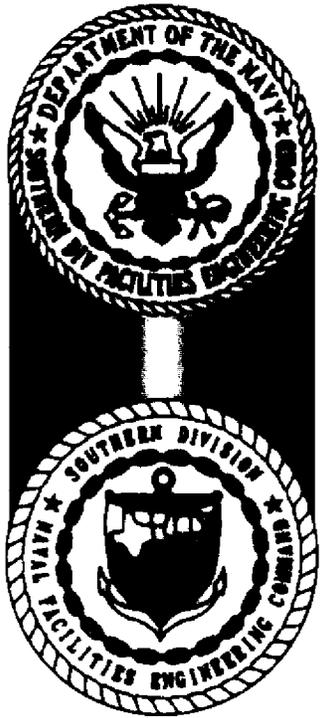


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CORRECTIVE MEASURES STUDY REPORT COMBINED SOLID WASTE MANAGEMENT
UNIT 83 (SWMU 83) ZONE E CNC CHARLESTON SC
12/23/2003
CH2M HILL

CORRECTIVE MEASURES STUDY REPORT

Combined SWMU 83, Zone E



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

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

CH2M Jones

December 2003

Contract N62467-99-C-0960

CH2MHILL TRANSMITTAL

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

From: Dean Williamson/CH2M-Jones

Date: Dec. 23, 2003

Re: Revision 2 pages for *CMS Report, Combined SWMU 83, Zone E, Revision 1* –
Submitted on June 30, 2003

We Are Sending You:

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2	Revision 2 pages for <i>CMS Report, Combined SWMU 83, Zone E, Revision 1</i> – Submitted on June 30, 2003

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**THE ATTACHED PAGES SHOULD BE INSERTED AS REPLACEMENTS IN THE
*CMS REPORT, COMBINED SWMU 83, ZONE E, REVISION 1 SUBMITTAL:***

- **REVISED COVER AND SPINE**
 - **REVISED INSIDE COVER**
 - **REVISION 2 CERTIFICATION PAGE**
 - **REVISED TABLE OF CONTENTS**
 - **REVISED SECTION 4.0 TEXT**
 - **REVISED FIGURE 4-1**
 - **REVISED SECTION 5.0 TEXT**
 - **NEW TABLE 5-1**
 - **REVISED TABLE 5-2**
 - **NEW APPENDIX A COST ESTIMATES**
-



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July 1, 2003

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

Re: CMS Report (Revision 1) – Combined SWMU 83, Zone E

Dear Mr. Scaturo:

Enclosed please find two copies of the CMS Report (Revision 1) for Combined SWMU 83 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 enclosed material are to be inserted into the Revision 0 binder as replacement pages, and additional appendix and front matter.

The principal author of this document is Sam Naik. Please contact him at 770/604-9182, ext. 255, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: Tim Frederick/Gannett Fleming, Inc., w/att
Dann Spariosu/USEPA, w/att
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January 24, 2003

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

Re: CMS Report (Revision 0) – Combined SWMU 83, Zone E

Dear Mr. Scaturo:

Enclosed please find two copies of the CMS Report (Revision 0) for Combined SWMU 83 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, ext. 255, if you have any questions or comments.

Sincerely,

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Gary Foster/CH2M HILL, w/att

CORRECTIVE MEASURES STUDY REPORT

Combined SWMU 83, Zone E



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

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

PREPARED BY
CH2M-Jones

December 2003

*Revision 2
Contract N62467-99-C-0960
158814.ZE.PR.20*

Certification Page for Corrective Measures Study Report (Revision 2) — Combined SWMU 83, Zone E

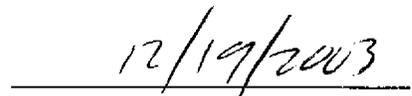
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

P.E. No. 21428



Dean Williamson, P.E.



