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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT  
ADDENDUM SOLID WASTE MANAGEMENT UNIT 145 (SWMU 145) ZONE E CNC  
CHARLESTON SC  
11/21/2001  
CH2M HILL

RFI REPORT ADDENDUM

**SWMU 145, Zone E**



***Charleston Naval Complex  
North Charleston, South Carolina***

SUBMITTED TO  
***U.S. Navy Southern Division  
Naval Facilities Engineering Command***

***CH2M-Jones***

***November 2001***

***Contract N62467-99-C-0960***



**CH2MHILL**

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November 21, 2001

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Environmental Control  
Bureau of Land and Waste Management  
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Columbia, SC 29201

Re: RFI Report Addendum (Revision 0) - SWMU 145, Zone E

Dear Mr. Scaturo:

Enclosed please find four copies of the RFI Report Addendum (Revision 0) for SWMU 145 in Zone E of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The principal author of this document is Kris Garcia. Please contact her at 770/604-9182, extension 476, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: ✓ Rob Harrell/Navy, w/att  
Gary Foster/CH2M HILL, w/att

# RFI REPORT ADDENDUM

## SWMU 145, Zone E



***Charleston Naval Complex  
North Charleston, South Carolina***

SUBMITTED TO  
***U.S. Navy Southern Division  
Naval Facilities Engineering Command***

PREPARED BY  
***CH2M-Jones***

*November 2001*

*Revision 0  
Contract N62467-99-C-0960  
158814.ZE.PR.16*

## Certification Page for RFI Report Addendum (Revision 0) — SWMU 145, Zone E

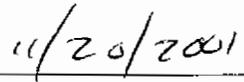
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

P.E. Number 21428



Dean Williamson, P.E.



Date

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13   A     Constituents Detected at SWMU 145

# 1 Acronyms and Abbreviations

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2	AOC	area of concern
3	AST	aboveground storage tank
4	BCT	BRAC Cleanup Team
5	BRAC	Base Realignment and Closure Act
6	BRC	background reference concentration
7	CA	corrective action
8	CMS	corrective measures study
9	CNC	Charleston Naval Complex
10	COC	chemical of concern
11	COPC	chemical of potential concern
12	CSI	confirmatory sampling investigation
13	DAF	dilution attenuation factor
14	EnSafe	EnSafe Inc.
15	EPA	U.S. Environmental Protection Agency
16	IM	interim measure
17	MCL	maximum contaminant level
18	$\mu\text{g/L}$	microgram per liter
19	mg/kg	milligrams per kilogram
20	NAVBASE	Naval Base
21	NFA	no further action
22	NFI	no further investigation
23	OWS	oil/water separator
24	RBC	risk-based concentration
25	RCRA	Resource Conservation and Recovery Act
26	RFA	RCRA Facility Assessment
27	RFI	RCRA Facility Investigation
28	SCDHEC	South Carolina Department of Health and Environmental Control
29	SSL	soil screening level
30	SVOC	semivolatile organic compound

- |   |      |                             |
|---|------|-----------------------------|
| 1 | SWMU | solid waste management unit |
| 2 | TDS  | total dissolved solids      |
| 3 | UST  | underground storage tank    |
| 4 | VOC  | volatile organic compound   |



# 1 1.0 Introduction

---

2 In 1993, Naval Base (NAVBASE) Charleston was added to the list of bases scheduled for  
3 closure as part of the Defense Base Realignment and Closure Act (BRAC), which regulates  
4 closure and transition of property to the community. The Charleston Naval Complex (CNC)  
5 was formed as a result of the dis-establishment of the Charleston Naval Shipyard and  
6 NAVBASE on April 1, 1996.

7 Corrective Action (CA) activities are being conducted under the Resource Conservation and  
8 Recovery Act (RCRA) with the South Carolina Department of Health and Environmental  
9 Control (SCDHEC) as the lead agency for CA activities at the CNC. All RCRA CA activities  
10 are performed in accordance with the Final Permit (Permit No. SC0 170 022 560).

11 In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation  
12 and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to  
13 complete the RCRA Facility Investigation (RFI) for solid waste management unit (SWMU)  
14 145 in Zone E of the CNC. The site is recommended for No Further Action (NFA).  
15 Figure 1-1 illustrates the location of Zone E in the CNC. Figure 1-2 provides an aerial view  
16 of SWMU 145 within Zone E.

17 Following agency review of the *Zone E RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1997)  
18 there were no comments made with respect to SWMU 145. Therefore, no response to  
19 comments is provided with this RFI Report Addendum.

## 20 1.1 Background

21 According to the RCRA Facility Assessment Report (U.S. Environmental Protection Agency  
22 [EPA], 1995), SWMU 145 is reportedly the site of a mercury spill that occurred beneath a  
23 portion of Building 13-A (see Figures 1-1 and 1-2) in Zone E. Building 13-A is adjacent to  
24 and connected to Building 13. There was no information regarding the date, amount, or  
25 duration of the release and no further information has been found.

26 Building 13 was constructed in 1906 and originally used for clothing manufacturing. Later,  
27 the building was converted to a seamen's barracks, a Quality Assurance Office, and then  
28 used for supply administration. Little information was found about the history of Building  
29 13-A.

30 The area is zoned for industrial use (M-2).

1 Mercury was identified as the material of concern for SWMU 145 in the *Final Zone E RFI*  
2 *Work Plan* (EnSafe Inc./Allen & Hoshall, 1995). Potential receptors that may be exposed to  
3 site contaminants include current and future building users and any site workers this area  
4 may support following base closure.

5 During the RCRA Facility Assessment (RFA), this unit was identified for a Confirmatory  
6 Sampling Investigation (CSI) to assess whether releases of contamination at the site had  
7 occurred. All field activities were conducted as part of the RFI phase.

## 8 **1.2 Purpose of the RFI Report Addendum**

9 This RFI Report Addendum provides information about SWMU 145 that documents the  
10 conclusions from the RFI report, evaluates the data, and provides conclusions regarding site  
11 closure. Based on a review of the data, CH2M-Jones has determined that investigation  
12 activities are complete and recommends the site for NFA.

13 Prior to changing the status of any site to NFA in the CNC RCRA CA permit, the BRAC  
14 Cleanup Team (BCT) agreed that the following issues should be considered:

- 15 • Status of the RFI
- 16 • Presence of metals (inorganics) in groundwater
- 17 • Potential linkage to SWMU 37, Investigated Sanitary Sewers at the CNC
- 18 • Potential linkage to Area of Concern (AOC) 699, Investigated Storm Sewers at the CNC
- 19 • Potential linkage to AOC 504, Investigated Railroad Lines at the CNC
- 20 • Potential linkage to surface water bodies (Zone J)
- 21 • Potential contamination associated with oil/water separators (OWSs)
- 22 • Relevance or need for land use controls at the site

23 A discussion of these issues is provided in this RFI Report Addendum to expedite  
24 evaluation of the site.

25 Provided that the information presented in this report is adequate to address these site  
26 closeout items, it is expected that the BCT will concur that NFA is appropriate for the site.  
27 At that time, a Statement of Basis will be prepared that will be made available for public  
28 comment in accordance with SCDHEC policy. This will allow for public participation in the  
29 final remedy selection.

## 1 **1.3 Report Organization**

2 This RFI Report Addendum consists of the following sections, including this introductory  
3 section:

4 **1.0 Introduction** — Presents the purpose of the report and background information relating  
5 to the RFI Report Addendum.

6 **2.0 Summary of RFI Conclusions for SWMU 145** — Summarizes the conclusions from the  
7 RFI investigations and risk evaluations for SWMU 145.

8 **3.0 Interim Measures and Underground Storage Tank (UST)/Aboveground Storage Tank  
9 (AST) Removals** — Provides information regarding any interim measures (IMs) or tank  
10 removal activities performed at the site.

