

N61165.AR.003448  
CNC CHARLESTON  
5090.3a

INTERIM MEASURE WORK PLAN COMBINED SOLID WASTE MANAGEMENT UNIT 14  
(SWMU 14) ZONE H CNC CHARLESTON SC  
5/21/2001  
CH2M HILL

# INTERIM MEASURE WORK PLAN

## Combined SWMU 14, Zone H



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

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

***CH2M-Jones***

***May 2001***

***Revision 1  
Contract N62467-99-C-0960***



**CH2MHILL**

**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**

May 21, 2001

John Litton, P.E., Director  
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: Interim Measure Work Plan for Combined SWMU 14, Zone H

Dear Mr. Litton:

Enclosed please find four copies of the Interim Measure Work Plan for Combined SWMU 14 in Zone H 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.

Please contact me if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: Tony Hunt/Navy, w/att ✓  
Rob Harrell/Navy, w/att  
Mihir Mehta/SCDHEC  
Gary Foster/CH2M HILL, w/att

# INTERIM MEASURE WORK PLAN

## Combined SWMU 14, Zone H



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

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

PREPARED BY  
***CH2M-Jones***

*May 2001*

*Revision 0  
Contract N62467-99-C-0960  
158814.ZH.PR.09*

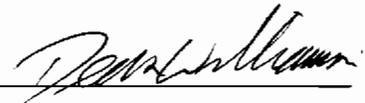
# Certification Page for Interim Measure Work Plan – Combined SWMU 14, Zone H

## Delineation Sampling and Soil Removal

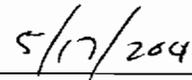
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

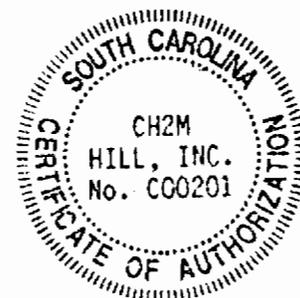
Temporary Permit No. T2000342



Dean Williamson, P.E.



Date



# 1 Contents

---

2 Section	Page
3 <b>Acronyms and Abbreviations</b> .....	<b>v</b>
4 <b>1.0 Introduction</b> .....	<b>1-1</b>
5 1.1 Purpose of the IM Work Plan .....	1-1
6 1.2 Site Background and Setting.....	1-1
7 1.3 Previous Investigations .....	1-2
8 1.3.1 1992 Geophysical and Soil-Gas Survey .....	1-2
9 1.3.2 RCRA Facility Investigation –1994-95 and Draft CMS –1999 .....	1-2
10 1.3.3 Navy DET IM 1997.....	1-5
11 1.4 Organization of the IM Work Plan .....	1-6
12 Figure 1-1 Location of Combined SWMU 14 within Zone H.....	1-7
13 Figure 1-2 Sampling Locations .....	1-8
14 Figure 1-3 Soil COCs and IM Removal Locations .....	1-9
15 <b>2.0 Technical Approach for Soil Delineation and Excavation</b> .....	<b>2-1</b>
16 2.1 Target Cleanup .....	2-1
17 2.2 Pre-excavation Sampling and Contaminant Delineation .....	2-1
18 2.3 Excavation of Soils .....	2-2
19 2.3.1 Excavation .....	2-2
20 2.3.2 Site Restoration.....	2-2
21 Figure 2-1 Proposed Typical Excavation Footprint.....	2-3
22 <b>3.0 Waste Management and Disposal</b> .....	<b>3-1</b>
23 <b>4.0 IM Completion Report</b> .....	<b>4-1</b>
24 <b>5.0 References</b> .....	<b>5-1</b>
25 <b>Appendices</b>	
26 <b>A</b> Figure 2.10 of the Draft Zone H Combined SWMU 14 (EnSafe, 1999)	
27 <b>B</b> Selected figures from the DET IM Report (DET, 1998)	
28 <b>C</b> Figure C-1 - DANC Excavation	

# 1 **Acronyms and Abbreviations**

---

2	AOC	area of concern
3	BEHP	bis(2-ethylhexyl)phthalate
4	BEQ	benzo(a)pyrene equivalent
5	CMS	corrective measures study
6	CNC	Charleston Naval Complex
7	COC	chemical of concern
8	DANC	Decontaminating Agent Non-Corrosive
9	DET	Navy Environmental Detachment
10	ESDSOPQAM	Environmental Services Division Standard Operating Procedures and Quality
11		Assurance Manual
12	EGIS	Environmental Geographic Information System
13	EnSafe	EnSafe, Inc.
14	EPA	U.S. Environmental Protection Agency
15	ft	feet
16	ft bgs	feet below ground surface
17	GPS	global positioning system
18	IM	interim measure
19	µg/L	micrograms per liter
20	mg/kg	milligrams per kilogram
21	PCB	polychlorinated biphenyl
22	pg/L	picograms per liter
23	PPE	personal protective equipment
24	ppm	parts per million
25	RBC	risk-based concentration
26	RCRA	Resource Conservation and Recovery Act
27	RFI	RCRA Facility Investigation
28	SCDHEC	South Carolina Department of Health and Environmental Control

1	SWMU	solid waste management unit
2	SVOC	semivolatile organic compound
3	TCDD	tetrachlorodibenzo-p-dioxin
4	TCLP	toxicity characteristic leaching procedure
5	TEQ	TCDD equivalent
6	TPH	total petroleum hydrocarbon
7	VOC	volatile organic compound
8	y <sup>3</sup>	cubic yards

SECTION 1.0

## **Introduction**

---

# 1.0 Introduction

---

## 1.1 Purpose of the Interim Measure Work Plan

This Interim Measure (IM) Work Plan presents the proposed technical approach to the removal of soils contaminated with benzo(a)pyrene equivalents (BEQs) and inorganics at Combined Solid Waste Management Unit (SWMU) 14 in Zone H of the Charleston Naval Complex (CNC).

Specifically, the proposed IM activities include locating and delineating the areas of contaminated soil in the field, and excavating soils with concentrations above the target cleanup levels for BEQs, arsenic, lead, antimony, and thallium.

## 1.2 Site Background and Setting

Combined SWMU 14 is located in the eastern portion of Zone H at the CNC. The Combined SWMU 14 area encompasses SWMU 14, SWMU 15, Area of Concern (AOC) 670, and AOC 684. The locations of these SWMUs and AOCs are shown on Figure 1-1.

SWMU 14 is an area where miscellaneous chemicals, warfare decontaminating agents, and possibly industrial wastes were reportedly buried.

SWMU 15 is the site of a former propane-fired incinerator reportedly used to destroy classified documents. Only the concrete slab and concrete propane tank saddles remain.

