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RCRA FACILITY INVESTIGATION REPORT ADDENDUM SOLID WASTE MANAGEMENT
UNIT 100 (SWMU 100) ZONE E WITH TRANSMITTAL CNC CHARLESTON SC
5/14/2002
CH2M HILL

RFI REPORT ADDENDUM

SWMU 100, Zone E



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



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

PREPARED BY
CH2M-Jones

May 2002

*Revision 0
Contract N62467-99-C-0960
158814.ZE.PR.01*

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May 14, 2002

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

Re: RFI Report Addendum (Revision 0) – SWMU 100, Zone E

Dear Mr. Scaturo:

Enclosed please find four copies of the RFI Report Addendum (Revision 0) for SWMU 100 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 Sam Naik. Please contact him at 770/604-9182, extension 255, 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

**Certification Page for RFI Report Addendum (Revision 0) –
SWMU 100, 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. No. 21428



Dean Williamson, P.E.

5/14/2002
Date

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1 Acronyms and Abbreviations

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	HHRA	Human health risk assessment
17	HI	Hazard index
18	IM	Interim measure
19	LUC	Land use control
20	MCL	Maximum contaminant level
21	µg/L	Microgram per liter
22	mg/kg	Milligram per kilogram
23	NAVBASE	Naval Base
24	NFA	No further action
25	NFI	No further investigation
26	OWS	Oil/water separator
27	PCB	Polychlorinated biphenyl
28	RBC	Risk-based concentration
29	RCRA	Resource Conservation and Recovery Act
30	RFI	RCRA Facility Investigation

1 **Acronyms and Abbreviations, Continued**

2	SAA	Satellite Accumulation Area
3	SCDHEC	South Carolina Department of Health and Environmental Control
4	SSL	Soil screening level
5	SVOC	Semivolatile organic compound
6	SWMU	Solid waste management unit
7	TDS	Total dissolved solids
8	UST	Underground storage tank
9	VOC	Volatile organic compound

Section 1.0

1.0 Introduction

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

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

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to complete the RCRA Facility Investigation (RFI) for Solid Waste Management Unit (SWMU) 100 in Zone E of CNC. The location of this site in Zone E is shown in Figure 1-1. Figure 1-2 shows an aerial photograph of the site.

SWMU 100, Building 218 Satellite Accumulation Area (SAA), was a less-than-90-day accumulation area located adjacent to Building 218. The operation dates of the SAA are not known. The unit consisted of closed 55-gallon drums accumulated on an asphalt-paved area. This unit has no containment structures.

The materials of concern identified in the *Final Zone E RFI Work Plan, Revision 1* (EnSafe Inc. [EnSafe]/Allen & Hoshall, 1995) at SWMU 100 include metals, paints, epoxies, solvents, blasting grit, and petroleum hydrocarbons. This area of Zone E is zoned M-2 (for industrial land use). The CNC RCRA Permit identified SWMU 100 as requiring an RFI.

The RFI was initially conducted by the Navy/EnSafe team. The RFI activities were documented in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). A regulatory review was conducted on this document and a draft response to the comments from SCDHEC were prepared by the Navy/EnSafe team.

1.1 Purpose of the RFI Report Addendum

The purpose of this RFI Report Addendum is to document the results of previous RFI investigations conducted by the Navy/EnSafe team at SWMU 100. This RFI Report

1 Addendum also discusses various closeout issues and the findings of previous
2 investigations, existing site conditions, and the surrounding area land use.

3 **1.2 Report Organization**

4 This RFI Report Addendum consists of the following sections, including this introductory
5 section:

6 **1.0 Introduction** – Presents the purpose of the report and background information relating
7 to the site.

8 **2.0 Summary of RFI Conclusions for SWMU 100** – Summarizes the conclusions from the
9 RFI and risk evaluations for SWMU 100 as presented in *the Zone E RFI Report, Revision 0*.

10 **3.0 Interim Measures and UST/AST Removals** – Provides information regarding any
11 interim measures (IMs) or underground storage tank (UST)/aboveground storage tank
12 (AST) removal activities performed at the site.

13 **4.0 Summary of Additional Investigations** – Summarizes any information collected after
14 completion of the *Zone E RFI Report, Revision 0* (EnSafe, 1997).

15 **5.0 COPC/COC Refinement** – Provides further evaluation of chemicals of potential concern
16 (COPCs) based on RFI and additional data to assess them as chemicals of concern
17 (COCs).

18 **6.0 Summary of Information Related to Site Closeout Issues** – Discusses the various site
19 closeout issues that the BRAC Cleanup Team (BCT) agreed to evaluate prior to site
20 closeout.

21 **7.0 Recommendations** – Provides recommendations for proceeding with site closure.

22 **8.0 References** – Lists the references used in this document.

23 **Appendix A** – Contains excerpts from the *Zone E RFI Report, Revision 0*, including a
24 summary of detections of chemicals and a groundwater flow map for the site vicinity.

25 **Appendix B** – Contains responses to SCDHEC comments for SWMU 100 from the *Zone E*
26 *RFI Report, Revision 0*.

