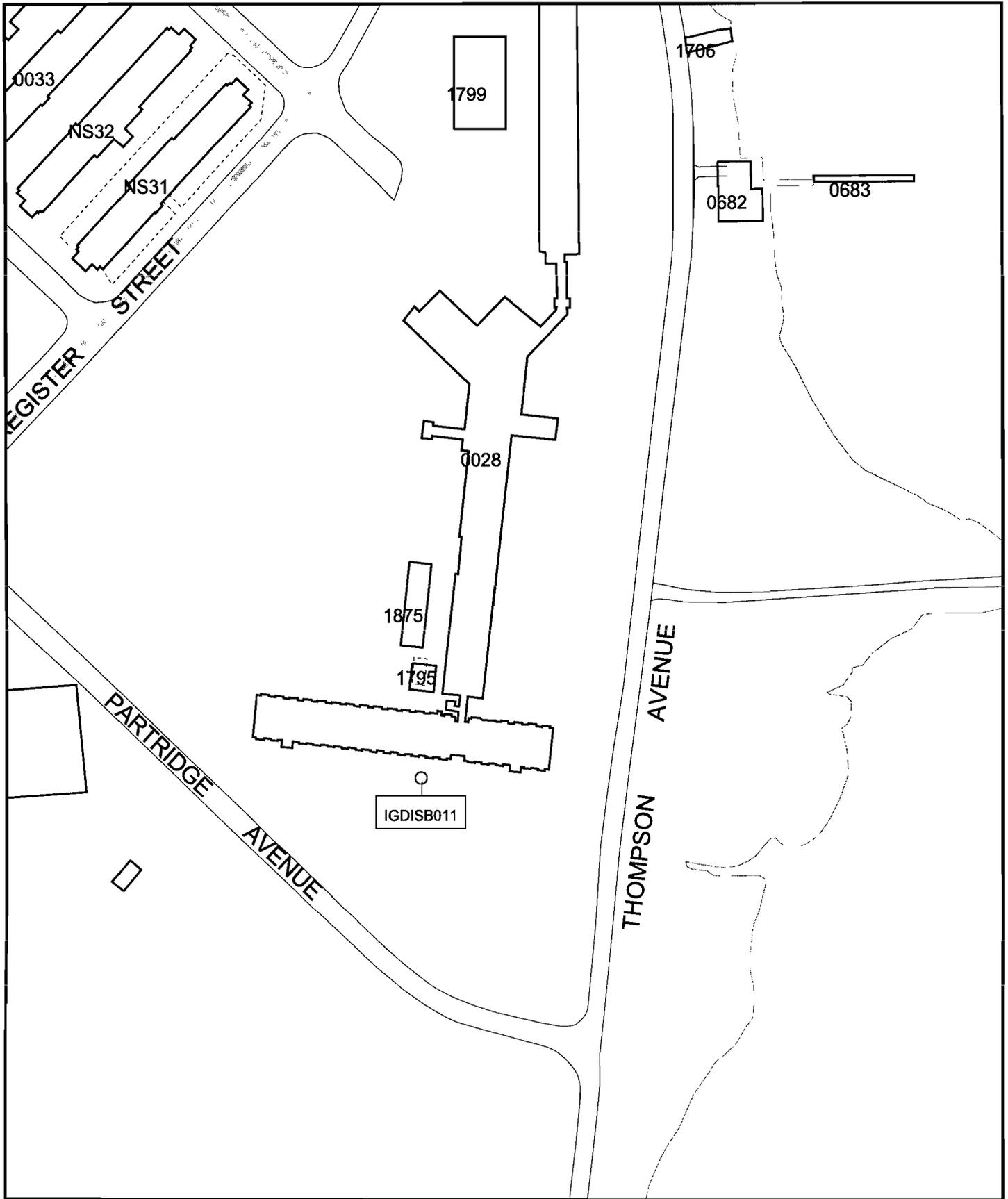
5 The shallow and deep grid well pair IGDIGW011/IGDIGW011D was 1 of 19 pairs of grid
6 wells installed and sampled as part of the Zone I RFI investigation. Figure 2-2 shows the
7 location of this well pair near Building 28. Grid well pair IGDIGW011/IGDIGW011D was
8 sampled during four sampling events. Groundwater samples were analyzed for VOCs,
9 SVOCs, pesticides, PCBs, metals, cyanide, total dissolved solids, chlorides and sulfates.
10 Additionally, the samples from the first sampling event were analyzed for organotins and
11 dioxins. Constituents detected in the groundwater samples were evaluated relative to
12 maximum contaminant levels (MCLs). In the absence of an MCL, the EPA Region III tap
13 water RBCs were used. Analytical results for inorganics were used to calculate background
14 inorganic values for Zone I groundwater.