AOC 670 is a former outdoor trap and skeet range operated from 1960 until the late 1970s. Buildings 1887, 1893, and 1896 remain in the AOC 670 area. Building 1897, which was inside the footprint of AOC 670, was demolished during an interim measure performed by the U.S. Navy Environmental Detachment (DET) during 1997.

AOC 684 is a former outdoor pistol range that was in operation from the early 1960s until 1981.

## 1.3 Previous Investigations

### 1.3.1 1992 Geophysical and Soil-Gas Survey

EnSafe Inc. (EnSafe) conducted a geophysical and soil-gas survey at Combined SWMU 14 during 1992 as part of a preliminary Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) (EnSafe, 1996).

The magnetics geophysical survey identified 34 anomalies with characteristics suggesting metal objects. Nine of the better-defined geophysical anomalies were tested by soil-gas analyses. Only five of these anomaly locations showed total volatiles exceeding the detection limits and only one location showed volatile concentrations in excess of 20 micrograms per liter ( $\mu\text{g}/\text{L}$ ). Individual volatile analytes did not show levels above the detection limit except at one location, which showed xylenes at  $1.6 \mu\text{g}/\text{L}$ .

No drums or other containers or sources of contamination were observed on the ground surface at Combined SWMU 14 during the 1992 geophysical survey.

### 1.3.2 RCRA Facility Investigation (RFI) -1994-95 and Draft CMS -1999

Soil, groundwater, sediment, and surface water were sampled during the RFI to identify whether contamination resulted from chemicals and other waste disposal in the Combined SWMU 14 area, and whether residual contamination resulted from firearm discharges in the vicinity. Sample locations were selected to spatially cover the anomaly locations detected in the geophysical survey as well as areas suspected to be impacted by activities from previous site use.

#### RFI Soil Sampling

During the first round of soil sampling, 135 soil samples were collected from 72 locations (72 surface and 63 subsurface) within the Combined SWMU 14 area. These samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, cyanide, Appendix IX suite of analyses (herbicides, organophosphate pesticides, hexavalent chromium, dioxins, and additional VOCs and SVOCs). During the second round, 25 additional samples (19 surface and 6 subsurface) were collected and analyzed for metals, SVOCs and PCBs. During the third round, 16 additional samples (8 surface and 8 subsurface) were collected and analyzed for SVOCs. RFI soil sample locations are shown on Figure 1-2.

1 The RFI risk assessment identified the following chemicals of concern (COCs) in soils (for  
2 the residential and site worker scenarios):

- 3 • At SWMU 14, arsenic and beryllium in surface soils only (for the site worker scenario).
- 4 • At SWMU 15, arsenic and BEQs in surface soils only (for the site worker scenario).
- 5 • At AOC 670, arsenic and BEQs in surface soils only (for the site worker scenario).
- 6 • At AOC 684, arsenic, beryllium, and BEQs in surface soils only (for the site worker  
7 scenario).
- 8 • No subsurface soil COCs were identified in the Rev. 0 RFI (Ensafe, 1996).

9 During the preparation of a Draft Corrective Measures Study (CMS) Report, lead was added  
10 to the list of COCs based on exceedances of the U.S. Environmental Protection Agency  
11 (EPA)'s target cleanup goal for residential land use (400 milligrams per kilogram [mg/kg])  
12 (EnSafe, 1999).

13 **EnSafe Lead Shot Investigation (July 1998).** A separate lead-shot distribution sampling was  
14 conducted by EnSafe during 1998 to estimate the area or volume of lead-impacted soil due  
15 to firearm discharge from the pistol and skeet ranges. These sample locations covered gaps  
16 in the southern portion of the area of influence from the pistol range (i.e., southern side of  
17 AOC 670) which had not been investigated during the RFI. No impacts from previous site  
18 use were reported in this area except for surface soil impact from firearm discharge.  
19 Information pertaining to this effort is contained in the Draft CMS Report for Combined  
20 SWMU 14 (EnSafe, 1999).

21 Thirty-three surface soil samples were collected from the southern portion of Combined  
22 SWMU 14 as part of this sampling effort. Each sample location was excavated from a 1-foot  
23 (ft) x 1-ft x 4-inch deep excavation area, sieve-analyzed, and tested for lead. Three of the 33  
24 soil samples showed lead concentrations in excess of the 400 mg/kg goal. Figure 2.10 from  
25 the *Draft Zone H Combined SWMU 14 CMS Report* (see Appendix A) shows the locations of  
26 the lead shot distribution samples and the surface soil lead concentrations at these locations  
27 (EnSafe, 1999). The three sample locations that show lead concentrations in excess of the  
28 400 mg/kg are also shown on Figure 2-1 of this IM Work Plan.

29 Figure 1-3 shows surface soil locations that indicate the presence of COCs which were  
30 identified during the RFI, the Draft CMS, and after supplemental lead shot distribution  
31 sampling conducted by EnSafe on the southern side of Combined SWMU 14.

1 **RFI Groundwater Sampling**

2 Five pairs of shallow and deep permanent monitor wells (identified as H014GW001,  
3 H014GW001D, H014GW0002, H014GW0002D, H014GW0003, H014GW003D, H014GW0004,  
4 H014GW004D, H014GW0005 and H014GW005D) were installed during the RFI. During the  
5 first round of sampling, analyses were conducted on the samples for the Appendix IX list of  
6 parameters and total petroleum hydrocarbon (TPH), due to the unknown nature of the  
7 contamination. During the second and third rounds of sampling, analyses were conducted  
8 for VOCs, SVOCs, pesticides, herbicides and metals. A fifth round of sampling was  
9 conducted for VOCs.

10 One additional pair of shallow and deep monitor wells (identified as H014GW006 and  
11 H014GW06D) and a shallow well (identified as H104GW007) were installed during 1998-99  
12 after an Interim Measure was completed by the DET. These wells were sampled in four  
13 subsequent rounds for VOCs to evaluate the subsurface impact of previously buried  
14 Decontaminating Agent Non-Corrosive (DANC) containers. Figure 1-2 shows the locations  
15 of the groundwater monitor wells.

16 The RFI identified aluminum, bis(2-ethylhexyl)phthalate (BEHP), tetrachlorodibenzo-p-  
17 dioxin (TCDD) equivalents (TEQ) and vanadium as shallow groundwater COCs; and TEQs,  
18 BEHP, heptachlor epoxide, and thallium as deep groundwater COCs. These constituents  
19 were identified as COCs based on one-time first-round detections only, but were not  
20 detected in subsequent rounds of groundwater sampling. No groundwater COCs were  
21 identified in the Draft CMS Report (Ensafe, 1999).