11 **4.0 Summary of Additional Investigations** — Summarizes information collected after  
12 completion of the RFI report.

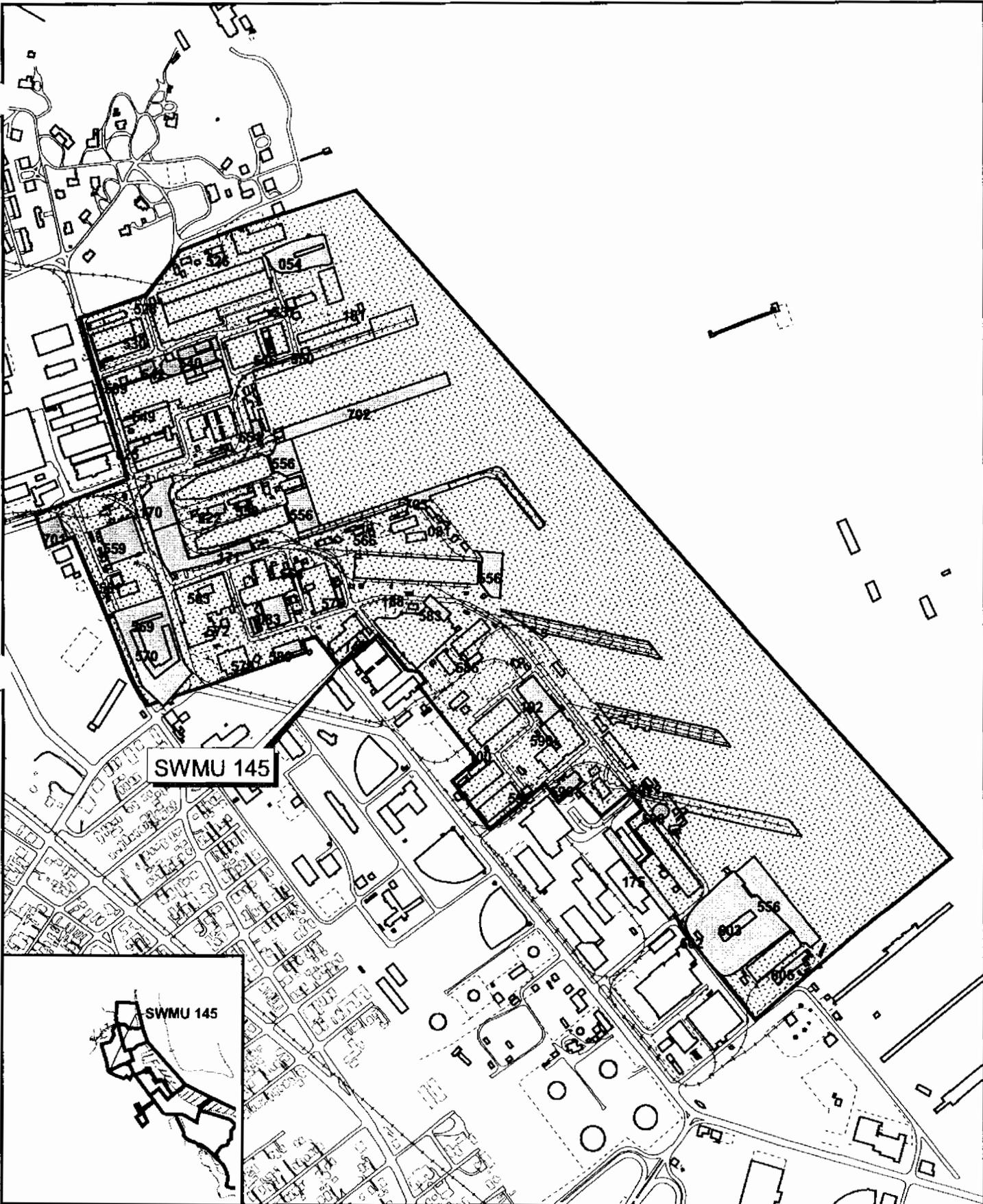
13 **5.0 Chemical of Potential Concern (COPC)/ Chemical of Concern (COC) Refinement**—  
14 Provides further evaluation of COPCs based on RFI and additional data to assess them as  
15 COCs.

16 **6.0 Summary of Information Related to Site Closeout Issues**—Discusses the various site  
17 closeout issues that the BCT agreed to evaluate prior to site closeout.

18 **7.0 Recommendations**—Provides recommendations for proceeding with site closure.

19 **8.0 References** — Lists the references used in this document.