15 No VOCs, SVOCs, pesticides/PCBs, herbicides, or dioxins exceeded their screening criteria
16 in samples collected from deep groundwater well IGDIGW011D. Four VOCs and one
17 pesticide exceeded their screening criteria in groundwater samples collected from shallow
18 groundwater well IGDIGW011.

- 19 • 1,2-Dichloroethene (total) was detected at 7 micrograms per liter ($\mu\text{g}/\text{L}$), exceeding its
20 tap water RBC of $5.5 \mu\text{g}/\text{L}$ during the second sampling event. However, detections
21 during the first, third, and fourth sampling events were below the tap water RBC.
- 22 • Trichloroethene (TCE) was detected in all four sampling events, exceeding its MCL of 5
23 $\mu\text{g}/\text{L}$ in the first, third, and fourth sampling events.
- 24 • Dibenzofuran was detected in all four sampling events, exceeding its tap water RBC of
25 $2.4 \mu\text{g}/\text{L}$ in the first three sampling events.
- 26 • 4-Methylphenol was detected in the first two sampling events and only exceeded its tap
27 water RBC during the first sampling event.
- 28 • Gamma-BHC (Lindane) was detected only in the first sampling event, exceeding its
29 MCL of $0.2 \mu\text{g}/\text{L}$. It was not detected in the three subsequent sampling events.

30 As a result of VOC detections in grid well IGDIGW011 groundwater samples, five
31 groundwater samples were collected during the RFI in the vicinity of grid well IGDIGW011

- 1 using direct push technology (DPT) (see Figure 2-2). These sample points were located
- 2 approximately 200 or more feet away from the grid well.
- 3 The five DPT samples were analyzed for VOCs. The RFI did not identify any groundwater
- 4 chemicals of concern (COCs) in the samples from the DPT investigation.
- 5



- Soil Sample
- ⋈ Fence
- ⋈ Roads
- ⋈ Shoreline
- ▭ AOC Boundary
- ▭ SWMU Boundary
- ▭ Buildings
- ▭ Zone Boundary