22 **RFI Sediment Sampling**

23 Four samples were collected from the 0-1 ft depth interval in two converging ditches within  
24 AOC 670 and AOC 684 (east of buildings 1887, 1893, and 1897). These intermittent drainage  
25 ditches have no outlet to Shipyard Creek, which is the nearest surface water body, but  
26 probably collect surface runoff from adjacent areas. Samples from these ditches were  
27 analyzed for VOCs, SVOCs, pesticides, Appendix IX herbicides, TPH, and dioxin.

28 Contaminants detected in these samples were similar to those detected in soils at AOC 670  
29 and 684. The most significant detections were for TPH at two locations (H684M001 and  
30 H684M002) with concentrations of 780 ppm and 2100 ppm, respectively. This indicated that  
31 some of the organic compounds detected at these locations could be related to the presence  
32 of TPH. Figure 1-2 shows the sediment sampling locations.

1 No COCs were identified in sediments during the RFI. However, this IM targets the two  
2 sediment locations H684M001 and H684M002 for removal, where elevated levels of TPH  
3 were detected in samples.

#### 4 **RFI Surface Water Sampling**

5 One surface water sample was collected from one of the ditches west of AOC 684 near the  
6 location of one of the sediment samples. The only detections were for the herbicide 2,4,5-TP  
7 at 0.34 µg/L and dioxins (TEQ) at 7.33 picograms per liter (pg/L). No COCs were  
8 identified in surface water during the RFI. Figure 1-2 shows the surface water sampling  
9 location.

### 10 **1.3.3 Navy DET IM (1997)**

11 The Navy DET IM involved a geophysical investigation to identify more anomalies and  
12 excavate the 34 anomalies found in both the 1992 EnSafe geophysical survey and the 1995  
13 DET IM geophysical survey.

14 The DET IM identified 25 additional anomalies (named anomalies A through Y). Figure 4  
15 from the *Completion Report, Interim Remedial Measure for SWMU 14* (DET, 1998), which is  
16 included in Appendix B, shows the locations of these geophysical anomalies and their  
17 identification numbers. The IM effort excavated all 59 anomalies and found miscellaneous  
18 non-hazardous metallic objects such as rebar, fence posts, strapping, welding rods, concrete  
19 footings, horseshoes, and one anomaly (Anomaly G) with DANC containers.

20 Anomaly G was detected within AOC 670, south of Building 1897. The Anomaly G  
21 excavation involved removal of 90 DANC containers (each container approximately 5  
22 gallons in volume). Building 1897 was demolished to allow excavation of an additional 50  
23 DANC containers from under the footprint of the building. DANC is a decontaminating  
24 agent primarily consisting of chlorinated compounds, and historic information indicated  
25 that DANC containers had been buried at Combined SWMU 14 (EnSafe, 1996). Tables 1 and  
26 2 from the DET IM Report (DET, 1998), also included in Appendix B, show the descriptions  
27 of the anomalies found in the excavations conducted at these locations. Figure C-1 in  
28 Appendix C shows the location of the DANC excavation at Combined SWMU 14.

29 Subsequent to the DANC container excavation, a total of 30 screening and confirmatory soil  
30 samples were collected from the excavated area to verify that all contamination related to  
31 DANC (primarily 1,1,2,2,-tetrachloroethane and trichloroethylene) had been removed.  
32 Confirmatory soil sampling results showed no presence of these compounds above their  
33 residential risk-based concentrations (RBCs).

1 The uppermost 6 inches of all anomaly excavations within AOC 670 and AOC 684 were  
2 collected separately with the assumption that they may be influenced by lead shots.  
3 Approximately 40 cubic yards (y<sup>3</sup>) of soil were accumulated from these excavations and  
4 analyzed for total metals and toxicity characteristic leaching procedure (TCLP) lead. Based  
5 on the analytical results, this non-hazardous soil was backfilled into excavations after  
6 approval from the South Carolina Department of Health and Environmental Control  
7 (SCDHEC). All anomaly excavation areas were screened with a magnetic detector after  
8 excavations to confirm that no subsurface anomalies existed in the excavated areas.

## 9 **1.4 Organization of the IM Work Plan**

10 This IM Work Plan consists of the following six sections, including this introductory section:

11 **1.0 Introduction** — Presents the purpose of the IM Work Plan and background information  
12 regarding the site.

13 **2.0 Technical Approach** — Provides a brief description of the technical approach for the IM.

14 **3.0 Waste Management and Disposal** — Describes the procedures for waste management  
15 and disposal.

16 **4.0 IM Completion Report** — Describes the contents of the IM Completion Report.

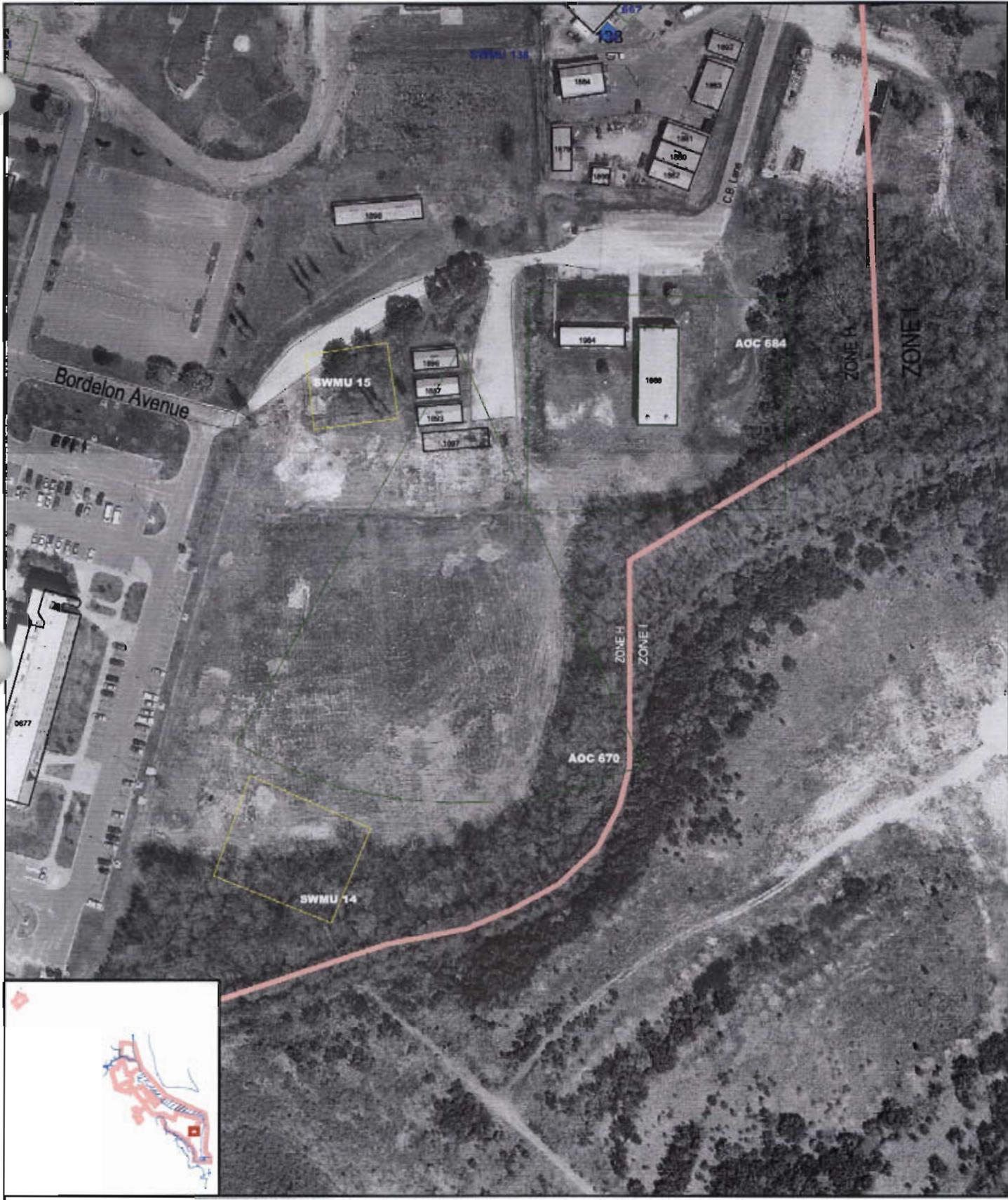
17 **5.0 References** — Lists the references used in this document.