NOTE: Original figure created in color

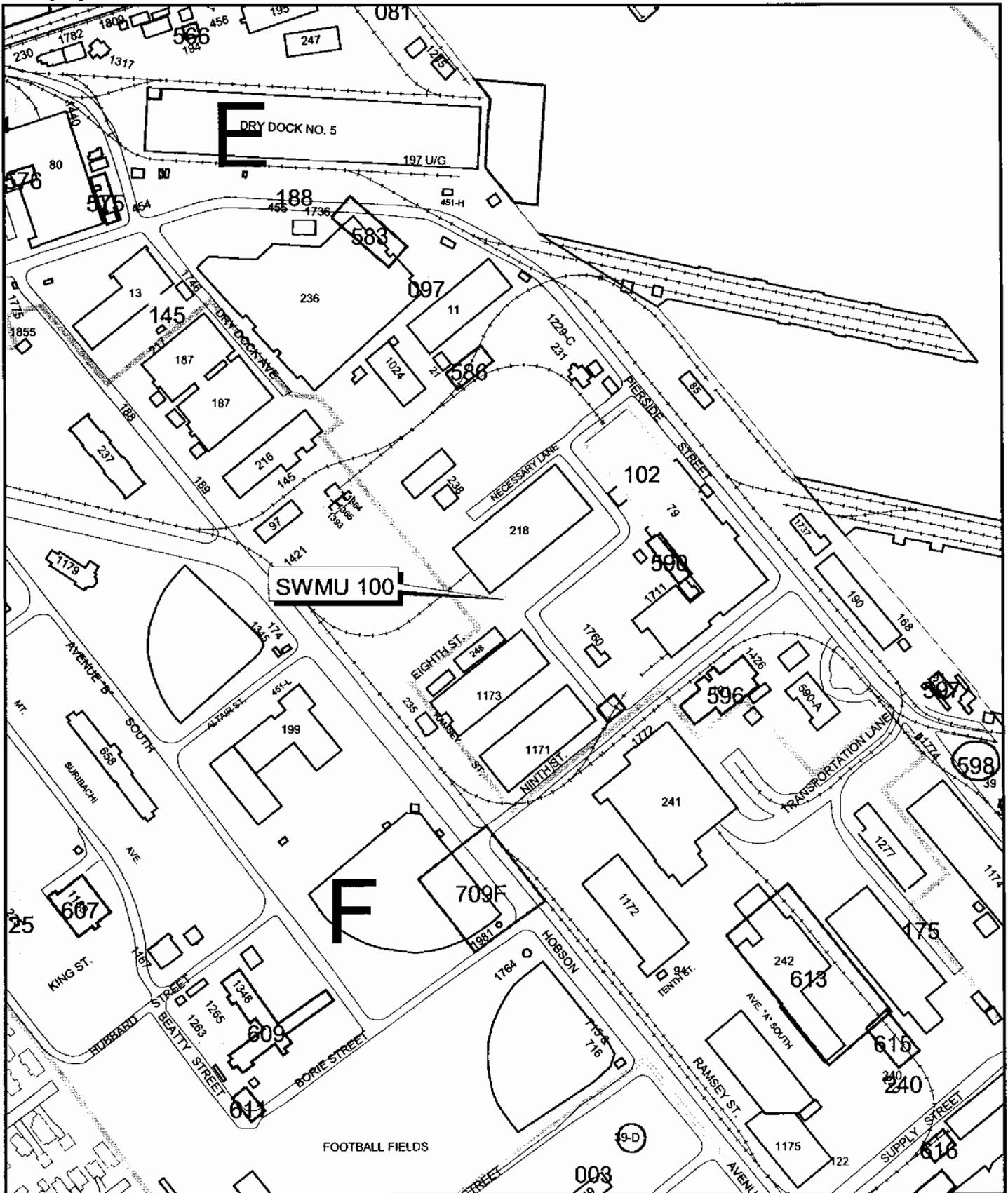
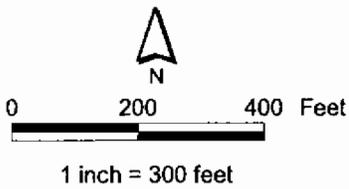
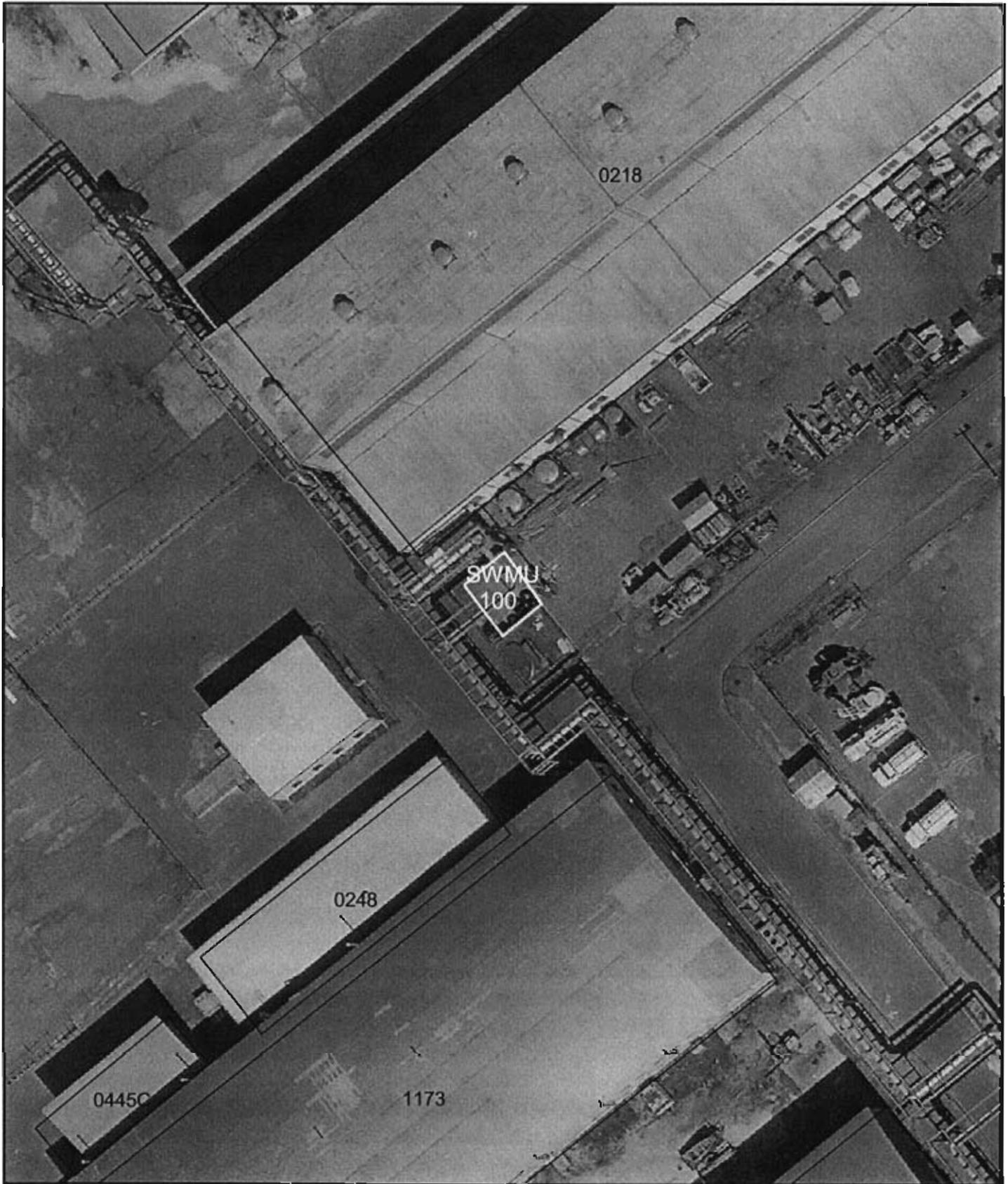