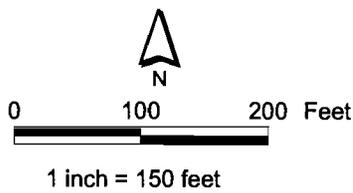
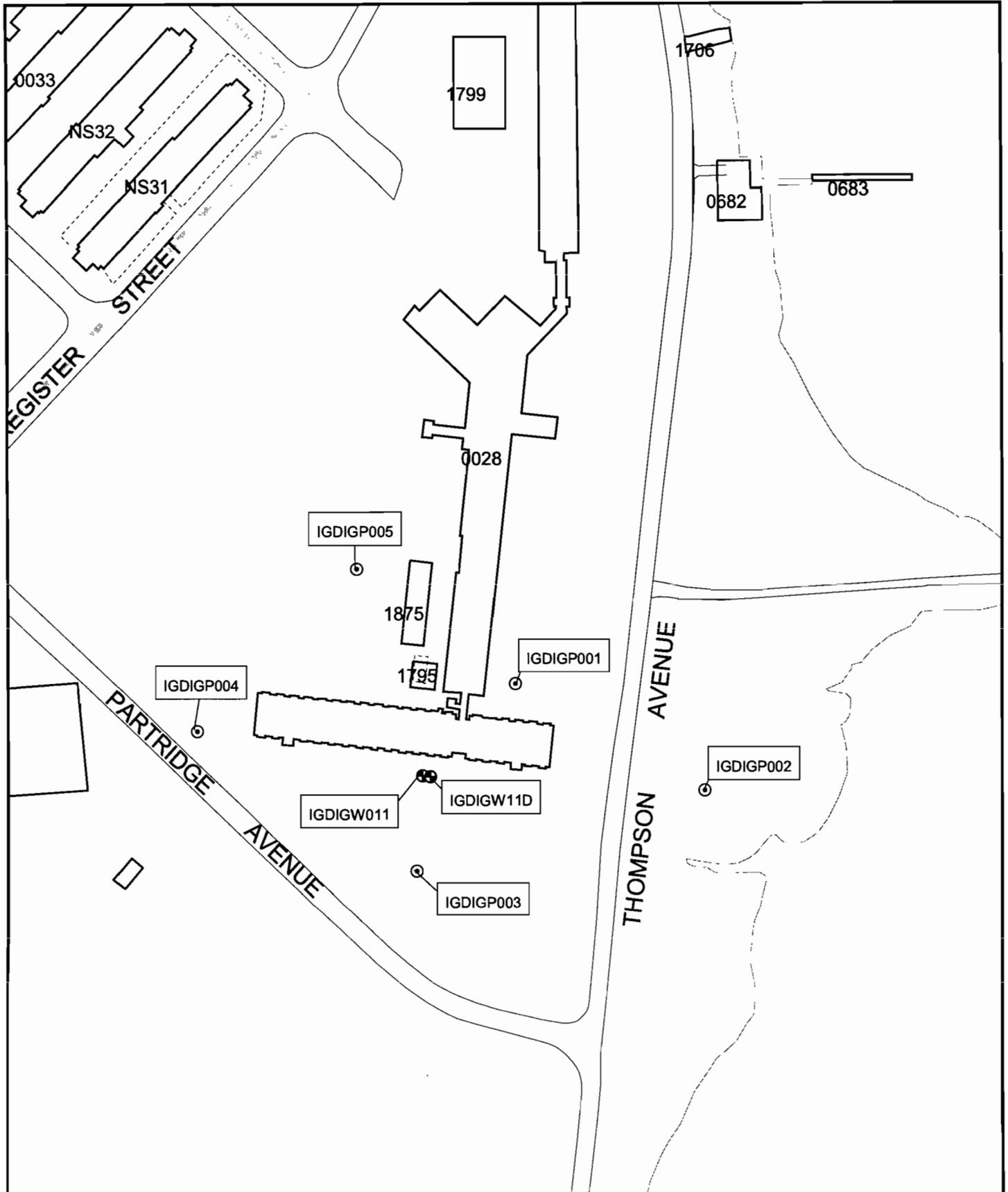


Figure 2-1
 Historical Soil Sample Locations
 Zone I
 Charleston Naval Complex



<ul style="list-style-type: none"> ⊙ GeoProbe ● Groundwater Well - - - Fence ≡ Roads ~ Shoreline ▭ AOC Boundary 	<ul style="list-style-type: none"> ▭ SWMU Boundary ▭ Buildings ▭ Zone Boundary 		<p>0 100 200 Feet</p> <p>1 inch = 150 feet</p>	<p>Figur 2-2 Historical Groundwater Sample Locations Zone I Charleston Naval Complex</p>
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3.0 Proposed Sampling and Analysis

Based on an evaluation of the data collected during the RFI and a comparison to COPC screening criteria currently used by the Base Realignment and Closure Act (BRAC) Cleanup Team (BCT), TCE in shallow groundwater requires further delineation. No soil constituents were detected at levels exceeding screening criteria. Thus, delineation sampling will focus on VOCs in shallow groundwater. A full evaluation and presentation of the COPC screening against current criteria, as well as a COPC/COC refinement analysis, will be provided in an RFI report addendum after collection and analyses of the samples proposed herein.

3.1 Groundwater

TCE has been identified as a COPC for groundwater in the vicinity of shallow grid well IGDIGW011 based on historic detections above its MCL of 5 µg/L. When this well was last sampled in 2000, TCE was detected at a concentration of 8.1 µg/L. Therefore, shallow well IGDIGW011 will be resampled as part of this field investigation. In addition, three shallow groundwater samples will be collected using new permanent monitoring wells to be installed around the grid well pair, at points approximately 50 feet from grid well IGDIGW011. These shallow samples will be collected from the interval immediately below the water table, which is approximately at 2 to 4 ft bls. Figure 3-1 shows the historic detections of TCE in shallow well IGDIGW011 and deep well IGDIGW11D and in the samples collected from DPT wells installed during the initial RFI to further investigate the TCE occurrence in shallow groundwater.