Date

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1 **Acronyms and Abbreviations, Continued**

2	RCRA	Resource Conservation and Recovery Act
3	RDA	Redevelopment Authority
4	RFI	RCRA Facility Investigation
5	RGO	remedial goal option
6	SCDHEC	South Carolina Department of Health and Environmental Control
7	SVOC	semivolatile organic compound
8	SWMU	solid waste management unit
9	VOC	volatile organic compound
10	yd ³	cubic yard

1 Acronyms and Abbreviations

2	AOC	area of concern
3	AST	aboveground storage tank
4	BEQ	benzo[a]pyrene equivalent
5	BRAC	Base Realignment and Closure Act
6	CA	corrective action
7	CMS	corrective measures study
8	CNC	Charleston Naval Complex
9	COC	chemical of concern
10	COPC	chemical of potential concern
11	EnSafe	EnSafe, Inc.
12	EPA	U.S. Environmental Protection Agency
13	ft ²	square feet
14	ft bls	feet below land surface
15	HI	hazard index
16	ILCR	Incremental Lifetime Cancer Risk
17	µg/kg	micrograms per kilogram
18	LUC	land use control
19	LUCIP	land use control implementation plan
20	LUCMP	land use control management plan
21	MCL	maximum contaminant level
22	MCS	media cleanup standard
23	NAVBASE	Naval Base
24	PCB	polychlorinated biphenyl
25	PPE	personal protective equipment
26	RAO	remedial action objective

Section 1.0

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). In April
11 2000, CH2M-Jones was awarded a contract to provide environmental investigation and
12 remediation services at the CNC.

13 A RCRA Facility Investigation (RFI) Report Addendum and Corrective Measures Study
14 (CMS) Work Plan were prepared for Solid Waste Management Units (SWMU) 83, SWMU
15 84, and Area of Concern (AOC) 574 in Zone E of the CNC (CH2M-Jones, 2002). These sites
16 were previously investigated together due to their proximity to each other and have been
17 collectively referred to as Combined SWMU 83. The RFI Report Addendum and CMS Work
18 Plan presented the remedial action objectives (RAOs) and media cleanup standards (MCSs)
19 proposed for Combined SWMU 83. This CMS report has been prepared by CH2M-Jones to
20 complete the next stage of the CA process for Combined SWMU 83.

21 1.1 Corrective Measures Study Report Purpose and Scope

22 This CMS report evaluates corrective measure (remedial) alternatives for preventing
23 unacceptable exposure to contamination from benzo[a]pyrene equivalents (BEQs) found in
24 the soil at Combined SWMU 83. BEQs in surface soil are the only chemicals of concern
25 (COCs) identified at Combined SWMU 83 under the unrestricted (i.e., residential) and
26 industrial land use scenarios. Figure 1-1 illustrates the original location of Combined SWMU
27 83 within Zone E. Figure 1-2 is an aerial photograph showing the layout of Combined
28 SWMU 83.

29 This CMS report consists of: 1) the identification of a set of corrective measure alternatives
30 that are considered to be technically appropriate for addressing soil contaminated with

1 COCs; 2) an evaluation of the alternatives using standard criteria from U.S. Environmental
2 Protection Agency (EPA) RCRA guidance; and 3) the selection of a recommended
3 (preferred) corrective measure alternative for the site.

4 This focused CMS evaluates the options for meeting the RAOs, which are described in
5 Section 2.0 of this CMS report. The two remedies considered for achieving the RAOs are: 1)
6 soil excavation and offsite removal, and 2) land use controls (LUCs). The remedial activities
7 associated with soil removal include excavation, backfilling, (replacing) pavement, and
8 offsite disposal. The remedial activities that are associated with LUCs include maintaining
9 the existing site use (commercial/ industrial) and site controls (pavement/building), a LUC
10 Management Plan (LUCMP) agreement between the Navy and the State of South Carolina,
11 and long-term monitoring and review.

12 **1.2 Background Information**

13 This section of the CMS report presents background information on the facility, site history,
14 and a summary of the nature and extent of the COCs at the site. This information is
15 important to the understanding of the remedial goal options (RGOs), MCSs, and ultimately
16 the evaluation of corrective measure alternatives for Combined SWMU 83. Additional
17 information on the site and hydrogeology in the Zone E area of the CNC is provided in the
18 *Zone E RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1997).