Figure 1-1
 Location of SWMU 100 in Zone E
 SWMU 100, Zone E
 Charleston Naval Complex

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





-  Railroads
-  Fence
-  Roads
-  SWMU Boundary
-  Buildings



0 40 80 Feet

1 inch = 50 feet

Figure 1-2
Site Map
SWMU 100, Zone E
Charleston Naval Complex

CH2MHILL

2.0 Summary of RFI Conclusions for SWMU 100

This section summarizes the results and conclusions from the soil and groundwater investigations conducted at SWMU 100, which were reported in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). Figure 2-1 shows the soil and groundwater sampling locations.

As part of the Zone E RFI, soil and groundwater investigations were conducted at SWMU 100 during 1995 to 1996. The RFI report presented the results of these investigations and conclusions concerning contamination and risk, as summarized in the following sections. A further evaluation of COCs at this site is provided in Section 5.0.

2.1 Soil Sampling and Analysis

RFI soil sampling at SWMU 100 involved the collection and analysis of three surface soil and three subsurface soil samples from locations under concrete and asphalt pavement. Figure 2-1 shows the RFI sampling locations. Surface soil and subsurface soil samples were also collected from the well boring during installation of the shallow monitoring well at this site. All samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, pesticides/polychlorinated biphenyls (PCBs), cyanide, and organotins. These boring locations were identified as E100SB001 through E100SB003. No duplicate samples were collected at SWMU 100.

2.1.1 Surface Soil

During the RFI, surface soil detections of organic compounds were evaluated against the U.S. Environmental Protection Agency (EPA) Region III industrial risk-based concentrations (RBCs) (with a hazard index [HI]=0.1 for noncarcinogens). Surface soil detections of inorganic compounds were evaluated against the EPA Region III industrial RBCs (HI=0.1 for noncarcinogens) and the Zone E background reference concentrations (BRCs).

Detected concentrations of organic and inorganic analytes exceeding their respective criteria are as follows:

VOCs: No VOC detections exceeded the screening criteria in surface soils.

SVOCs: There were no SVOC detections above laboratory detection limits in surface soil samples from SWMU 100.

Inorganics: No inorganic detections exceeded the screening criteria in surface soils.

1 **Pesticides/PCBs:** There were no detections of pesticides/PCBs above laboratory detection
2 limits in surface soil samples from SWMU 100.

3 Figure 2-1 shows the soil sampling locations.

4 **2.1.2 Subsurface Soil**

5 During the RFI, subsurface soil detections of organic compounds were compared with
6 generic soil screening levels (SSLs) (using a dilution attenuation factor [DAF]=10).

7 Subsurface soil detections of inorganic compounds were compared with generic SSLs (using
8 a DAF=10) and the Zone E BRCs.

9 Detected concentrations of organic and inorganic compounds from subsurface soil samples
10 are as follows:

11 **VOCs:** No VOC detections exceeded the screening criteria in subsurface soils.

12 **SVOCs:** There were no SVOC detections above laboratory detection limits in subsurface soil
13 samples from SWMU 100.

14 **Inorganics:** Among detected inorganic analytes, only arsenic at a concentration of 23.6
15 milligrams per kilogram (mg/kg) at sampling location E100SB001, exceeded both its SSL of
16 15 mg/kg and the Zone E subsurface soil BRC of 19.9 mg/kg.

17 **Pesticides/PCBs:** There were no pesticides/PCBs detections above laboratory detection limits
18 in subsurface soil samples from SWMU 100.