Figure 3-2 shows the locations of the three proposed permanent monitoring wells and the existing shallow and deep wells to be sampled. These monitoring well groundwater samples will be analyzed for VOCs. The well screen depths will be set below the water table. Table 3-1 summarizes the sampling identification, sample locations, and parameters for the investigation.

3.2 Sampling and Analysis Plan

All investigative work will be performed in accordance with the Comprehensive Sampling and Analysis Plan (CSAP) portion of the *Final Zone I RFI Work Plan, Revision 1* (EnSafe/Allen & Hoshall, 1996). All samples will be analyzed for VOCs as shown in Table 3-1.

1 **3.3 Health and Safety**

2 CH2M-Jones places significant emphasis on the health and safety of our personnel, our
3 subcontractors, and the local community. Once all personnel have arrived on site as part of
4 the mobilization phase of the SAP, a project briefing and health and safety orientation meet-
5 ing will be held. All work completed as part of this SAP will be performed in accordance
6 with the CH2M-Jones Site-Specific Health and Safety Plan (CH2M-Jones, 2000).

7 Personnel working at the site will be required to comply with Level D personal protective
8 equipment (PPE) requirements, as specified in the Health and Safety Plan.

9 **3.4 Site Clearance**

10 Groundwater monitor well locations will be marked or staked prior to the initiation of
11 sampling activities, relative to grid well IGDIGW011.

12 To prepare for the start of onsite operations, CH2M-Jones will notify the necessary agencies
13 and departments regarding planned activities at the project site.

14 CH2M-Jones will examine the site for existing water, electrical, natural gas, telephone, and
15 other utility lines that are potential hazards at the site. Utilities will be clearly marked and
16 identified. Table 3-1 shows the coordinates for the proposed DPT well locations.

17 **3.5 Waste Management and Disposal**

18 Five waste streams will be generated as part of this SAP: pavement debris, soil cuttings,
19 purge water, decontamination wastes, and used PPE. Soil cuttings will be characterized in
20 accordance with South Carolina Hazardous Waste Management Regulations (SCDHEC
21 R.61-79.261) and disposed in accordance with all applicable regulations and permits.
22 Decontamination wastes and used PPE will also be disposed in accordance with applicable
23 regulations.

24 Pavement debris will be transported offsite for disposal either by asphalt recycling or
25 landfilled as demolition debris. Offsite transportation and disposal will be performed by
26 properly permitted and licensed subcontractors. Purge water will be drummed and
27 disposed of appropriately.

28 **3.6 Equipment Decontamination**

29 Decontamination of personnel, sampling and removal equipment, and materials will be in
30 accordance with the CH2M-Jones Site-Specific Project Health and Safety Plan.

TABLE 3-1
 Analytical Summary for Supplemental Sampling Activities
Sampling and Analysis Plan, Grid Well IGDIGW011, Zone I, Charleston Naval Complex

Constituent	Number of Sample Points	Sample Location Coordinates (Northing) (Easting)	Analytes	Analytical Methods
Groundwater Monitor Wells	3		VOCs	SW- 846 8260B
IG11GW001		369,624 2,326,587		
IG11GW002		369,565 2,326,636		
IG11GW003		369,611 2,326,696		
Existing Wells	2		VOCs	SW- 846 8260B
IGDIGW011		369,617 2,326,647		
IGDIGW11D		369,618 2,326,637		