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



-  Zone E Boundary
-  SWMU/AOC Within Zone E Boundary



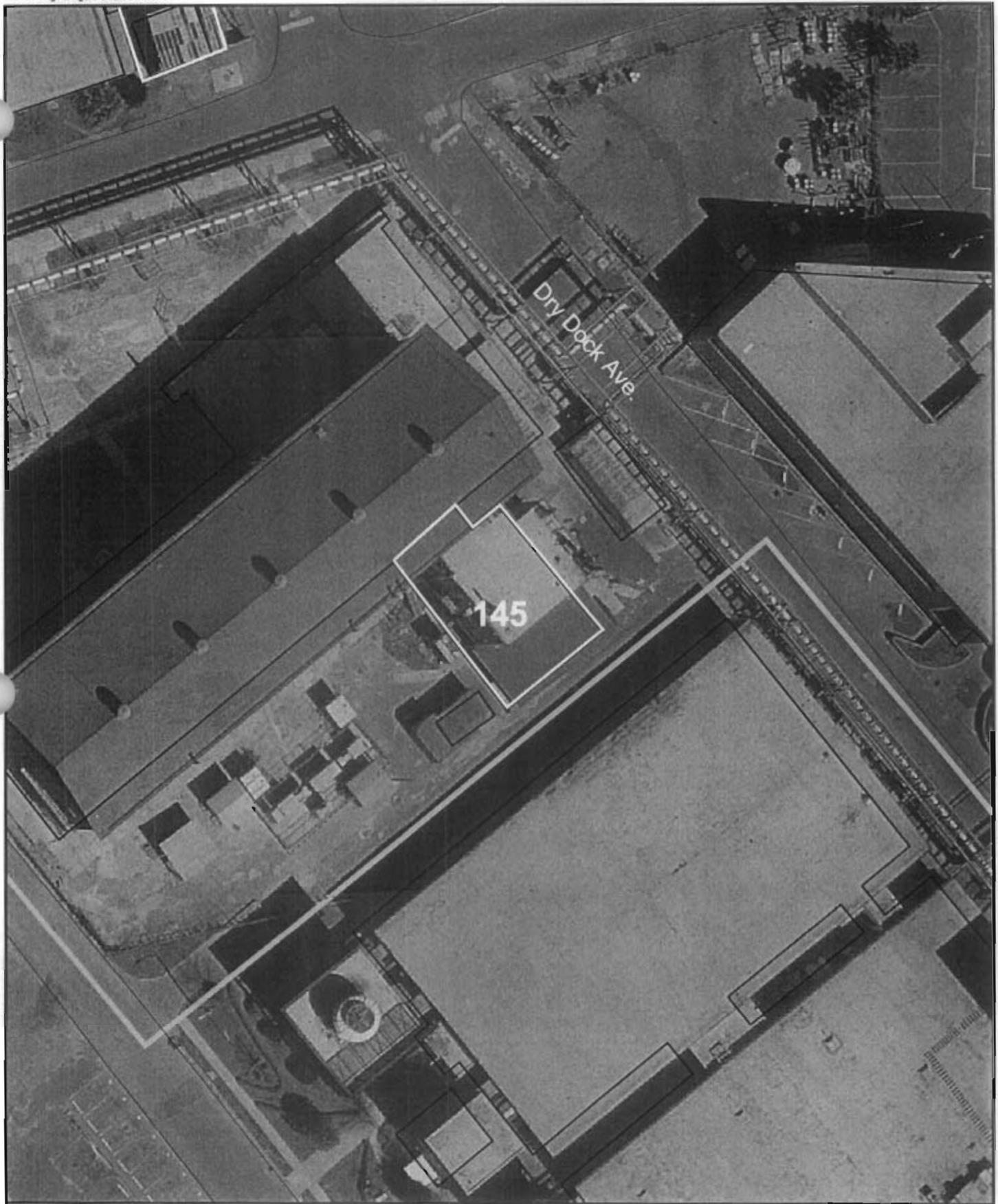
0 800 1600 Feet



1 inch = 800 feet

**Figure 1-1**  
 Zone E Within CNC  
 SWMU 145 Zone E  
 Charleston Naval Complex

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



-  Roads - Lines
-  AOC Boundary
-  SWMU Boundary
-  Buildings
-  Zone Boundary



1 inch = 50 feet

**Figure 1-2**  
Site Map  
SWMU 145, Zone E  
Charleston Naval Complex

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## 1 **2.0 Summary of RFI Conclusions for SWMU 145**

2 This section summarizes the results and conclusions from the soil, groundwater, and air  
3 investigations conducted in the area of SWMU 145, which were reported in the *Zone E RFI*  
4 *Report, Revision 0* (EnSafe, 1997). Figure 2-1 presents the site features and RFI surface and  
5 subsurface soil sample locations. Figure 2-2 shows locations where groundwater samples  
6 were collected.

7 As part of the Zone E RFI, surface soil, subsurface soil, groundwater, and air investigations  
8 were conducted at SWMU 145 in October 1995. The RFI report presented the results of this  
9 investigation and conclusions concerning contamination and risk, as summarized in  
10 Sections 2.1 and 2.2 of this report addendum. A further evaluation of COCs is provided in  
11 Section 5.0.

### 12 **2.1 Soil**

13 Surface and subsurface soil samples were collected during the RFI field investigation from  
14 the 0- to 1-foot and 3- to 5-foot intervals, respectively. These samples were analyzed for  
15 mercury, in accordance with the SCDHEC-approved RFI Work Plan. Mercury results for  
16 surface soil and subsurface soil samples are presented in Appendix A.

#### 17 **2.1.1 Surface Soil**

18 A total of twelve surface soil samples (see Figure 2-1) were collected and analyzed for  
19 mercury. Two surface soil duplicate samples were analyzed for mercury as well as volatile  
20 organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, cyanide,  
21 pesticides, herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins.  
22 In order to collect these samples, it was necessary to core through the overlying concrete  
23 and asphalt to reach the soils.

24 The comparison criteria used for the *Zone E RFI Report, Revision 0* included the "Tier 1"  
25 criteria: U.S. Environmental Protection Agency (EPA) Region III residential and industrial  
26 risk-based concentrations (RBCs), soil screening levels (SSLs) (based on a dilution  
27 attenuation factor [DAF] of 10), and background reference concentrations (BRCs) (see  
28 Tables 6.2 and 5.5, respectively, of the *Zone E RFI Report, Revision 0*). According to  
29 information provided in the RFI, inorganic analytes detected in the surface soil samples  
30 included six detections for mercury. Constituents detected in surface soil samples are

1 presented in Appendix A. The RFI report indicated that there were no mercury detections  
2 above the industrial RBC and BRC, which were the final screening criteria based on the  
3 assumption that the area would remain industrial in nature. However, further evaluation  
4 shows that the detected concentrations of mercury found in the surface soils at SWMU 145  
5 (max. 0.61 milligram per kilogram [mg/kg]) are also well below the residential RBC of  
6 2.3 mg/kg.

### 7 **2.1.2 Subsurface Soil**

8 Subsurface samples were collected from the same locations as the surface soil samples (see  
9 Figure 2-1). Constituents detected in subsurface soil samples were evaluated relative to their  
10 respective SSLs (DAF = 10 for all analytes). Constituents detected in surface soil samples are  
11 presented in Appendix A.

12 Detected inorganic analytes in the subsurface soil samples included three detections for  
13 mercury. No mercury detections exceeded the SSL and BRC.

## 14 **2.2 Groundwater**

15 Groundwater samples were collected during the RFI field investigation from three shallow  
16 wells and one deep well (see Figure 2-2). Groundwater samples were analyzed for mercury,  
17 chlorides, sulfates, and total dissolved solids (TDS). One shallow groundwater sample was  
18 selected as a duplicate and also analyzed for herbicides, hexavalent chromium, organophos-  
19 phorous pesticides, and dioxins. Constituents detected in shallow and deep groundwater  
20 samples are presented in Appendix A.

21 Shallow groundwater flows toward the north-northeast from SWMU 145 and toward the  
22 Cooper River (see Figure 2-3). Deep groundwater flows in a more northerly direction, but  
23 still toward the Cooper River and at a lower gradient (see Figure 2-4).

24 The comparison criteria used for the *Zone E RFI Report, Revision 0* included the "Tier 1"  
25 criteria: EPA Region III Tap Water RBCs, EPA Saltwater Surface Water Chronic screening  
26 values, and BRCs.

27 No mercury was detected in shallow or deep groundwater samples.

## 28 **2.3 Air**

29 Ambient air at SWMU 145 was screened with a mercury vapor analyzer. Suitable sampling  
30 locations were determined in the field and were biased in an attempt to identify worst case  
31 situations. No mercury vapors were detected at SWMU 145.

## 2.4 Human Health Risk Assessment

The *Zone E RFI Report, Revision 0* noted that the area is currently industrialized and there were no current residential properties for consideration in the risk assessment. As a result, all risk evaluation activities were based on potential future unrestricted land use and current industrial scenarios. However, because no future residential land use was anticipated, the final considerations presented for SWMU 145 were evaluated only with respect to current and future industrial uses.

The detailed presentation of the risk assessment for SWMU 145 is presented in Section 10.16.8 of the *Zone E RFI Report, Revision 0*, and summarized in the sections below.

### 2.4.1 Soil

No COCs were identified for surface soils and subsurface soils at SWMU 145, based on an unrestricted land use scenario.

### 2.4.2 Groundwater

Arsenic was identified in the RFI report as a COC for deep groundwater because it was detected in a single well in the fourth quarter sampling event at a concentration of 96.9 microgram per liter ( $\mu\text{g}/\text{L}$ ) and because of its proximity to SMWU 83, AOC 576, and AOC 580, all of which had been associated with high levels of arsenic in the deep groundwater.