19 Figure 2-2 shows the arsenic exceedance in subsurface soil.

20 **2.2 Groundwater Analysis**

21 The RFI for SWMU 100 consisted of one shallow monitoring well, E100GW001, which was
22 installed at the southwest corner of Building 218, as shown in Figure 2-1. Groundwater
23 samples were analyzed for VOCs, SVOCs, metals, pesticides/PCBs, cyanide, organotins,
24 chlorides, sulfates, and total dissolved solids (TDS). No duplicate groundwater samples
25 were collected.

26 During the RFI, the shallow well was sampled four times (1996–1997). The detections in
27 groundwater samples were compared with the EPA Region III tap water RBCs, maximum
28 contaminant levels (MCLs) and the Zone E BRCs for shallow aquifers.

29 **2.2.1 Shallow Groundwater**

30 Analyte concentrations in shallow groundwater samples were detected as follows at this
31 site:

1 **VOCs:** There were no VOC detections above laboratory detection limits in shallow
2 groundwater samples from SWMU 100.

3 **SVOCs:** There were no SVOC detections above laboratory detection limits in shallow
4 groundwater samples from SWMU 100.

5 **Inorganics:** The *Zone E RFI Report, Revision 0* reported detections in the first sampling event
6 only. Among detected inorganic analytes, two metals exceeded their respective screening
7 criteria:

- 8 • Iron was detected at a concentration of 7,590 micrograms per liter ($\mu\text{g}/\text{L}$) in the one
9 sample from E100GW001, above the tap water RBC of 1,100 $\mu\text{g}/\text{L}$. No primary MCL
10 exists for iron, and no shallow groundwater BRC was developed for iron in Zone E
11 during the RFI.
- 12 • Arsenic was detected at a concentration of 20.6 $\mu\text{g}/\text{L}$ in one sample from E100GW001,
13 above both the tap water RBC of 0.045 $\mu\text{g}/\text{L}$ and the Zone E shallow groundwater BRC
14 of 18.7 $\mu\text{g}/\text{L}$ for arsenic. The detection did not exceed the arsenic MCL of 50.0 $\mu\text{g}/\text{L}$.

15 Figure 2-1 shows the groundwater sampling location.

16 **2.3 RFI Human Health Risk Assessment (HHRA)**

17 The *Zone E RFI Report, Revision 0* used a fixed-point risk evaluation (FRE) approach at this
18 site, which considered site resident and site worker scenarios. The detailed risk assessment
19 for the SWMU 100 site is presented in Sections 10.13.6.2 and 10.13.6.3 of the *Zone E RFI*
20 *Report, Revision 0*.

21 **2.3.1 Surface and Subsurface Soils**

22 The FRE did not identify any COCs in surface or subsurface soil at SWMU 100.

23 **2.3.2 Groundwater**

24 The FRE did not identify iron as a COPC. Arsenic was retained as a COC for shallow
25 groundwater for both the unrestricted and commercial/industrial future land use scenarios.

26 **2.4 RFI Conclusions and Recommendations**

27 The *Zone E RFI Report, Revision 0* recommended that a Corrective Measures Study (CMS) be
28 conducted for the shallow groundwater COC (arsenic) at SWMU 100.