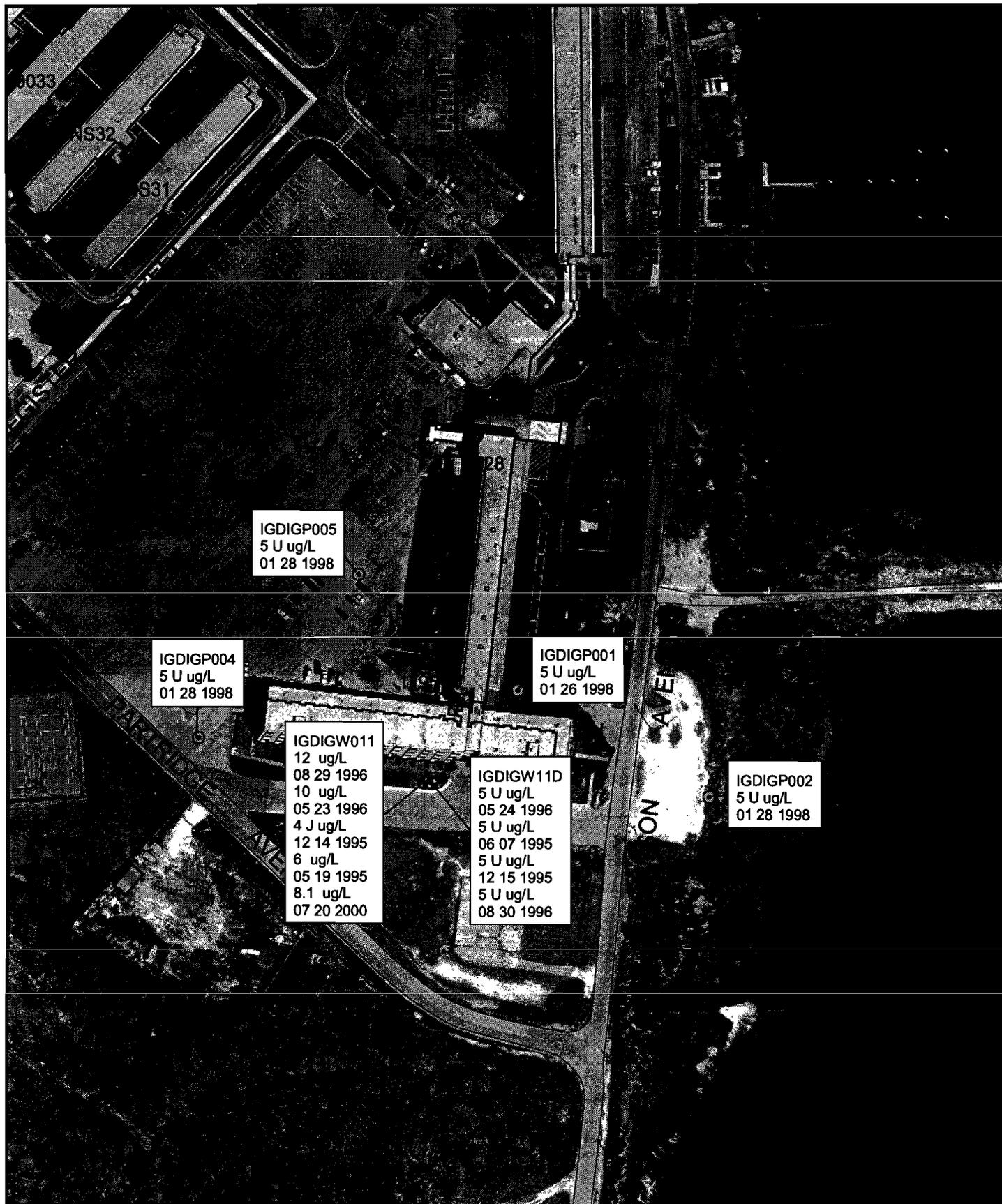
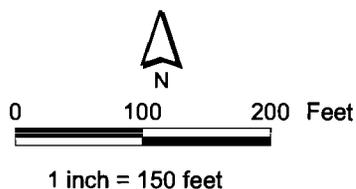
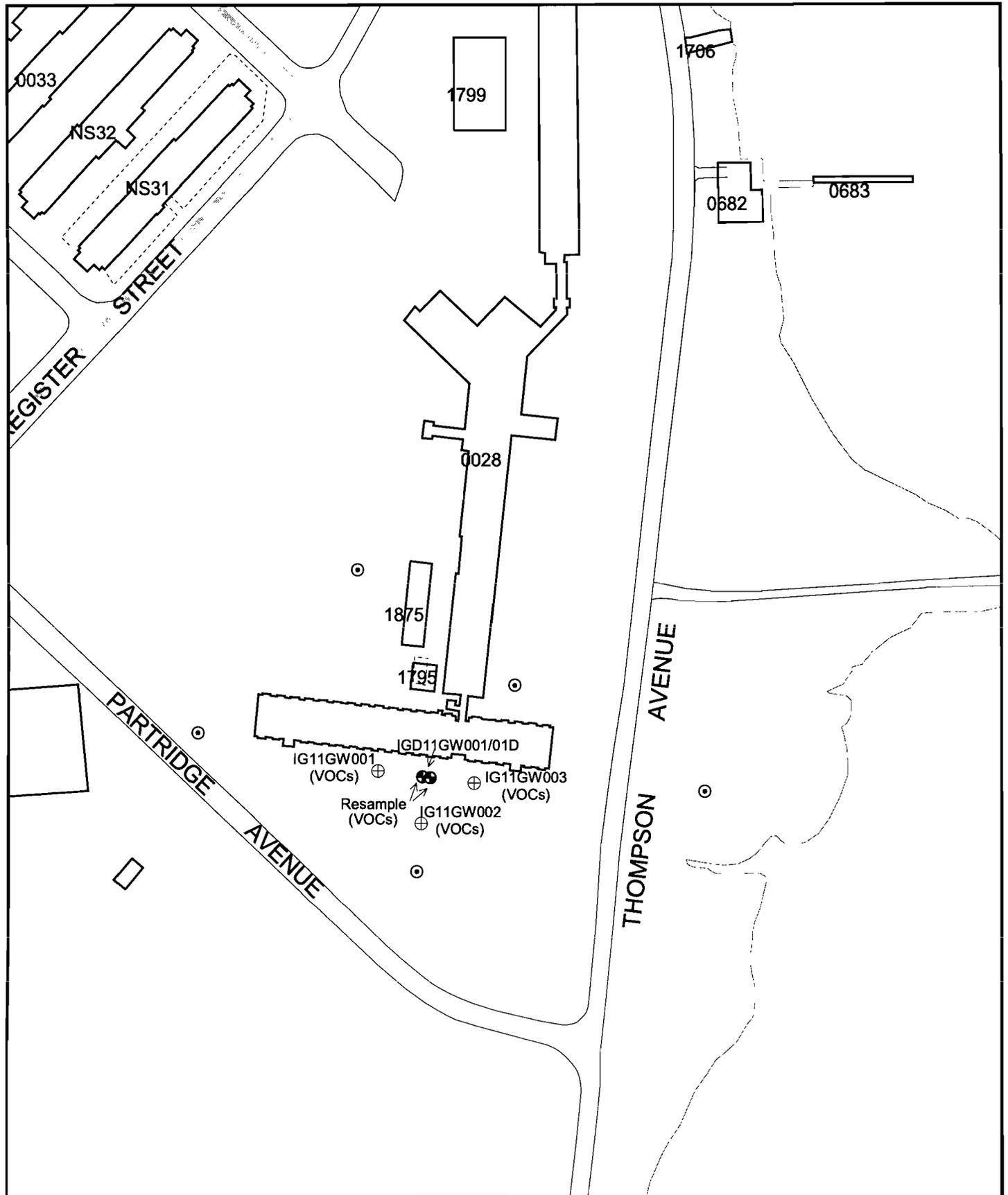