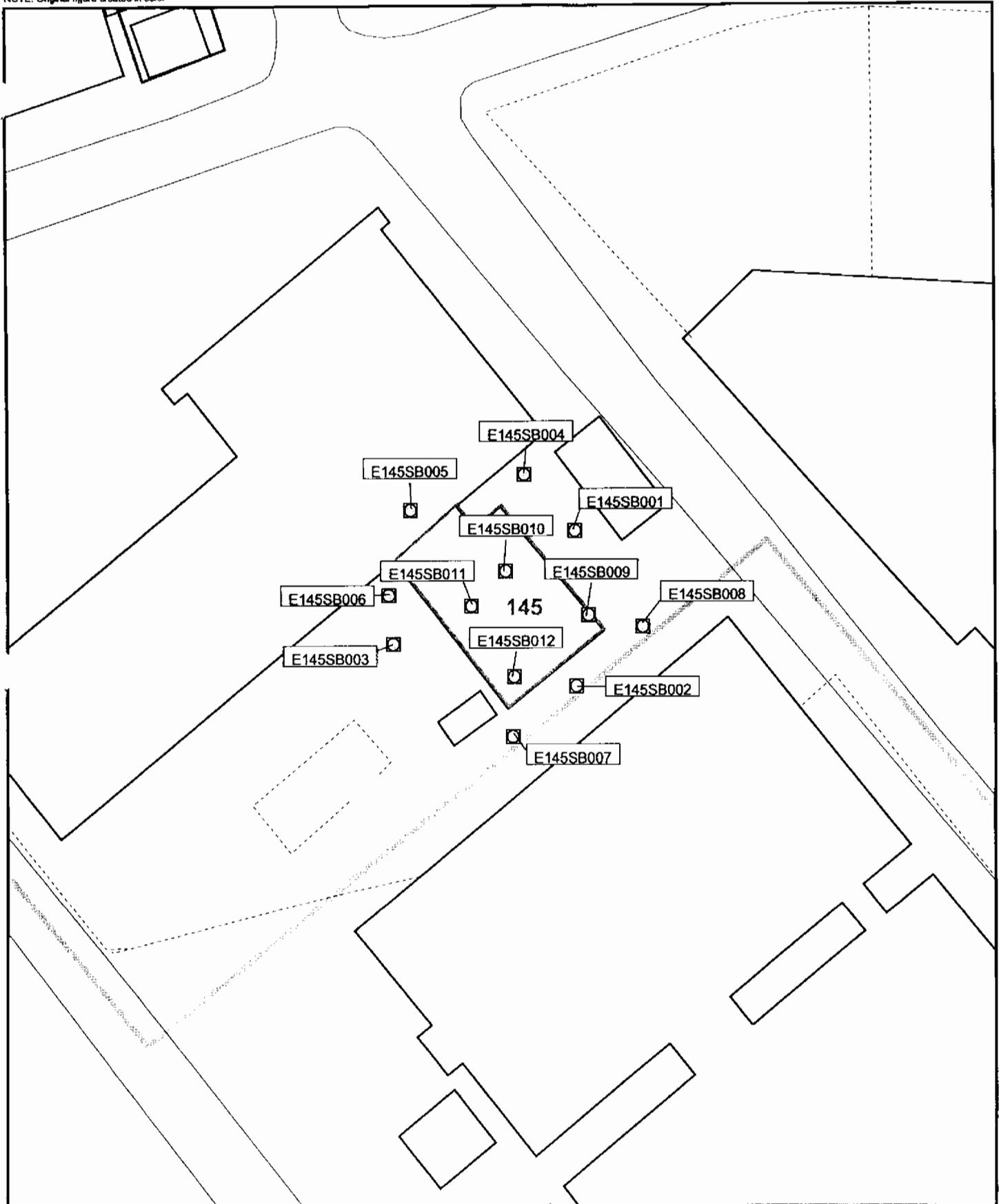
### 2.4.3 Air

No mercury vapors were detected at SWMU 145.

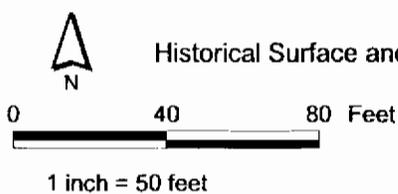
## 2.5 Conclusions and Recommendations

The RFI concluded that there were no COCs for soils or shallow groundwater. The only COC identified was arsenic in deep groundwater, based on a single exceedence of the maximum contaminant level (MCL) in the fourth quarter sampling event. The RFI report recommended continued monitoring of arsenic in the deep groundwater.

NOTE: Original figure created in color

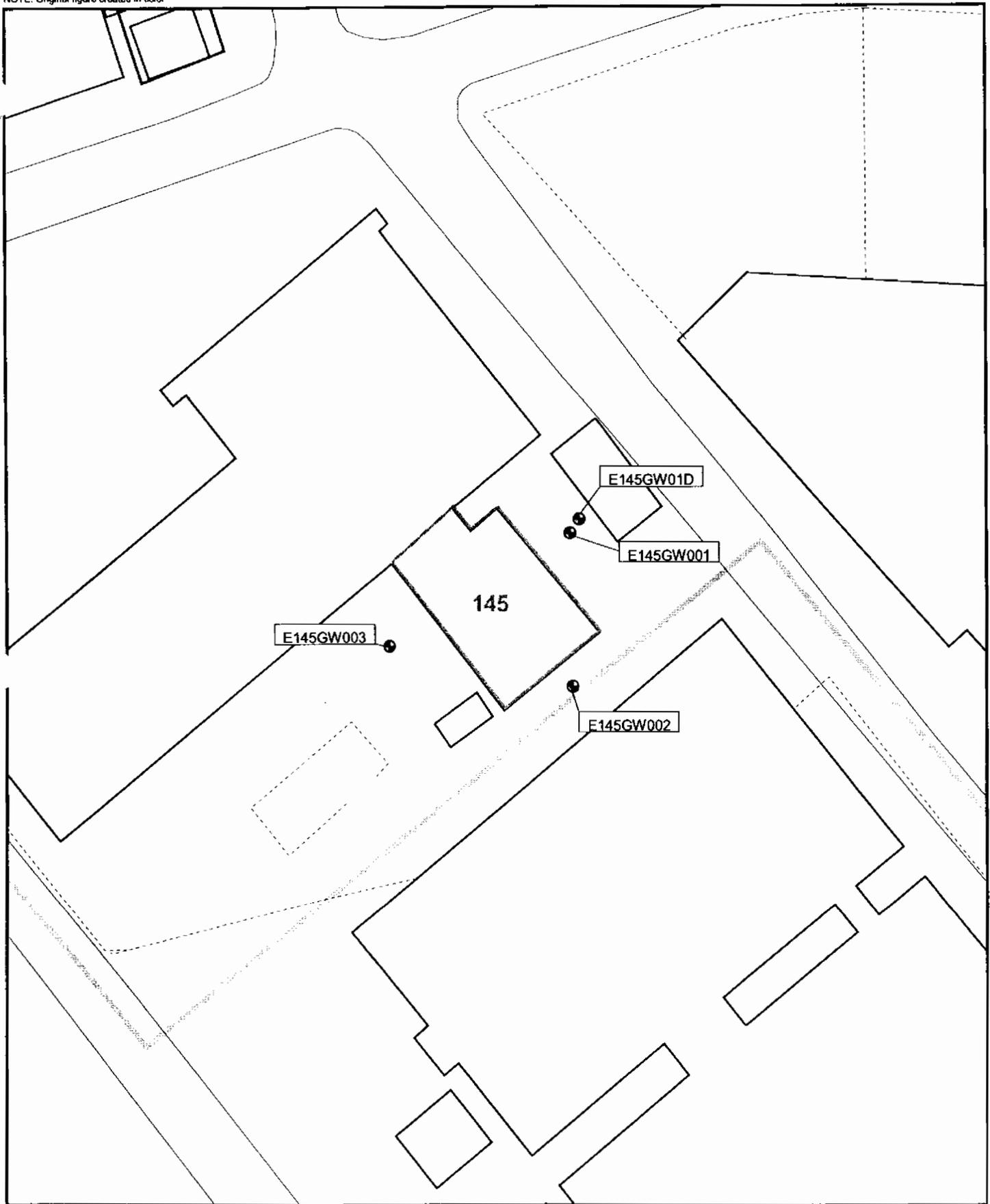


- Surface Soil Sample
- Subsurface Soil Sample
- - - Fence
- ≡ Roads
- ▭ AOC Boundary
- ▭ Buildings
- ▭ SWMU Boundary
- ▭ Zone Boundary



**Figure 2-1**  
Historical Surface and Subsurface Soil Sample Location Map  
SWMU 145, Zone E  
Charleston Naval Complex