19 **1.2.1 Facility Description**

20 SWMU 83 is part of Building 9, which was originally a foundry. Building 9 is a cross-shaped
21 structure with four wings, and SWMU 83 encompasses the southern wing of this building.
22 The foundry was built in 1906 and was used to cast metal parts in refitting ships. The
23 primary industrial process associated with this facility was melting and casting copper alloy
24 parts. The foundry operations have been discontinued since at least 1991, and at the time the
25 RFI was conducted (1995-1997), the building contained electrical power supply equipment,
26 capacitors, transformers, rectifiers, furnaces, and ovens.

27 The building is currently being used as a storage warehouse by Detyens Shipyard, Inc.
28 Paints are temporarily stored in the east wing and a variety of old machines and equipment
29 are stored in the rest of wings. Old equipment and scrap metal was observed in the areas
30 outside the building during a site walk-through conducted by CH2M-Jones during February
31 2002.

1 SWMU 84 consists of an outside area to the west of Building 9. This area was formerly used
2 to store lead blankets and shielding. The majority of the lead was encased in either rubber or
3 fabric; however, uncovered lead materials are also reported to have been stored here. The
4 lead-containing materials were placed either on pallets or directly on the concrete
5 pavement. No containment structures were associated with this unit. No information was
6 found during the RFI regarding the period of operation.

7 AOC 574 is the former site of a 3,700-gallon aboveground storage tank (AST) at the
8 southeast corner of Building 9. The fuel tank, which has been removed, contained #2 fuel oil
9 for the furnaces and torches in Building 9. The tank was located in an unpaved area and had
10 no secondary containment. No information was found during the RFI regarding the period
11 of operation. According to the *Interim Measure Completion Report* for AOC 574 prepared by
12 the Navy Environmental Detachment (DET, 1996), two other ASTs were also located in this
13 area. One was a 250-gallon waste oil tank and the second was a 586-gallon #2 fuel oil tank.
14 The fuel oil tanks were removed by the DET during 1996, and the waste oil tank was
15 removed by the DET sometime between 1993 and 1996.

16 A review of historical engineering drawings for this site shows that railroad lines were
17 installed between 1929 and 1935 adjacent to and across Combined SWMU 83. Portions of
18 these railroad lines still remain at the site.

19 Materials of concern identified in the *Zone E RFI Work Plan, Revision 1* (EnSafe/Allen &
20 Hoshall, 1995) for the Combined SWMU 83 site were lead, paints, solvents, friable asbestos,
21 dielectric fluid, and petroleum hydrocarbons.

22 SWMU 83 is located inside Building 9, which has concrete paved floors. SWMU 84 and AOC
23 574 are located in a largely unpaved area. This area of Zone E is zoned M-2 (marine
24 industrial use). The CNC RCRA Permit identified the Combined SWMU 83 site as requiring
25 an RFI.

26 Regulatory review was conducted on the *Zone E RFI Report, Revision 0* (EnSafe, 1997), and a
27 draft responses to the comments from SCDHEC were prepared by the Navy/EnSafe team.
28 The RFI Report Addendum, prepared by CH2M-Jones, identified BEQs as COCs in surface
29 soil at Combined SWMU 83. Detailed information on the analytical results and the screening
30 of those results for the determination of COCs can be found in the *Zone E RFI Report,*
31 *Revision 0*, and the *RFI Report Addendum and CMS Work Plan for Combined SWMU 83, Zone E,*
32 *Revision 0* (CH2M-Jones, 2002).