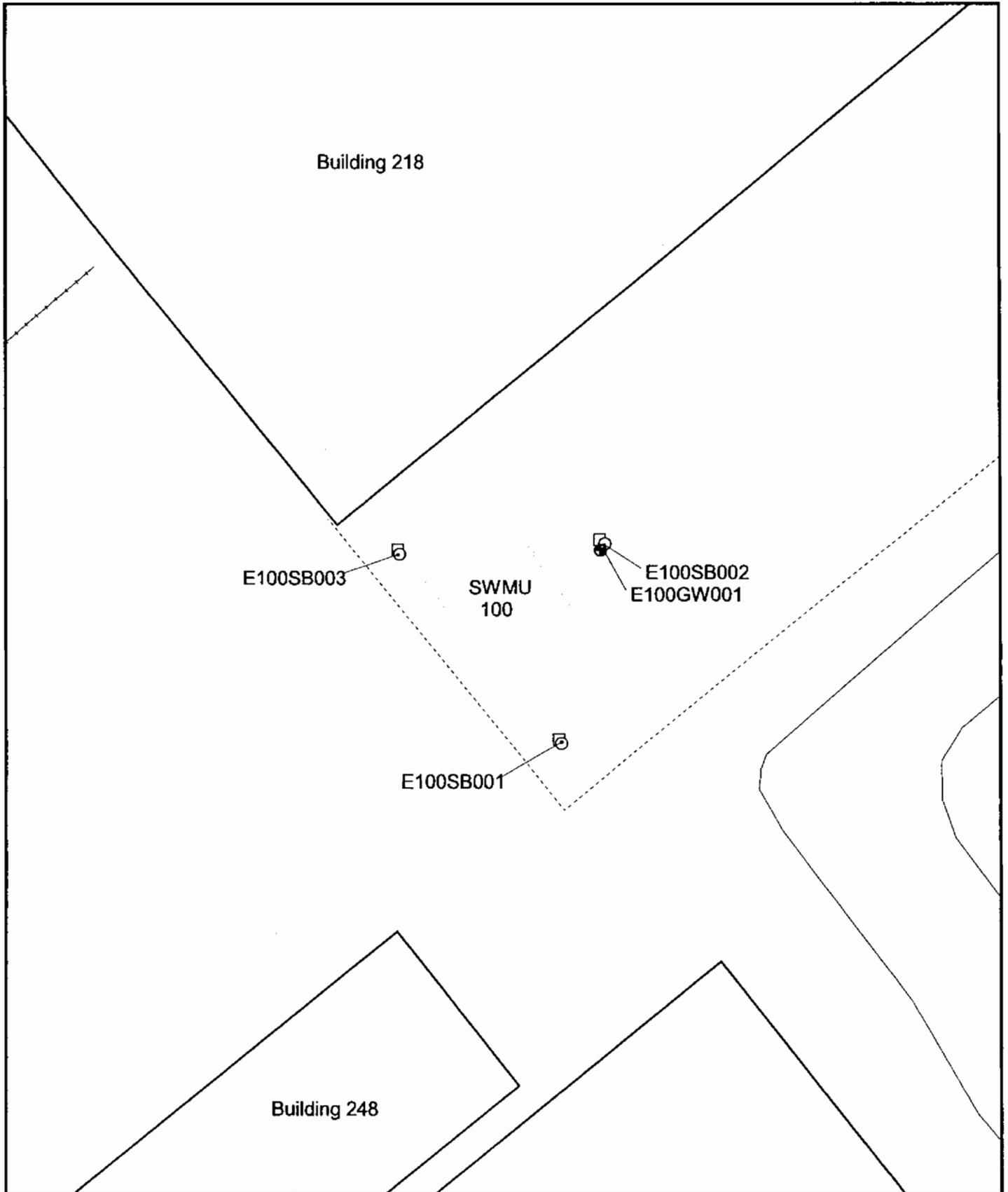


Figure 2-1
RFI Sample Locations
SWMU 100, Zone E
Charleston Naval Complex

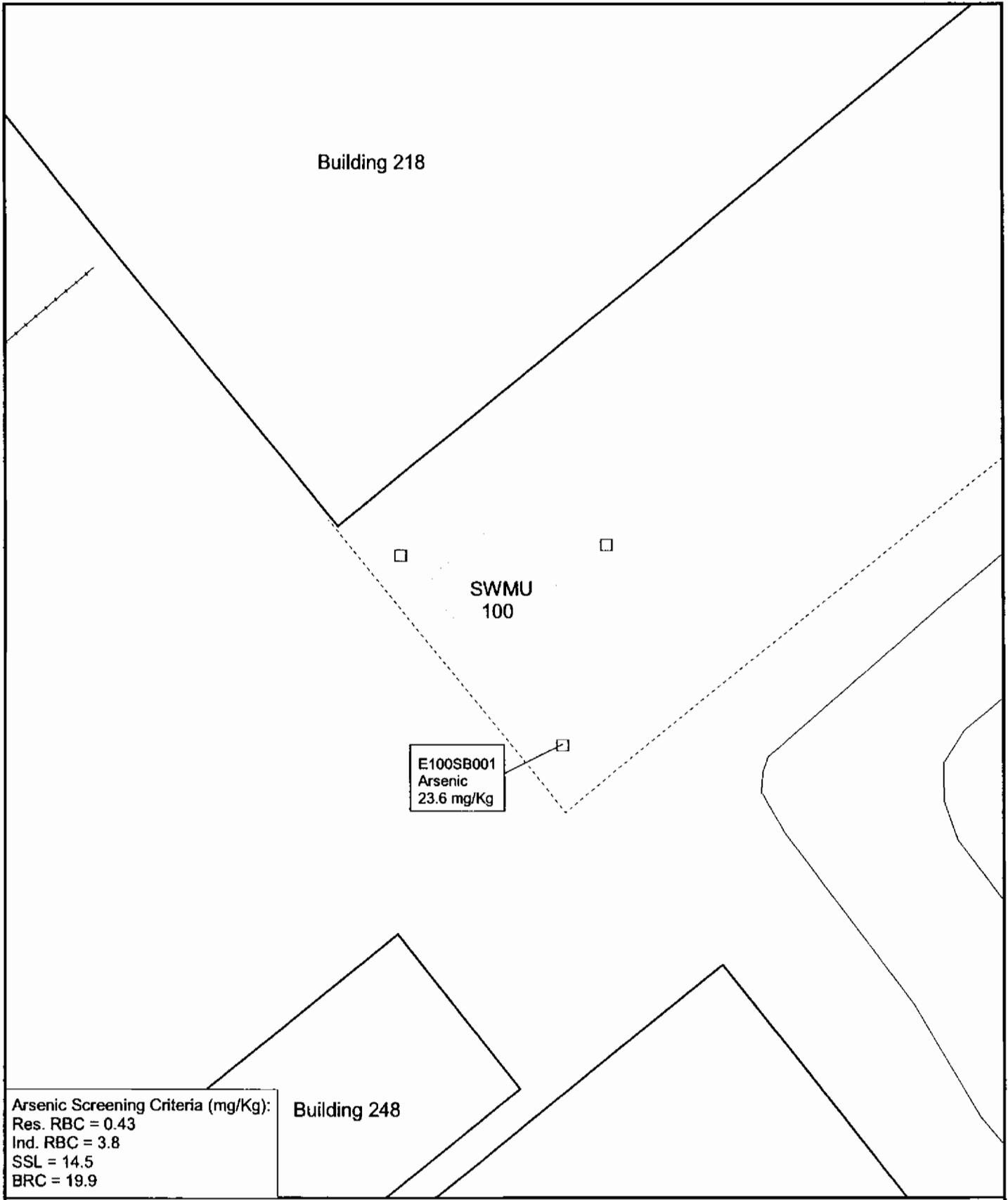
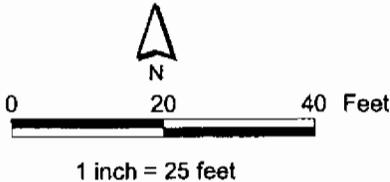


Figure 2-2
 RFI Subsurface Soil Exceedance
 SWMU 100, Zone E
 Charleston Naval Complex

- Subsurface Soil Sample Locations
- ∕ Railroads
- ∕ Fence
- ∕ Roads
- SWMU Boundary
- Buildings



Section 3.0

1 **3.0 Summary of Interim Measures and UST/AST**
2 **Removals**

3 **3.1 UST/AST Removals**

4 There is no indication of a UST or AST being present at this site.

5 **3.2 Interim Measures**

6 There were no IMs conducted at the site.

1 **4.0 Summary of Additional Investigations**

- 2 No additional investigations have been conducted at SWMU 100 since the RFI field
- 3 investigations conducted by EnSafe during the period of 1995- 1997.