NOTE: Original figure created in color



● Groundwater Sample

⋈ Fence

⋈ Roads

▭ AOC Boundary

▭ SWMU Boundary

▭ Buildings

▭ Zone Boundary

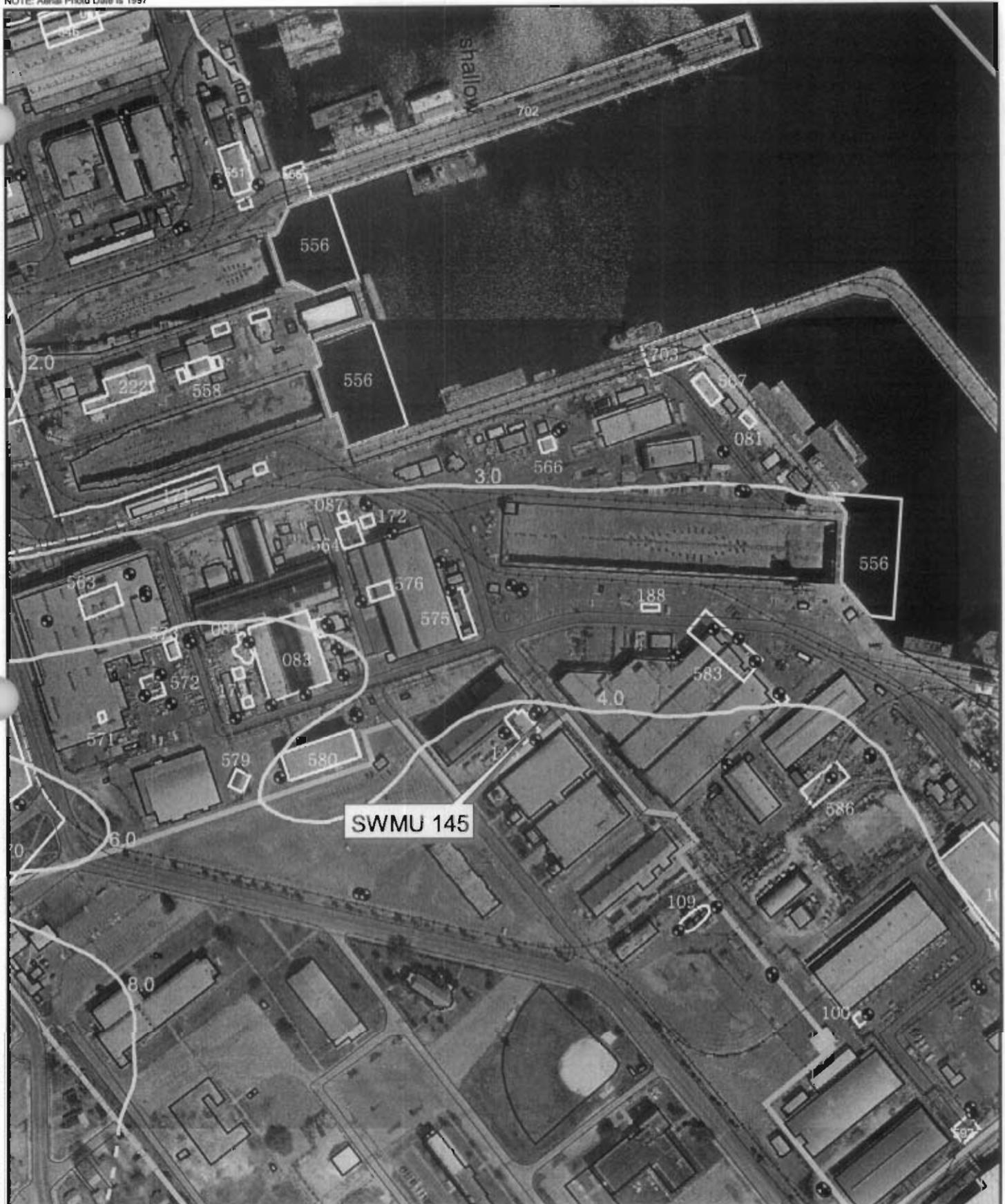


0 40 80 Feet

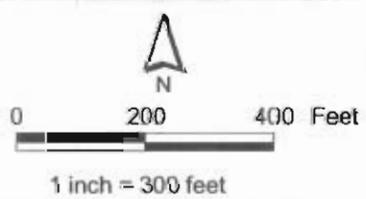
1 inch = 50 feet

**Figure 2-2**  
Historical Groundwater Sample Location Map  
SWMU 145, Zone E  
Charleston Naval Complex

NOTE: Aerial Photo Date is 1997



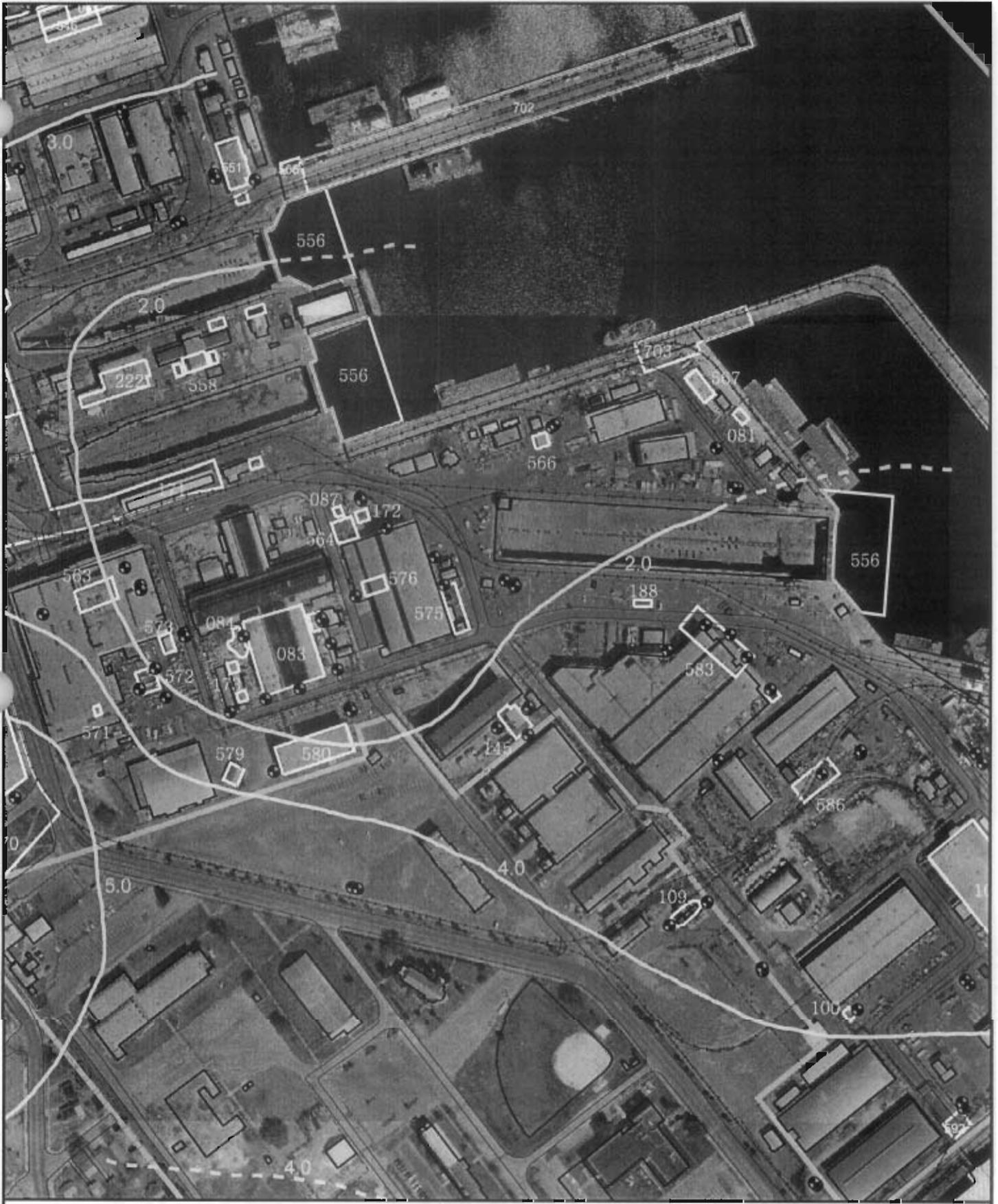
- Groundwater Well inferred
- Groundwater Well known
- Fence
- Railroads
- Roads
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary



**Figure 2-3**  
Groundwater Contours - Shallow (1/20/98)  
SWMU 145, Zone E  
Charleston Naval Complex  
Charleston, SC

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NOTE: Aerial Photo Date is 1997  
 NOTE: Aerial Photo Date is 1997



**Figure 2-4**  
 Groundwater Contours - Deep (1/20/98)  
 SWMU 145, Zone E  
 Charleston Naval Complex

<ul style="list-style-type: none"> <li>● Groundwater Well</li> <li>○ inferred</li> <li>○ known</li> <li>- - - Fence</li> <li>≡ Railroads</li> <li>≡ Roads</li> </ul>	<ul style="list-style-type: none"> <li>▭ AOC Boundary</li> <li>▭ SWMU Boundary</li> <li>▭ Buildings</li> <li>▭ Zone Boundary</li> </ul>	<p>N</p> <p>0 200 400 Feet</p> <p>1 inch = 300 feet</p>
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## 1 **3.0 Interim Measures and UST/AST Removals**

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- 2 No IMs are known to have been conducted at SWMU 145.
- 3 No USTs or ASTs are known to have been located at or removed from SWMU 145.



## 1 **4.0 Summary of Additional Investigations**

---

2 No additional investigations have been conducted at SWMU 145 since the RFI field  
3 investigation conducted in January 1996 (soil sampling) and January 1997 (quarterly  
4 groundwater monitoring from April 1996 – January 1997).



## 5.0 COPC/COC Refinement

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Arsenic was the only COPC identified in the RFI report due to single exceedance of the MCL in a deep groundwater sample.

### 5.1 Arsenic in Deep Groundwater

Table 5-1 presents a summary of historical arsenic, iron, and manganese concentrations in SWMU 145 wells. Figure 2-2 shows the locations of these wells. The highest iron and manganese levels at SWMU 145 are consistently associated with the deep well. Arsenic concentrations in shallow groundwater are generally present at concentrations below analytical detection limits, with only two detections in the third sampling event at concentrations of 3.9  $\mu\text{g}/\text{L}$  and 2.9  $\mu\text{g}/\text{L}$  in monitoring wells E145MW002 and E145MW003, respectively, both of which are well below the MCL of 50  $\text{mg}/\text{L}$ . (See Table 5-1.)

Arsenic concentrations in deep well E145MW001D show elevated concentrations of arsenic, relative to the shallow well concentrations. Observed concentrations in the deep well were 45.5  $\mu\text{g}/\text{L}$  and 98.6  $\mu\text{g}/\text{L}$  for the third quarter and fourth quarter sampling events, respectively. The fourth quarter result for arsenic exceeded the MCL.

Arsenic is not a COC in surface soils, subsurface soils, or shallow groundwater, and there are no data indicating that it was used in process activities at the site. Available information regarding SWMU 145 operations does not indicate that arsenic-containing compounds, such as pesticides, were ever routinely stored or disposed at this location.

The presence of elevated iron and manganese in the well suggests the possibility that natural biological/geochemical processes, such as iron-reducing microbial action, may also be responsible for mobilizing arsenic in the deep aquifer. A discussion of the natural processes that can mobilize arsenic into groundwater were previously provided to the BCT in a memorandum titled *An Overview of Arsenic Geochemistry, Terminal Electron Accepting Processes in GW Systems, and Implications for the CNC Hydrogeologic Environment* (CH2M-Jones, 2001).

1 Based upon the above considerations, the lack of data indicating that arsenic is related to  
2 activities at SWMU 145, the absence of elevated arsenic in shallow groundwater, the  
3 occurrence of elevated arsenic only in the deep well, and the significant possibility that the  
4 elevated arsenic is due to natural geochemical processes, CH2M-Jones believes that arsenic  
5 should not be considered a COC in the deep groundwater at SWMU 145 and that further  
6 evaluation of arsenic at this site is not warranted.

**Table 5-1**  
 Arsenic, Iron and Manganese Concentrations in SWMU 145 Wells  
*RFI Report Addendum, SWMU 145, Zone E, CNC*

Location	Date Collected	Arsenic Concentration (µg/L)	Iron Concentration (µg/L)	Manganese Concentration (µg/L)
MCL/RBC		50	1100	73
<b>SWMU 145 Shallow Wells</b>				
145GW00103	11/06/1996	2.5 U	7,560.0 =	306.0 =
145GW00104	01/17/1997	2.5 U	1,780.0 =	226.0 =
145GW00203	11/06/1996	3.9 J	1,160.0 =	136.0 =
145GW00204	01/17/1997	8.8 U	5,190.0 =	200.0 =
145GW00303	11/05/1996	2.9 J	5,740.0 =	38.2 =
145GW00304	01/17/1997	2.5 U	1,440.0 =	69.3 =
<b>SWMU 145 Deep Well</b>				
145GW01D03	11/06/1996	45.5 =	11,300.0 =	647.0 =
145GW01D04	01/17/1997	98.6 =	8,240.0 =	865.0 =

= Chemical detected at concentration shown.  
 J Chemical detected at concentration below method detection limit.  
 µg/L Micrograms per liter



## 1 6.0 Summary of Information Related to Site 2 Closeout Issues

---

### 3 6.1 RFI Status

4 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) addressed SWMUs/AOCs within the Naval  
5 Complex, including SWMU 145.

6 In accordance with the RFI completion process, if a determination of no further  
7 investigation (NFI) is made upon completion of the RFI, then a site may proceed to either  
8 NFA status or to a corrective measures study (CMS). The results of the CH2M-Jones  
9 evaluation have concluded that no COCs related to SWMU 145 are present; therefore,  
10 CH2M-Jones recommends this site for NFA.

11 The remaining subsections address the issues that BCT agreed to evaluate prior to site  
12 closeout.

### 13 6.2 Presence of Inorganics in Groundwater

14 For the purpose of site closeout documentation, the inorganics in groundwater issue refers  
15 to the occasional or intermittent detection of several metals (primarily arsenic, thallium, and  
16 antimony) in groundwater at concentrations above the applicable maximum contaminant  
17 level (MCL), preceded or followed by detections of these same metals below the MCL or  
18 below the practicable quantitation limit.

19 As discussed in Section 5.0, arsenic exceeded its MCL in one deep groundwater sample  
20 during the fourth quarter sampling event, but was either not present at detectable levels or  
21 at very low levels (8.8  $\mu\text{g}/\text{L}$ , maximum) in the other wells. Supporting data on iron and  
22 manganese concentrations strongly suggest the elevated levels of arsenic in the  
23 groundwater are related to natural conditions.

24 Antimony and thallium were not detected in SWMU 145 groundwater samples.

### **6.3 Potential Linkage to SWMU 37, Investigated Sanitary Sewers at the CNC**

The nearest sanitary sewer manhole is located approximately 35 feet west of SWMU 145. No investigations related to SWMU 37 (sanitary sewers) were conducted at SWMU 145. No known or suspected linkage between SWMU 37 and SWMU 145 exists. Therefore, further evaluation of this issue is not warranted.