1 1.2.2 Soil COC Summary

2 Soil sampling was conducted during two events under the initial RFI. During the first
3 sampling event, 19 surface and subsurface soil samples were collected and analyzed for
4 volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides,
5 polychlorinated biphenyls (PCBs), metals, and cyanide. The second sampling event was
6 conducted based on exceedances of detected concentrations of some site constituents above
7 screening criteria during the first sampling event. The screening criteria used during the
8 initial RFI to compare the detections in surface soil were the EPA Region III industrial RBCs,
9 and additionally, for inorganics, the Zone E surface soil background reference
10 concentrations (BRCs). Subsurface soil detections were compared with generic SSLs (with a
11 DAF=10), and additionally, for inorganics, the Zone E subsurface soil BRCs. The second
12 sampling event included sampling at eight locations, and the surface and subsurface soil
13 samples were analyzed for VOCs and SVOCs. One surface soil duplicate sample was
14 analyzed for the extended list of SVOCs, pesticides, metals, and cyanide.

15 Based on an evaluation of the data collected during the RFI, antimony, copper, lead, and
16 BEQs in soils required further delineation to complete the RFI. CH2M-Jones conducted
17 additional soil sampling at Combined SWMU 83 during November 2001. Figure 1-3 shows
18 the RFI and supplemental November 2001 soil sampling locations. The analytical results
19 from these investigations and chemical of potential concern (COPC) screening were
20 presented in *RFI Report Addendum and CMS Work Plan for Combined SWMU 83, Revision 0*
21 (CH2M-Jones, 2002). Appendix B includes a copy of Tables 5-1, 5-2, and 5-3 from the RFI
22 Report Addendum and CMS Work Plan. These tables show the detected concentrations of
23 COPCs and the exceedances of COPC screening criteria.

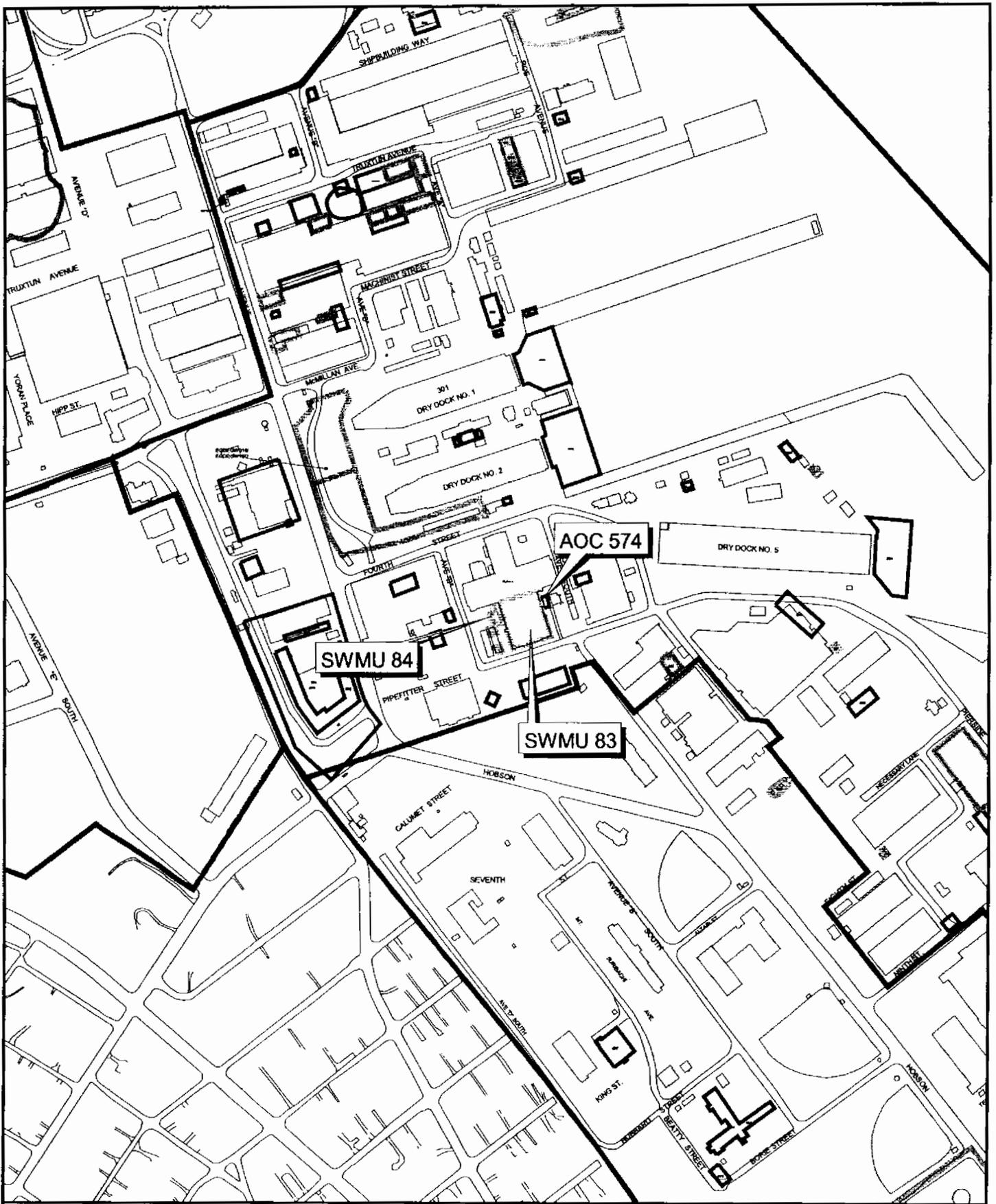
24 The RFI Report Addendum identified BEQs in surface soil as the only COC for this site. No
25 COCs were identified in subsurface soil or in any other media. Figure 1-4 shows locations
26 where BEQ concentrations exceed the BEQ screening criteria.