1 **5.0 COPC/COC Refinement**

2 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) identified arsenic as a shallow groundwater
3 COC for SWMU 100. However, arsenic detections in groundwater are below the MCL as
4 discussed below, and therefore arsenic is not considered a groundwater COC at this site.

5 The RFI report did not identify any COCs in the soil at this site. The RFI report identified an
6 arsenic exceedance in the subsurface soil sample from E100SB001 with a detection of 23.6
7 mg/kg, which is above its SSL of 15 mg/kg and the Zone E subsurface soil BRC of 19.9
8 mg/kg. However, this detection is below the maximum background arsenic concentration
9 in subsurface soils for Zone E of 26 mg/kg. Therefore, arsenic in subsurface soil is not
10 considered a COC at this site.

11 **5.1 Groundwater**

12 **5.1.1 Arsenic**

13 The RFI report considered arsenic a COC at SWMU 100 based on the detections of arsenic
14 above the EPA Region III tap water RBC and the shallow groundwater BRC of 18.7 µg/L.

15 The detections of arsenic in the shallow well RFI samples at this site ranged from 12.2 µg/L
16 to 22.3 µg/L, all of which are below the MCL for arsenic of 50 µg/L. Therefore, arsenic is
17 not a groundwater COC at this site.

18 **5.2 COC Summary**

19 No COCs that require further action are identified at SWMU 100.

Section 6.0

6.0 Summary of Information Related to Site Closeout Issues

6.1 RFI Status

The *Zone E RFI Report, Revision 0* (EnSafe, 1997) addressed SWMUs/ Areas of Concern (AOCs) within Zone E of the CNC, including SWMU 100.

In accordance with the RFI completion process, if a determination of No Further Investigation (NFI) is made upon completion of the RFI, then a site may proceed to either NFA status or to a CMS. The RFI report identified arsenic as a COC for shallow groundwater at SWMU 100. Based on the discussion presented in Section 5.0 above, arsenic in shallow groundwater is not considered a COC at SWMU 100; therefore, CH2M-Jones recommends this site for NFA status.

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

6.2 Presence of Inorganics in Groundwater

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

There were no detections of antimony or thallium in the shallow well above the laboratory detection limits. There were no detections of arsenic in shallow groundwater at the site above the MCL. Further evaluation of this issue is not warranted.

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

There are no data suggesting that there was an impact to the sanitary sewers from this site. Therefore, further evaluation of this issue is not warranted.

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

No COCs requiring further evaluation are present at this site and there are no data suggesting an impact to the investigated storm sewers at this site from site-related activities. Based on these findings, further evaluation of this issue is not warranted.

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

The nearest existing railroad line to SWMU 100 is approximately 80 feet northwest of the site, leading up to Building 218. There is no known linkage between SWMU 100 and the investigated railroad lines of AOC 504; 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 100 is the Cooper River, which lies approximately 680 feet northeast of the site. The only potential migration pathway from the site to surface water is via overland flow via stormwater runoff. The entire site is covered with buildings and pavement, which eliminates contact of surface soil with stormwater. Similarly, runoff directed to the storm sewer system, which discharges to the Cooper River, does not contact the surface soil. Since no COCs requiring further evaluation are present at this site, no further evaluation of a potential pathway for contaminant migration via stormwater runoff is warranted.

The potential for groundwater contamination associated with SWMU 100 to enter the Cooper River will be addressed when groundwater is addressed on an installation wide level in a later document.

6.7 Potential Contamination in Oil/Water Separators (OWSs)

There are no OWSs associated with SWMU 100. In addition, there is no reference to an OWS at the site in the *Oil Water Separator Data* report, Department of the Navy, September 2000. Therefore, further evaluation of this issue is not warranted.

1 **6.8 Land Use Controls (LUCs)**

2 The CNC BCT has agreed that all of Zone E will have at least some LUCs and restrictions.

3 At a minimum, these LUCs are likely to include restrictions against residential land use.

4 Site-specific LUCs are also expected to be required at specific sites within Zone E depending
5 on the results of the site-specific investigations. At SWMU 100, LUCs are expected to be
6 applied due to the presence of COCs in surface soil. The specific LUCs will be identified in a
7 CMS for these sites.

8 Screening conducted using current screening criteria adopted by the BCT did not identify
9 any COCs in soil or groundwater at SWMU 100 for an unrestricted land use scenario.

10 Therefore, LUCs are not necessary at this site.

Section 7.0

1 **7.0 Recommendations**

- 2 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) identified arsenic in shallow groundwater
3 as a COC, and concluded that a CMS is appropriate for the SWMU 100 site. However,
4 further evaluation of COPCs, as presented in this RFI Report Addendum, concludes that
5 arsenic in in shallow groundwater is not a COC, and additionally, that there are no soil
6 COCs at this site. Therefore, no corrective action is necessary and this site is recommended
7 for NFA.
- 8 Once the BCT concurs that NFA is appropriate for the site, a Statement of Basis will be
9 prepared that will be made available for public comment in accordance with SCDHEC
10 policy. This will allow for public participation in the final remedy selection.