18 **Appendix A** — Presents Figure 2.10 of the Draft Zone H Combined SWMU 14 (EnSafe,  
19 1999).

20 **Appendix B** —Presents selected figures from the DET IM Report (DET, 1998).

21 **Appendix C** — Provides Figure C-1, which depicts the DANC excavation.

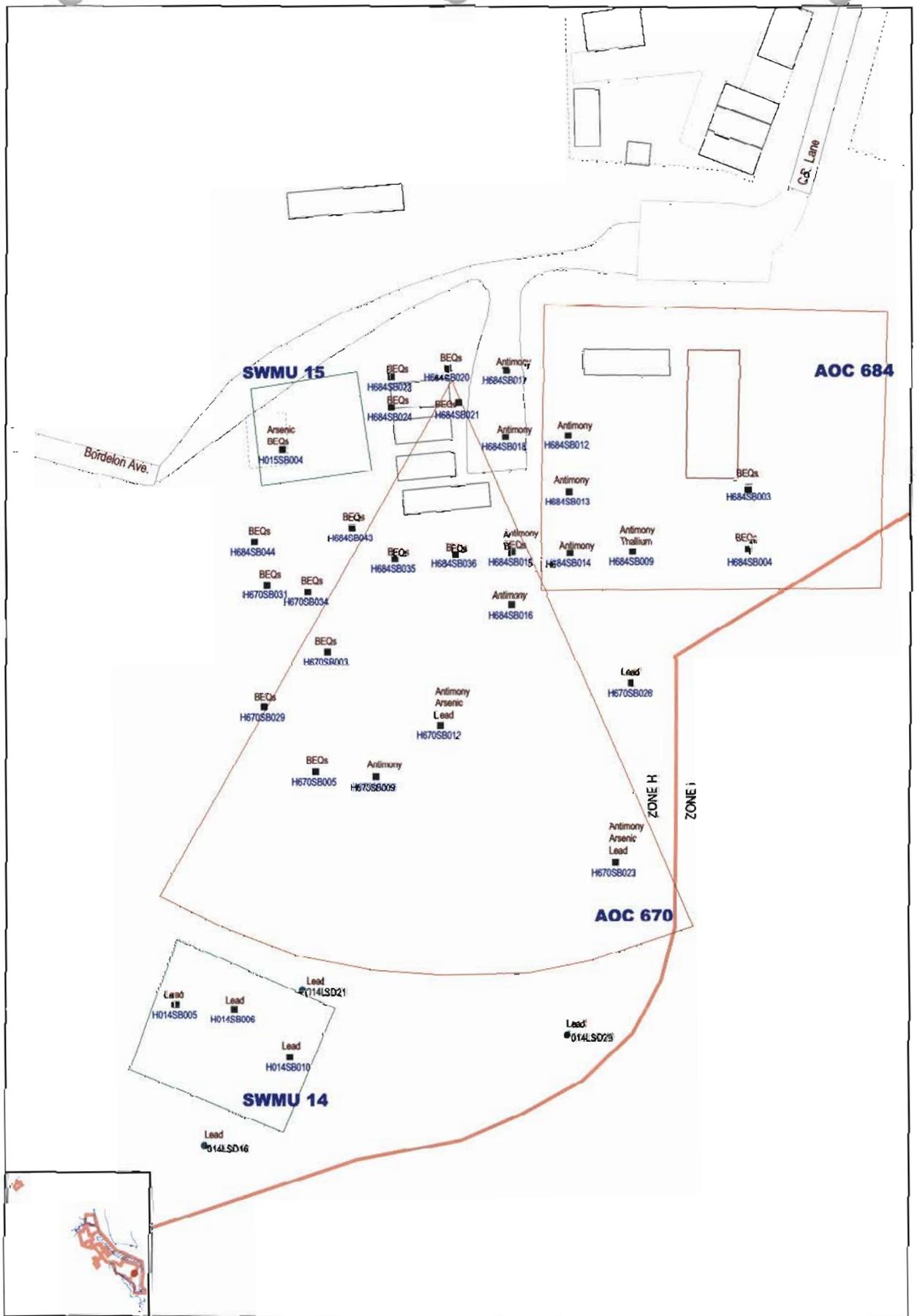
22 All figures appear at the end of their respective sections.



**Figure 1-1**  
 Site Location  
 Combined SWMU 14, Zone H  
 Charleston Naval Complex



Note: Original figure produced in color.  
 Aerial photograph dated 1996.



■	Soil Sampling Location
■	H684SB039 Soil Boring ID
●	Lead Shot Dist. Sampl. Location
—	AOC Boundary
—	SWMU Boundary
—	Buildings
—	Zone Boundary

Note: Original figure produced in color.

0 60 120 Feet

**Figure 1-3**  
 Soil COCs and Proposed IM Removal Locations  
 Combined SWMU 14, Zone H  
 Charleston Naval Complex



SECTION 2.0

**Technical Approach for  
Soil Delineation and Excavation**

---

## 2.0 Technical Approach for Soil Delineation and Excavation

---

This section outlines the technical approach to the delineation and removal of soils contaminated with BEQs and inorganics that showed the presence of COCs above residential cleanup goals during the RFI and the EnSafe Draft CMS efforts.