### **6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at the CNC**

There is no evidence of past site uses or the presence of contamination near the storm water sewer system near the site that could have potentially impacted the storm water sewer system. Further evaluation of this linkage is not warranted.

### **6.5 Potential Linkage to AOC 504, Investigated Railroad Lines at the CNC**

The nearest railroad line is approximately 300 feet to the north. There are no apparent interactions between SWMU 145 and the nearby railroad lines. In addition, there is no known linkage between SWMU 145 and the investigated railroad lines of AOC 504; therefore, further evaluation of this issue is not warranted.

### **6.6 Potential Migration Pathways to Surface Water Bodies at the CNC**

The nearest surface water body to SWMU 145 is the Cooper River, which lies approximately 760 feet to the northeast. The only potential migration pathway from the site to surface water is via overland flow via storm water runoff. Since no COCs were identified for this AOC, potential migration of contaminants to surface water is not likely from this unit. In addition, the entire site is covered with buildings and pavement, which eliminates contact of surface soils beneath the paving with storm water. Similarly, runoff directed to the storm sewer system, which discharges to the Cooper River, does not contact the surface soil. Further evaluation of a potential pathway for contaminant migration via storm water runoff is not warranted.

1 **6.7 Potential Contamination in Oil/Water Separators (OWSs)**

2 There are no OWSs associated with SWMU 145. In addition, there is no reference to an OWS  
3 at this facility made in the *Oil Water Separator Data* report, Department of the Navy,  
4 September 2000. Therefore, further evaluation of this issue is not warranted.

5 **6.8 Land Use Control Management Plan**

6 No COCs have been identified at SWMU 145. This evaluation was based on unrestricted  
7 risk-based criteria land use classification. Therefore, land use controls are not necessary.



## 1 7.0 Recommendations

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2 SWMU 145 is the location of a reported mercury spill that occurred beneath a portion of  
3 Building 13-A (see Figures 1-1 and 1-2) in Zone E. There is no information regarding the  
4 date, amount, or duration of the release.

5 Evaluation of the media of concern (surface soils, subsurface soils, and groundwater)  
6 indicated that there were no issues associated with the historical operation of or releases  
7 from this unit. According to the *Zone E RFI Report, Revision 0*, no COCs were identified at  
8 SWMU 145.

9 The *Zone E RFI Report, Revision 0* concluded that NFI and NFA are appropriate for soils and  
10 shallow groundwater at SWMU 145; evaluation of COPCs by CH2M-Jones confirmed this  
11 assessment. The RFI report recommended continued monitoring of deep groundwater to  
12 address elevated arsenic levels. Based on detailed evaluation of the deep groundwater data  
13 (Section 5.0), it appears that the source of the elevated arsenic is most likely related to  
14 naturally-occurring processes and not SMWU 145. Therefore, this site is recommended for  
15 NFA.

16 Once the BCT concurs that NFA is appropriate for the site, a Statement of Basis will be  
17 prepared that will be made available for public comment in accordance with SCDHEC  
18 policy. This will allow for public participation in the final remedy selection.



## 1 **8.0 References**

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- 2 CH2M-Jones. *An Overview of Arsenic Geochemistry, Terminal Electron Accepting Processes in*
- 3 *GW Systems, and Implications for the CNC Hydrogeologic Environment*. 2001.
- 4 EnSafe Inc. *Zone E RFI Report, NAVBASE Charleston, Revision 0*. November 1997.
- 5 EnSafe Inc./Allen & Hoshall. *Zone E RFI Report Workplan*. 1995.
- 6 Department of the Navy. *Oil Water Separator Data*. September 2000.
- 7 U.S. Environmental Protection Agency (EPA). *Soil Screening Guidance: Technical Background*
- 8 *Document*. May 1996.



**Appendix A-1**  
**SMWU 145 - Constituents Detected in Surface Soils**  
**Charleston Naval Complex**

Station	Sample ID	Date	MERCURY	
			Result (mg/kg)	Qualifier
			R. RBC	2.3
			I. RBC	61
			SSL	1
			BRC	2.6
E145SB001	145SB00101	01/24/1996		0.11 =
E145SB002	145SB00201	01/24/1996		0.04 U
E145SB003	145SB00301	01/24/1996		0.07 =
E145SB004	145SB00401	01/23/1996		0.05 =
E145SB005	145SB00501	01/25/1996		0.04 U
E145SB006	145SB00601	01/23/1996		0.61 =
E145SB007	145SB00701	01/23/1996		0.04 U
E145SB008	145SB00801	01/23/1996		0.04 U
E145SB009	145SB00901	01/25/1996		0.05 =

= Analyte was detected; the reported value is equal to the sample concentration  
I. RBC Industrial Risk-Based Concentration (EPA Region III)  
R. RBC Residential Risk-Based Concentration (EPA Region III)  
SSL Soil Screening Level Protective of Groundwater  
U Analyte was not detected; the reported value is the detection limit

**Appendix A-2**  
**SMWU 145 - Constituents Detected in Subsurface Soils**  
**Zone E - Charleston Naval Complex**

Station	Sample ID	Date	MERCURY	
			Result (mg/kg)	Qualifier
			SSL	1
			BRC	1.59
E145SB001	145SB00102	01/24/1996	0.05	U
E145SB002	145SB00202	01/24/1996	0.04	U
E145SB003	145SB00302	01/24/1996	0.04	=
E145SB004	145SB00402	01/23/1996	0.03	U
E145SB005	145SB00502	01/25/1996	0.04	U
E145SB006	145SB00602	01/23/1996	0.08	=
E145SB007	145SB00702	01/23/1996	0.07	=
E145SB008	145SB00802	01/23/1996	0.06	U
E145SB009	145SB00902	01/25/1996	0.05	U
E145SB010	145SB01002	01/25/1996	0.04	U
E145SB011	145SB01102	01/24/1996	0.04	U
E145SB012	145SB01202	01/24/1996	0.05	U

= Analyte was detected; the reported value is equal to the sample concentration  
I. RBC Industrial Risk-Based Concentration (EPA Region III)  
R. RBC Residential Risk-Based Concentration (EPA Region III)  
SSL Soil Screening Level Protective of Groundwater  
U Analyte was not detected; the reported value is the detection limit

Appendix A-3

SMWU 145 - Inorganic Constituents Detected in Shallow Groundwater  
Charleston Naval Complex

Sample			Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium	
Station	ID	Date	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier
			MCL/RBC BRC (shallow)	200 2810		6 NOC		50 18.7		2000 211		4 0.43		5 NOC
E145GW001	145GW00101	04/05/96												
	145GW00102	07/18/96												
	145GW00103	11/06/96	268	=	3.2	U	2.5	U	19.4	J	1.1	U	0.5	U
	145GW00104	01/17/97	81.2	UJ	2.1	U	2.5	U	9.5	J	0.79	U	0.5	U
E145GW002	145GW00201	04/02/96												
	145GW00202	07/19/96												
	145GW00203	11/06/96	18	UJ	3.6	U	3.9	J	18.3	J	1.2	U	0.5	U
	145GW00204	01/17/97	57.8	UJ	2.1	U	8.8	U	19.7	J	0.77	U	0.5	U
E145GW003	145GW00301	03/27/96												
	145GW00302	07/17/96												
	145GW00303	11/05/96	122	J	2.1	U	2.9	J	33.5	J	0.79	U	0.5	U
	145GW00304	01/17/97	315	=	2.1	U	2.5	U	34.7	J	1.1	U	0.5	U

= Analyte was detected; the reported value is equal to the sample concentration  
 J Analyte was detected; the reported value is an estimated concentration  
 MCL Maximum Concentration Limit  
 NA The analyte was not analyzed for in this sample  
 NC No BRC was calculated due to the large number of detects  
 ND Non-detects  
 NOC No UTL calculated for this analyte (ND > (1%))  
 U Analyte was not detected; the reported value is the detection limit  
 UJ Analyte was not detected; the reported value is an estimated detection limit