Section 8.0

1 **8.0 References**

- 2 EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston*. 1997.
- 3 EnSafe Inc./ Allen & Hoshall. *Final Zone E RFI Work Plan, Revision 1, NAVBASE Charleston*.
- 4 June 1995.
- 5 South Carolina Department of Health and Environmental Control, Final RCRA Part B
- 6 Permit No. SC0 170 022 560.

Appendix A

Chemicals Present in Site Samples
 SWMU 100 - Groundwater
 NAVBASE - Charleston
 Charleston, SC

Parameter	Frequency of Detection	Range of Detection		Average Detected Concentration	Range of SQL		Screening Concentration		Units	Number Exceeding			
							Residential RBC	Reference		Res.	Ref.		
Inorganics													
Arsenic (As)	*	1	1	20.6	20.6	20.6	NA	NA	0.045	18.7	UG/L	1	1
Calcium (Ca)	N	1	1	148000	148000	148000	NA	NA	NA	NA	UG/L		
Iron (Fe)	N	1	1	7590	7590	7590	NA	NA	NA	NA	UG/L		
Magnesium (Mg)	N	1	1	65300	65300	65300	NA	NA	NA	NA	UG/L		
Manganese (Mn)		1	1	1110	1110	1110	NA	NA	84	2560	UG/L	1	
Nickel (Ni)		1	1	1.2	1.2	1.2	NA	NA	73	15.2	UG/L		
Potassium (K)	N	1	1	34300	34300	34300	NA	NA	NA	NA	UG/L		
Sodium (Na)	N	1	1	658000	658000	658000	NA	NA	NA	NA	UG/L		
Vanadium (V)		1	1	1.4	1.4	1.4	NA	NA	26	11.4	UG/L		

* - Identified as a COPC

N - Essential nutrient

UG/L - micrograms per liter

SQL - Sample quantitation limit

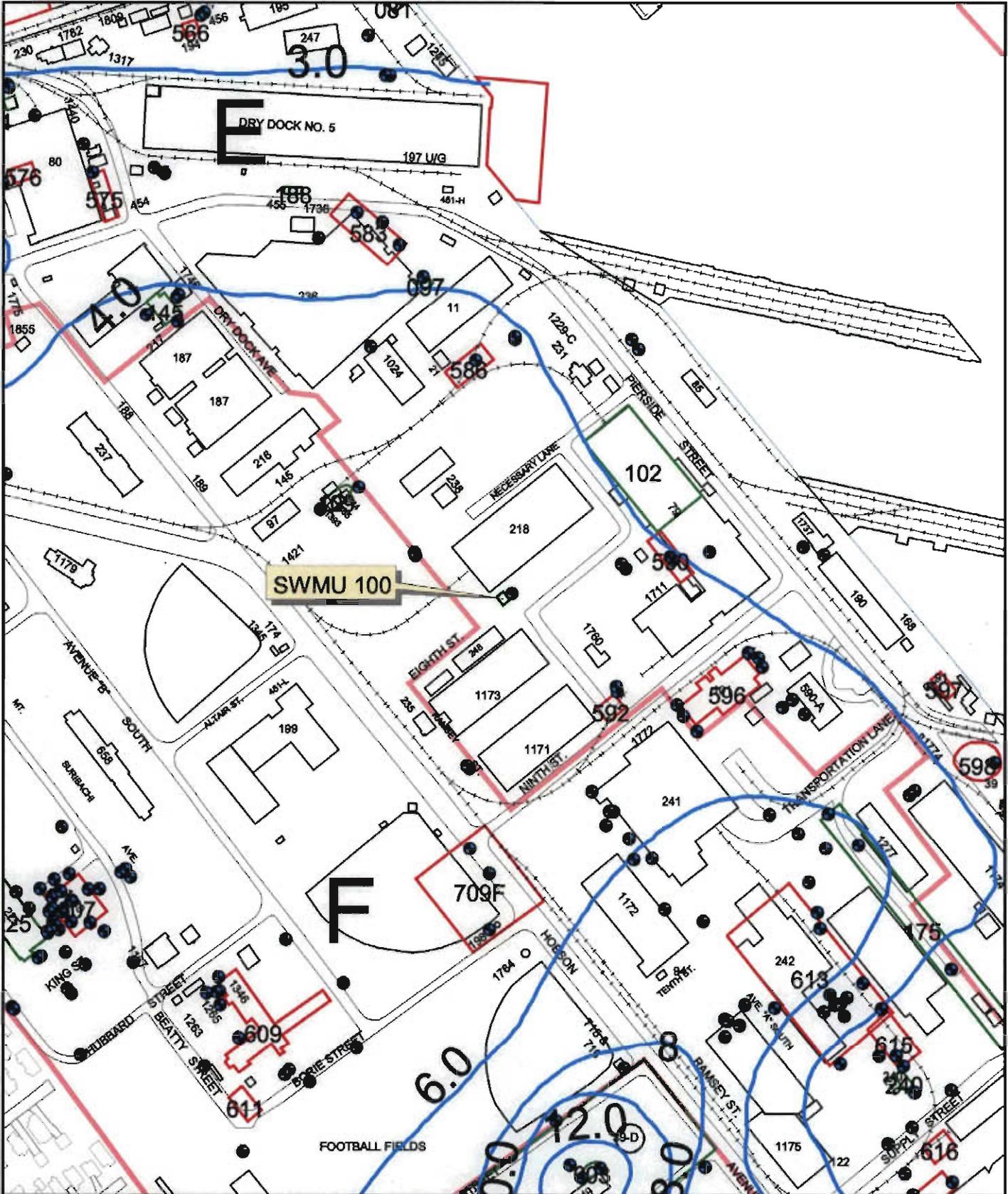
NA - Not applicable

Chemicals Present in Site Samples
 SWMU 100 - Surface Soil
 NAVBASE - Charleston
 Charleston, SC