This IM proposes to remove soils at all locations where concentrations of site constituents exceeded a residential screening goal. The confirmatory sampling to delineate the excavation extent will be compared to unrestricted use cleanup goals.

Locations targeted for surface soil removal and the COCs that are targeted for removal at these locations are shown on Figure 1-3.

### 2.1 Target Cleanup

The COCs in surface soil identified for removal in this IM are BEQs, arsenic, antimony, and thallium.

For arsenic and thallium, the target cleanup goals in surface soils are background values based on the background (reference) concentrations derived from the grid sample data set for Zone H surface soils. For arsenic, the target cleanup goal is 15.6 mg/kg. This is the value used as a reference concentration in the RFIs. For thallium, the target cleanup value is 1.1 mg/kg, which is also the reference concentration used in the RFI.

For antimony, the target cleanup goal in surface soils is the U.S. Environmental Protection Agency (EPA) Region III residential RBC of 3.1 mg/kg, since the background data set for antimony in the Zone H background data set did not detect antimony in over 90 percent of the background soil samples.

For BEQs, the target cleanup goal in surface soils is the sitewide CNC BEQ reference concentration of 1,304 µg/kg for surface soil.

### 2.2 Pre-excavation Sampling and Contaminant Delineation

Prior to the commencement of excavation activities, the former soil boring locations will be staked in the field using coordinates derived from the CNC Environmental Geographic Information System (EGIS) tool and hand-held Global Positioning System (GPS) equipment.

1 At each location where surface soil excavation will be performed, a 10-ft x 10-ft excavation  
2 footprint will be laid out, and four delineation samples will be collected around each  
3 excavation footprint. These samples will be analyzed to verify the concentrations of the  
4 COCs being removed (BEQs or inorganics or both). Analytical results from the delineation  
5 sampling will be evaluated to determine the horizontal extent of excavation at each location.  
6 If any of these delineation samples exceeds the target cleanup levels for the COC being  
7 removed at that location, additional soil samples will be collected farther out to complete  
8 the delineation. The final excavation limits will be determined based on these analytical  
9 results. Typical initial excavation footprint and delineation sampling locations are shown on  
10 Figure 2-1.

## 11 **2.3 Excavation of Soils**

### 12 **2.3.1 Excavation**

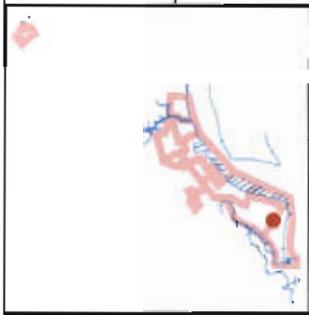
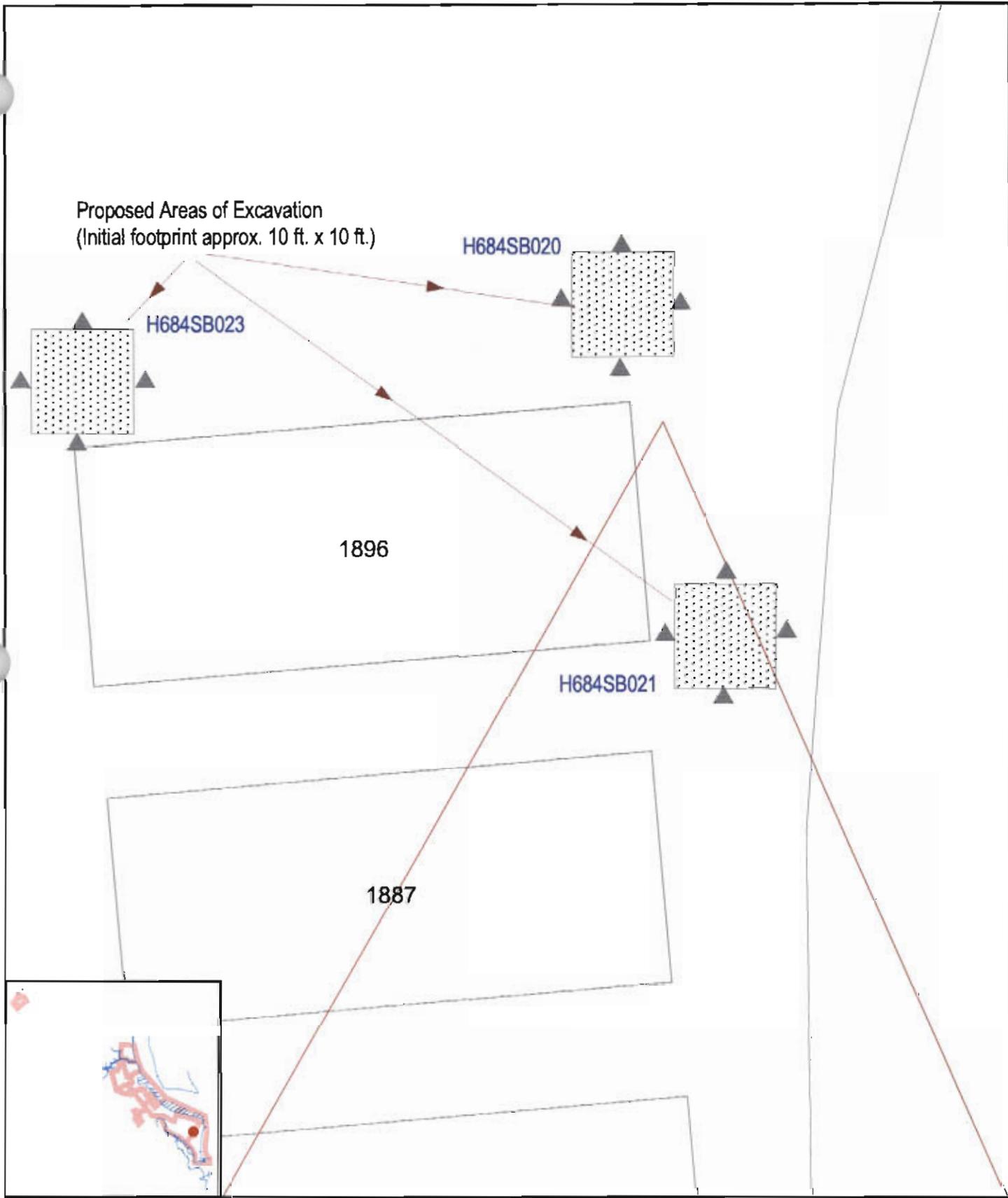
13 At each location, excavation will be performed based on delineation sampling to a depth of  
14 1 ft below ground surface (ft bgs), using a backhoe or similar equipment. At some locations,  
15 the initial excavation footprint may be larger than 10 ft x 10 ft if the pre-excavation  
16 delineation sampling indicates the presence of COCs in surface soils outside the initial 10 ft  
17 x 10 ft footprint.