27 1.3 Report Organization

28 This CMS report consists of the following sections, including this introductory section:

29 **1.0 Introduction** — Presents the purpose of and background information relating to this
30 CMS report.

- 1 **2.0 Remedial Goal Options and Proposed Media Cleanup Standards** — Defines the RGOs
2 and proposed MCSs for Combined SWMU 83, in addition to the criteria used in evaluating
3 the corrective measure alternatives for the site.
- 4 **3.0 Overall Approach for Evaluating Focused Alternatives for Combined SWMU 83** —
5 Describes the alternative development process and presents the detailed evaluation criteria.
- 6 **4.0 Description of Candidate Corrective Measure Alternatives** — Describes each of the
7 candidate corrective measure alternatives for addressing BEQs in soil.
- 8 **5.0 Evaluation and Comparison of Corrective Measure Alternatives** — Evaluates each
9 alternative relative to standard criteria, then compares the alternatives and the degree to
10 which they meet or achieve the evaluation criteria.
- 11 **6.0 Recommended Corrective Measure Alternative** — Describes the preferred corrective
12 measure alternative to achieve the MCS and RGOs for BEQs in soil based on a comparison
13 of the alternatives.
- 14 **7.0 References** — Lists the references used in this document.
- 15 **Appendix A** contains cost estimates developed for the proposed corrective measure
16 alternatives.
- 17 **Appendix B** contains copies of Tables 5-1, 5-2, and 5-3 from the RFIRA/CMSWP for
18 Combined SWMU 83.
- 19 **Appendix C** contains CH2M-Jones' responses to EPA comments on the CMS Report,
20 Combined SWMU 83, Zone E, Revision 0 (CH2M-Jones, 2003).
- 21 All tables and figures appear at the end of their respective sections.