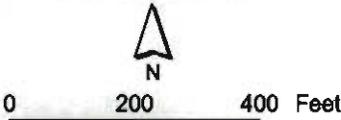
Parameter	Frequency of Detection		Range of Detection		Average Detected Concentration	Range of SQL		Screening Concentration			Units	Number Exceeding		
								Residential RBC	Industrial RBC	Reference		Res.	Ind.	Ref.
Inorganics														
Aluminum (Al)	3	3	4580	6780	5313	NA	NA	7800	100000	26600	MG/KG			
Arsenic (As)	3	3	1.5	2.3	1.8	NA	NA	0.43	3.8	23.9	MG/KG	3		
Barium (Ba)	3	3	7.1	21	12.5	NA	NA	550	14000	130	MG/KG			
Beryllium (Be)	1	3	0.3	0.3	0.3	0.11	0.11	0.15	1.3	1.7	MG/KG	1		
Calcium (Ca) N	3	3	1180	27400	10197	NA	NA	NA	NA	NA	MG/KG			
Chromium (Cr)	3	3	4.7	13.4	7.63	NA	NA	39	1000	94.6	MG/KG			
Cobalt (Co)	3	3	0.24	3.1	1.98	NA	NA	470	12000	19	MG/KG			
Copper (Cu)	3	3	0.77	5.3	2.69	NA	NA	310	8200	66	MG/KG			
Cyanide (CN)	1	3	0.56	0.56	0.56	0.23	0.23	160	4100	0.5	MG/KG			1
Iron (Fe) N	3	3	3570	4900	4127	NA	NA	NA	NA	NA	MG/KG			
Lead (Pb)	3	3	3.5	16.7	8.2	NA	NA	400	400	265	MG/KG			
Magnesium (Mg) N	3	3	124	759	343	NA	NA	NA	NA	NA	MG/KG			
Manganese (Mn)	3	3	6.8	44.7	20	NA	NA	180	4700	302	MG/KG			
Mercury (Hg)	1	3	0.06	0.06	0.06	0.02	0.02	2.3	61	2.6	MG/KG			
Nickel (Ni)	3	3	1.4	5.5	3.17	NA	NA	160	4100	77.1	MG/KG			
Potassium (K) N	1	3	617	617	617	254	319	NA	NA	NA	MG/KG			
Selenium (Se)	1	3	0.77	0.77	0.77	0.56	0.57	39	1000	1.7	MG/KG			
Sodium (Na) N	1	3	300	300	300	56.4	57	NA	NA	NA	MG/KG			
Vanadium (V)	3	3	6.4	12.6	8.6	NA	NA	55	1400	94.3	MG/KG			
Zinc (Zn)	3	3	4.5	21.5	11.8	NA	NA	2300	61000	827	MG/KG			
Volatile Organics														
Acetone	1	3	16	16	16	11	11	780000	20000000	NA	UG/KG			

* - Identified as a residential COPC
 ** - Identified as an industrial COPC
 N - Essential nutrient
 MG/KG - milligrams per kilogram
 UG/KG - micrograms per kilogram
 SQL - Sample quantitation limit
 RBC - Risk-based concentration
 NA - Not applicable

NOTE: Original figure created in color



- Groundwater Well
- AW Groundwater Elevation (ft. above msl)
- Railroads
- Roads - Lines
- ▭ AOC Boundary
- ▭ SWMU Boundary
- ▭ Shoreline
- ▭ Buildings
- ▭ Zone Boundary



1 inch = 300 feet

Figure A-1
 ' Shallow Groundwater Contour Map, 2001
 SWMU 100, Zone E
 Charleston Naval Complex

CH2MHILL

Appendix B

Comment Prepared by Charles B. Watson

SWMU 100

SCDHEC Comment 7:

Arsenic and beryllium were above residential RBC for surface soil and should be evaluated.

Navy/EnSafe Response:

Arsenic and beryllium were addressed in the site-specific risk assessment, which identified the fact that each of these elements were well below their respective background reference concentrations.

CH2M-Jones Response 7:

No further comment is necessary.

Comment Prepared by Eric F. Cathcart

SWMU 100

SCDHEC Comment 25:

Arsenic was above residential RBC for shallow groundwater. The nature and extent should be evaluated. The RFI is therefore incomplete.

Navy/EnSafe Response:

Arsenic was detected at concentrations exceeding its corresponding background reference concentration in the first two quarterly sampling events only. It did not exceed its reference concentration in the last two quarterly sampling events and did not exceed its MCL in any sampling event. Therefore it appears that the risk and hazard posed by arsenic have been overestimated. Discussions are ongoing pertaining to the widespread presence of inorganics in groundwater and how to interpret the significance of that data. A technical memo was submitted to the Project Team to review several months ago and it was briefly discussed at a meeting with SCDHEC in June. At that meeting SCDHEC indicated their review of the memo was not complete and that further discussion should be deferred until that review was complete.

CH2M-Jones Response 25:

The arsenic concentrations detected in groundwater at the site are below the arsenic MCL, and also well within the range of arsenic detected in groundwater in Zone E grid wells (3 to 316 µg/L). No further evaluation of arsenic in groundwater at the site is warranted.