18 Excavated material stockpiles will be placed in staging areas within the Combined SWMU  
19 14 boundary. These stockpile areas will be prepared and maintained in accordance with  
20 applicable regulations.

### 21 **2.3.2 Site Restoration**

22 Based on the prior delineation of contamination limits, the excavations will be backfilled  
23 with clean soil soon after contaminated soil is removed, in order to restore the site to  
24 original conditions.

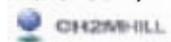
25 The sampling procedures will be performed in accordance with the *Environmental Services*  
26 *Division Standard Operating Procedures and Quality Assurance Manual (ESDSOPQAM)* (EPA,  
27 1996).



- Proposed Initial Excav. footprint
- Pre-excavation Delineation Sampling Location
- AOC 670 Boundary
- Buildings



**Figure 2-1**  
Proposed Typical  
Excavation Footprint  
Combined SWMU 14, Zone H  
Charleston Naval Complex



Note: Original figure produced in color.

SECTION 3.0

## **Waste Management and Disposal**

---

## 1 **3.0 Waste Management and Disposal**

---

2 The following three waste streams will be generated as part of this IM: excavated soils,  
3 decontamination wastes, and personal protective equipment (PPE). Excavated soils will be  
4 characterized in accordance with South Carolina Hazardous Waste Management  
5 Regulations (Section SCDHEC R.61-79.261), and disposed of in accordance with all  
6 applicable regulations and permits. Decontamination wastes and PPE will also be disposed  
7 of in accordance with regulations.

8 Offsite transportation and disposal will be performed by properly permitted and licensed  
9 subcontractors. Materials designated for offsite disposal will be documented, tracked, and  
10 their disposition verified. This information will be reported in the IM Completion Report.

SECTION 4.0

## **IM Completion Report**

---

## 1 **4.0 IM Completion Report**

---

2 A final report will be submitted within 60 days of receipt of final analytical data. The report  
3 will summarize the actions that were taken and provide the following information:

- 4 • Excavated volumes
- 5 • Nature and volume of waste generated
- 6 • Waste transportation and disposal records
- 7 • Analytical data reports
- 8 • Site photographs
- 9 • Problems encountered during the IM and the corrective measures implemented to  
10 correct the problems, if any
- 11 • Other information that would be helpful in evaluating the success of the IM

SECTION 5.0

## References

---

## 1 **5.0 References**

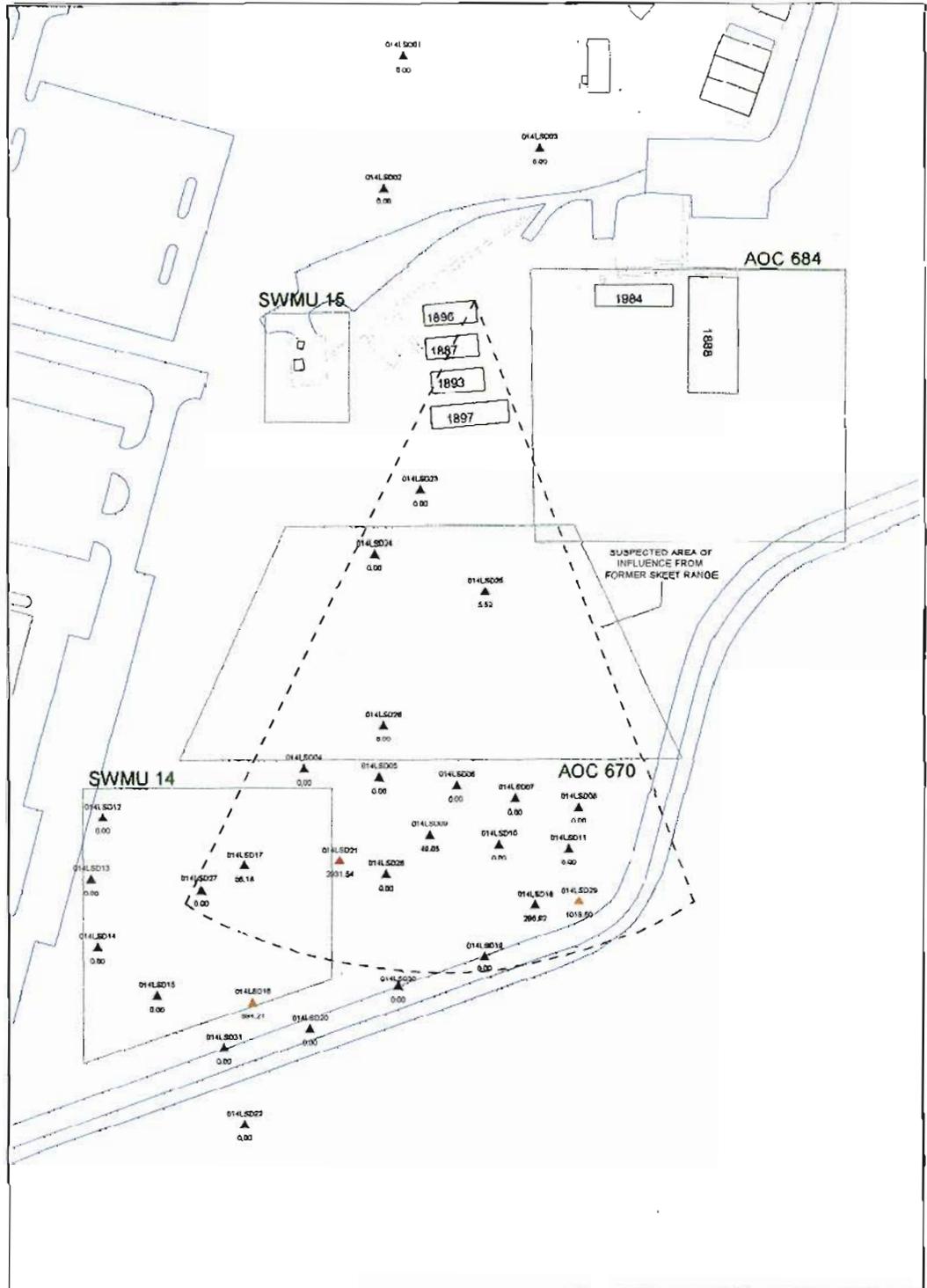
---

- 2 EnSafe, Inc. *Draft Zone H Combined SWMU 14 Corrective Measures Study Report, Charleston*  
3 *Naval Complex, N. Charleston, SC.* October 1999.
- 4 EnSafe, Inc. *RCRA Facility Investigation Report, Zone H, Charleston Naval Complex, N.*  
5 *Charleston, SC.* July 1996.
- 6 SPORTENVDETHASN (Navy Detachment (DET). *Completion Report, Interim Remedial*  
7 *Measure for SWMU 14, NAVBASE Charleston.* August 1998.
- 8 U.S. Environmental Protection Agency (EPA). *Environmental Services Division Standard*  
9 *Operating Procedures and Quality Assurance Manual (ESDSOPQAM).* 1996.