Figure 3-1
TCE Results in Groundwater
Zone I
Charleston Naval Complex

- ⊙ GeoProbe
- Groundwater Well
- ⋈ Fence
- ⌵ Roads
- ⌵ Shoreline
- ▭ AOC Boundary
- ▭ SWMU Boundary
- ▭ Buildings
- ⋈ Zone Boundary



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⊕	Proposed Groundwater Monitoring Well			<p>Figure 3-2 Proposed Groundwater Sampling Locations Zone I Charleston Naval Complex</p>
⊙	GeoProbe			
⊙	Groundwater Sample	AOC Boundary	SWMU Boundary	<p>1 inch = 150 feet</p>
⊕	Resample (VOCs)	Zone Boundary	Buildings	
⊕	IG11GW001 (VOCs)	Fence	Roads	
⊕	IG11GW002 (VOCs)	Shoreline	Roads	

1 **4.0 References**

- 2 EnSafe Inc. *Zone I RFI Report, Revision 0, NAVBASE Charleston*. March 1999.
- 3 EnSafe Inc./Allen & Hoshall. *Final Zone I RFI Work Plan, Revision 1, Naval Base Charleston*.
- 4 April 1996.
- 5 U.S. Environmental Protection Agency (EPA). *Environmental Services Division Standard*
- 6 *Operating Procedures and Quality Assurance Manual (ESDSOPQAM)*. 1996.
- 7 U.S. Navy. *Environmental Baseline Survey Report, Building Number 0028, Site Location N-*
- 8 *13*. 1994.
- 9