Appendix A-3  
 SMWU 145 - Inorganic Constituents Detected in Shallow Gro  
 Charleston Naval Complex

Sample			Calcium		Cobalt		Copper		Iron		Lead		Magnesium	
Station	ID	Date	Result (ug/L)	Qualifier										
			MCL/RBC	NA	73		1300		300		15		NA	
			BRC (shallow)	NA	2.5		2.7		NA		4.8		NA	
E145GW001	145GW00101	04/05/96												
	145GW00102	07/18/96												
	145GW00103	11/06/96	73100	=	0.9	U	4.3	U	7560	=	1.7	U	5630	=
	145GW00104	01/17/97	67800	=	0.9	U	2	J	1780	=	1.7	UJ	3860	J
E145GW002	145GW00201	04/02/96												
	145GW00202	07/19/96												
	145GW00203	11/06/96	141000	=	0.9	U	1.5	U	1160	=	1.7	U	13600	=
	145GW00204	01/17/97	161000	=	0.9	U	1.6	J	5190	=	1.7	UJ	17100	=
E145GW003	145GW00301	03/27/96												
	145GW00302	07/17/96												
	145GW00303	11/05/96	9240	=	5.1	J	3.5	U	5740	=	1.7	U	2950	J
	145GW00304	01/17/97	6420	=	4.5	J	0.97	J	1440	=	1.7	UJ	2580	J

= Analyte was detected; the reported value is equal to the MCL  
 J Analyte was detected; the reported value is an estimated value  
 MCL Maximum Concentration Limit  
 NA The analyte was not analyzed for in this sample  
 NC No BRC was calculated due to the large number of non-detects  
 ND Non-detects  
 NOC No UTL calculated for this analyte (ND > 10%)  
 U Analyte was not detected; the reported value is the detection limit  
 UJ Analyte was not detected; the reported value is an estimated value

Appendix A-3  
 SMWU 145 - Inorganic Constituents Detected in Shallow Grot  
 Charleston Naval Complex

Sample			Manganese		Mercury		Nickel		Total Dissolved Solids (Residue, filterable)		Chloride		Chromium, Total	
Station	ID	Date	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier
			MCL/RBC BRC (shallow)	50	2		73						100	
				2560	NOC		15.2						75.2	
E145GW001	145GW00101	04/05/96							235000	=	7700	=		
	145GW00102	07/18/96							157000	U	5600	U		
	145GW00103	11/05/96	38.2	=	0.1	U	2.8	UJ	380000	=	75300	=	1.3	U
	145GW00104	01/17/97	69.3	=	0.1	U	0.8	UJ	420000	=	23800	=	2	U
E145GW002	145GW00201	04/02/96							419000	=	26200	=		
	145GW00202	07/19/96							284000	J	35600	U		
	145GW00203	11/06/96	136	=	0.1	U	1.5	UJ	580000	=	24200	=	0.9	U
	145GW00204	01/17/97	200	=	0.1	U	0.8	UJ	796000	=	53300	=	2.5	U
E145GW003	145GW00301	03/27/96							199000	U	34000	U		
	145GW00302	07/17/96							210000	=	36300	=		
	145GW00303	11/05/96	306	=	0.1	U	4.7	UJ	244000	=	64100	=	0.8	U
	145GW00304	01/17/97	226	=	0.1	U	3	J	284000	=	40800	=	1.8	U

= Analyte was detected; the reported value is equal to the MCL  
 J Analyte was detected; the reported value is an exact value  
 MCL Maximum Concentration Limit  
 NA The analyte was not analyzed for in this sample  
 NC No BRC was calculated due to the large number of non-detects  
 ND Non-detects  
 NOC No UTL calculated for this analyte (ND > 1%)  
 U Analyte was not detected; the reported value is the detection limit  
 UJ Analyte was not detected; the reported value is the detection limit

Appendix A-4  
 SMWU 145 - Organic Constituents Detected in Deep Groundwater  
 Charleston Naval Complex

Station	Sample		Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		
	ID	Date	Result (ug/L)	Qualifier											
			MCL/RBC	200		6		50		2000		4		5	
			BRC (deep)	319.00		NOC		16.40		218.00		1.20		NOC	
E145GW01D	145GW01D01	04/02/96		NA											
	145GW01D02	07/18/96		NA											
	145GW01D03	11/06/96		18	UJ	2.1	U	45.5	=	62.6	J	1.2	U	0.5	U
	145GW01D04	01/17/97		18	UJ	2.1	U	98.6	=	63.5	J	0.85	U	0.5	U

= Analyte was detected; the reported value is equal to the sample concentration  
 J Analyte was detected; the reported value is an estimated concentration  
 MCL Maximum Concentration Limit  
 NA The analyte was not analyzed for in this sample  
 NC No BRC was calculated due to the large number of detects  
 ND Non-detects  
 NOC No UTL calculated for this analyte (ND >())%  
 U Analyte was not detected; the reported value is the detection limit  
 UJ Analyte was not detected; the reported value is an estimated detection limit

Appendix A-4  
 SMWU 145 - Organic Constituents Detected in Deep Groundwater  
 Charleston Naval Complex

Station	Sample ID	Date	Calcium		Cobalt		Copper		Iron		Lead		Magnesium	
			Result (ug/L)	Qualifier										
			MCL/RBC	NA	73		1300		300		15		NA	
			BRC (deep)	NA	12.90		NOC		NA		NOC		NA	
E145GW01D	145GW01D01	04/02/96		NA	NA									
	145GW01D02	07/18/96		NA	NA									
	145GW01D03	11/06/96		219000 =	7.6 J		1.4 U		8240 =		1.7 U		104000 =	
	145GW01D04	01/17/97		185000 =	16.7 J		0.6 U		11300 =		1.7 UJ		98700 =	
=	Analyte was detected; the reported value is equal to the MCL/RBC													
J	Analyte was detected; the reported value is an estimate													
MCL	Maximum Concentration Limit													
NA	The analyte was not analyzed for in this sample													
NC	No BRC was calculated due to the large number of samples													
ND	Non-detects													
NOC	No UTL calculated for this analyte (ND > 1%)													
U	Analyte was not detected; the reported value is the upper limit													
UJ	Analyte was not detected; the reported value is an upper limit													

Appendix A-4  
 SMWU 145 - Organic Constituents Detected in Deep Groundwater  
 Charleston Naval Complex

Station	Sample		Manganese		Mercury		Nickel		Total Dissolved Solids (Residue, filterable)		Chloride		Chromium, Total	
	ID	Date	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier	Result (ug/L)	Qualifier
			MCL/RBC	50		2		NA					100	
			BRC (deep)	869.00		0.20		42.20					15.5	
E145GW01D	145GW01D01	04/02/96		NA		NA		NA		4410000	=	2100000	=	
	145GW01D02	07/18/96		NA		NA		NA		2270000	=	2060000	=	
	145GW01D03	11/06/96		647	=	0.1	U	8.2	UJ	4170000	=	1970000	=	1.6 U
	145GW01D04	01/17/97		865	=	0.1	U	14.6	J	4620000	=	2040000	=	1.9 U

= Analyte was detected; the reported value is equal to the MCL/RBC  
 J Analyte was detected; the reported value is an estimated value  
 MCL Maximum Concentration Limit  
 NA The analyte was not analyzed for in this sample  
 NC No BRC was calculated due to the large number of non-detects  
 ND Non-detects  
 NOC No UTL calculated for this analyte (ND >())%  
 U Analyte was not detected; the reported value is the MCL/RBC  
 UJ Analyte was not detected; the reported value is an estimated value