APPENDIX A

**Figure 2.10, Draft Zone H Combined SWMU 14**  
**(EnSafe, 1999)**

---



**LEGEND**

LEAD SHOT CONTAMINATION  
(mg lead particulate per kg soil)

- ▲ X < 400
- ▲ 400 < X < 1300 (Above USEPA Residential Cleanup Standards)
- ▲ X > 1300 (Above USEPA Industrial Cleanup Standards)

- BUILDING BOUNDARY
- FENCE
- ROAD
- SIDE-WALKS



COMBINED SWMU 14  
CMS REPORT  
CHARLESTON NAVAL COMPLEX  
Charleston, SC

0 100 Feet

Figure 2.10  
Lead Shot Distribution

APPENDIX B

**Selected Figures from DET IM Report (1998)**

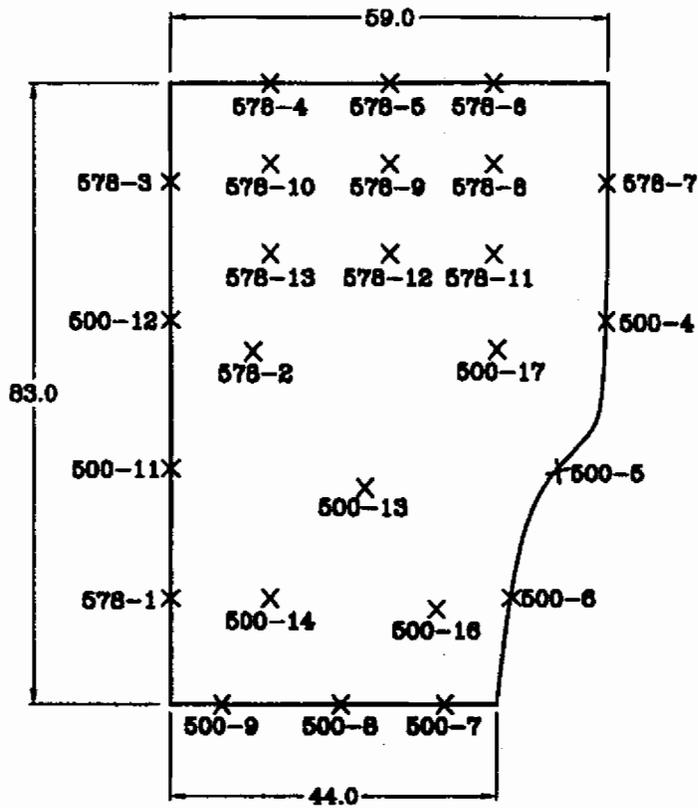
TABLE 1  
RFI ANOMALY EXCAVATION RESULTS

<b>ANOMALY #</b>	<b>ITEM EXCAVATED</b>	<b>DEPTH</b>
ANOMALY 1	2' rebar	6 inches
ANOMALY 2	rebar	6 inches
ANOMALY 3	rebar	6 inches
ANOMALY 4	rebar	6 inches
ANOMALY 5	2 ½' rebar	2 foot
ANOMALY 6	Wire, welding rods, & tie down straps	1 foot
ANOMALY 7	2' rebar	6 inches
ANOMALY 8	Metal strapping	6 inches
ANOMALY 9	2 pieces of rebar	1 foot
ANOMALY 10	2 pieces of rebar	1 foot
ANOMALY 11	Cement footing & metal fence post	6 inches
ANOMALY 12	Rebar & miscellaneous metal	1 ½ foot
ANOMALY 13	3 pieces of rebar	1 foot
ANOMALY 14	Cement footing & metal fence post	6 inches
ANOMALY 15	Rust colored soil	2 foot
ANOMALY 16	Cement footing & metal fence post	6 inches
ANOMALY 17	wire	1 foot
ANOMALY 18	Skeet/trap house concrete foundation	4 foot
ANOMALY 19	4 ½' channel steel	1 foot
ANOMALY 20	4' channel steel	1 foot
ANOMALY 21	Rebar rectangular shape	6 inches
ANOMALY 22	Miscellaneous scrap metal	1 ½ foot
ANOMALY 23	Metal grill & 10" eyebeam	2 foot
ANOMALY 24	10 ft x 2 ½ ft ½" metal plate	5 foot

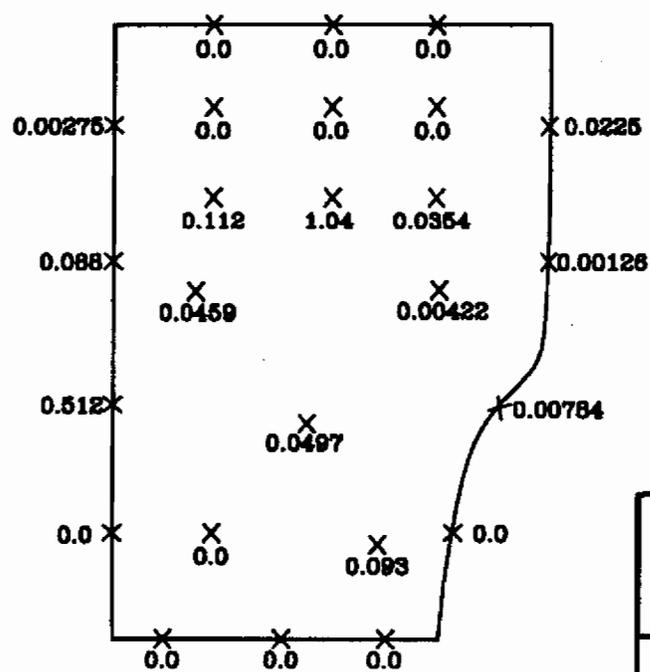
<b>ANOMALY #</b>	<b>ITEM EXCAVATED</b>	<b>DEPTH</b>
ANOMALY 25	3 pieces of rebar & 3 cement footings with pipe	1 foot
ANOMALY 26	1 ½' square pipe & rebar	2 foot
ANOMALY 27	2 pieces of rebar, 1 horseshoe, 4 boards with nails, & a tent stake	1 ½ foot
ANOMALY 28	Rebar	1 foot
ANOMALY 29	10' of 4' pipe	1 foot
ANOMALY 30	3' of 1" OD pipe	1 ½ foot
ANOMALY 31	6' pipe	2 ½ foot
ANOMALY 32	1 each 12" & 2' pipe, nails, & miscellaneous scrap metal	3 foot
ANOMALY 33	6' , 2 ½', & 3 ½' of 1 ½" pipe, & sheet metal	2 foot
ANOMALY 34	2 cement footings with pipe & 1 12" rebar	1 foot

**TABLE 2**  
**DETACHMENT ANOMALY EXCAVATION RESULTS**

<b>ANOMALY #</b>	<b>ITEM EXCAVATED</b>	<b>DEPTH</b>
ANOMALY A	Wire rope	1 foot
ANOMALY B	3 pieces of rebar	2 foot
ANOMALY C	Nails	6 inches
ANOMALY D	2' metal tubing	6 inches
ANOMALY E	Miscellaneous scrap metal	6 inches
ANOMALY F	Channel steel	6 inches
ANOMALY G	Approximately 140 DANC containers	3 to 4 foot
ANOMALY H	Metal tubing	1 foot
ANOMALY I	Nails	6 inches
ANOMALY J	Rebar	1 foot
ANOMALY K	Wire	6 inches
ANOMALY L	4 pieces of rebar	1 foot
ANOMALY M	6 pieces of rebar	1 foot
ANOMALY N	5 pieces of rebar	1 foot
ANOMALY O	Rebar	6 inches
ANOMALY P	Rebar	1 foot
ANOMALY Q	Rebar & miscellaneous metal	6 inches
ANOMALY R	Rebar	6 inches
ANOMALY S	Rebar	6 inches
ANOMALY T	Miscellaneous scrap metal	6 inches
ANOMALY U	Wire	6 inches
ANOMALY V	Nails	6 inches
ANOMALY W	Rebar	1 foot
ANOMALY X	2 ½' pipe	3 foot
ANOMALY Y	Rebar	1 foot



SAMPLE ID SPORTO \_ \_ \_ \_



RESULTS OF  
1,1,2,2-TETRACHLOROETHANE (ppm)

**SPORTENVDETHASN**  
1899 North Hobson Ave.  
North Charleston, SC 29405-2106  
Ph. (803) 743-6777

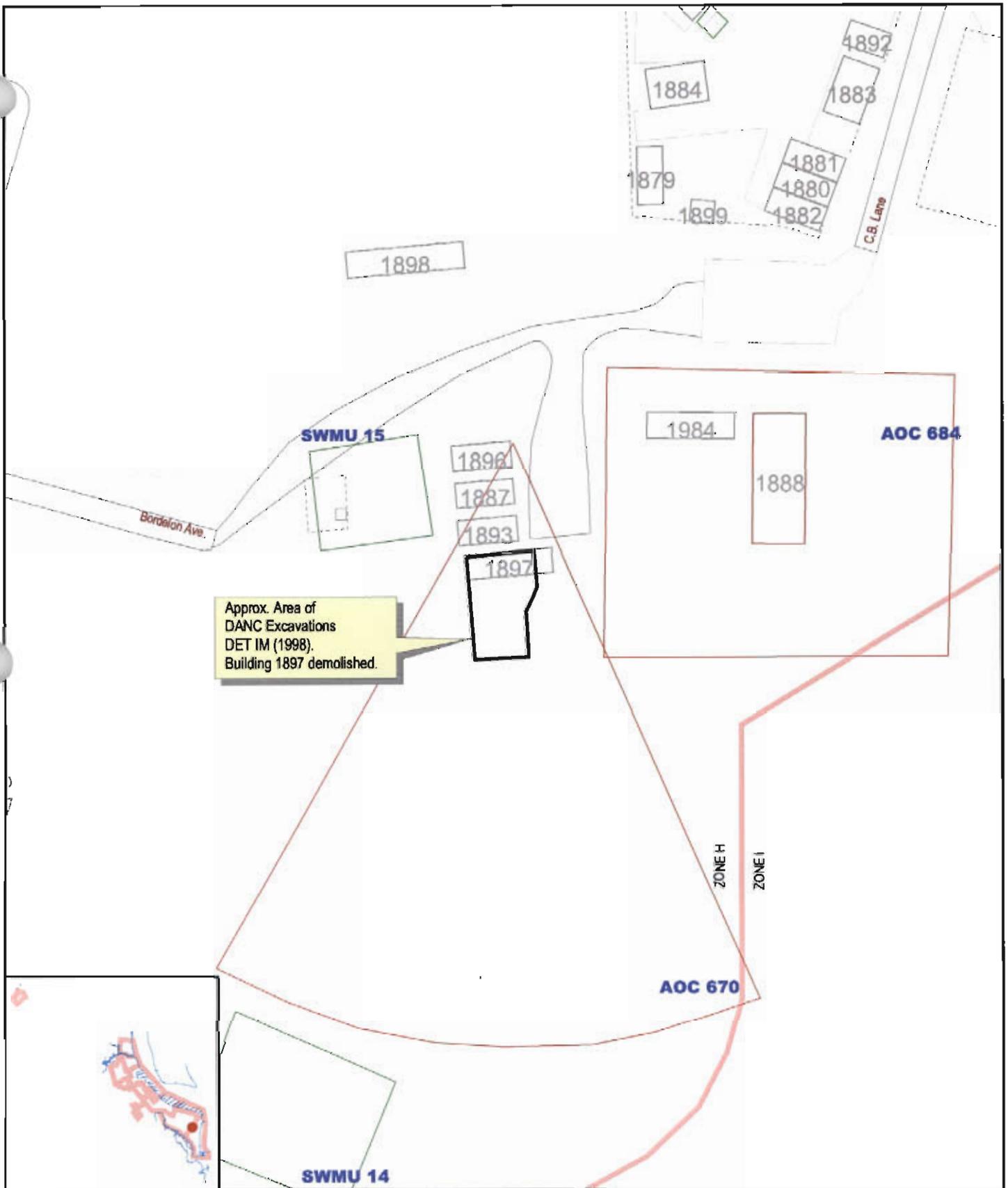
**Figure 4**  
**SWMU 14**  
**Confirmation Sample Location/Results**  
**Charleston Naval Base**  
**Charleston, SC**

DWG DATE: 4/13/98 DWG NAME: 14FIG4

APPENDIX C

**Figure C-1, DANC Excavation**

---



-  Approx. Extent of DANC Excavation Area
-  AOC Boundary
-  SWMU Boundary
-  Buildings
-  Zone Boundary

Note: Original figure produced in color.



**Figure C-1**  
 Location of DANC Excavation  
 Area, DET IM (1998)  
 Combined SWMU 14, Zone H  
 Charleston Naval Complex