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

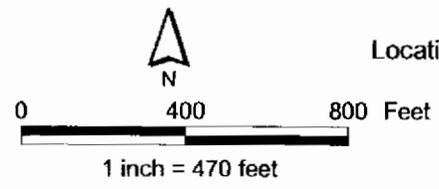
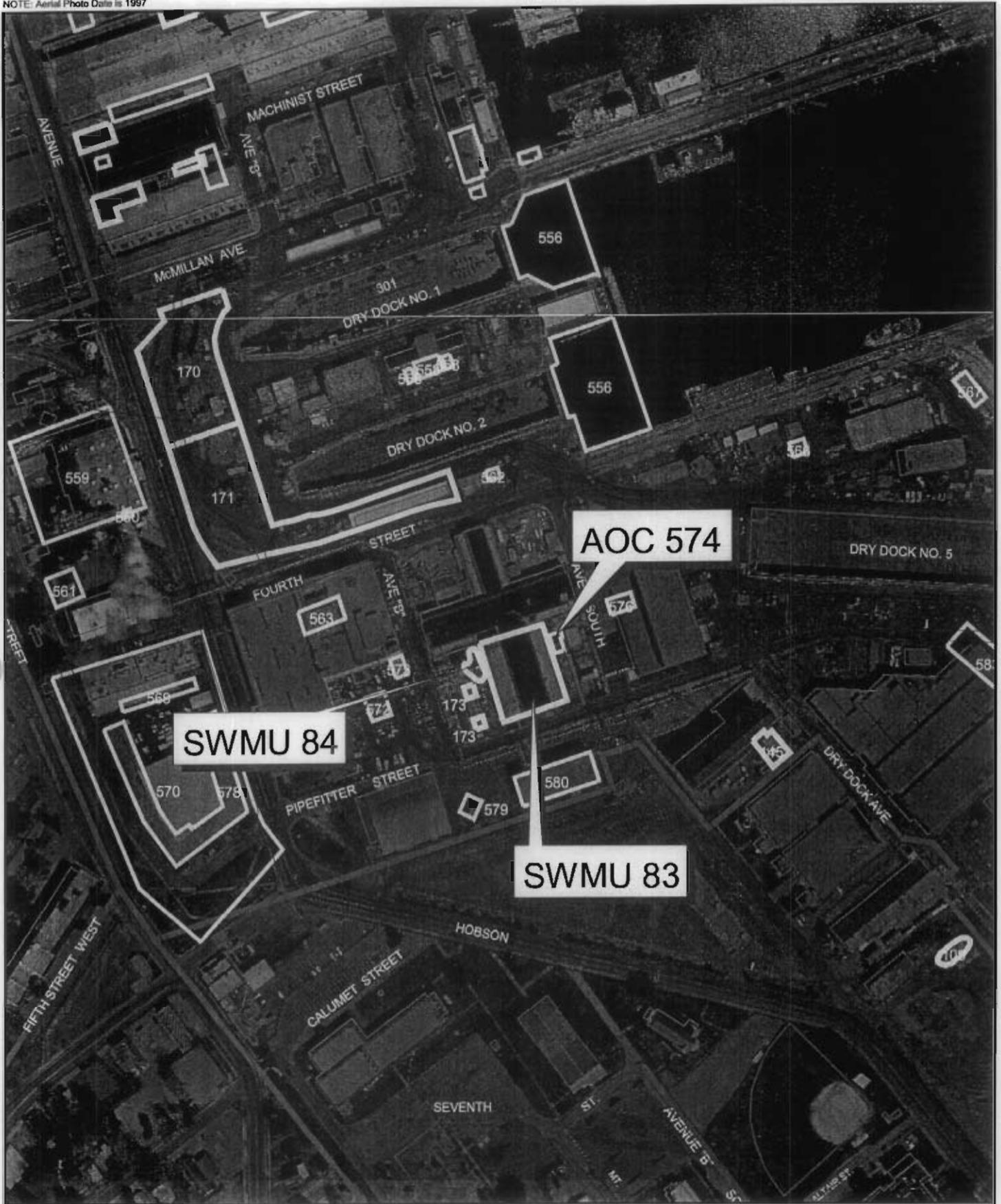


Figure 1-1
 Location of Combined SWMU 83 in Zone E
 Charleston Naval Complex

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



SWMU 84

AOC 574

SWMU 83

- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary

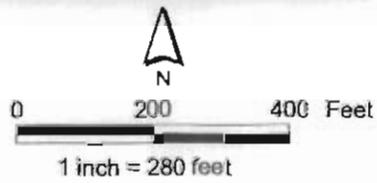
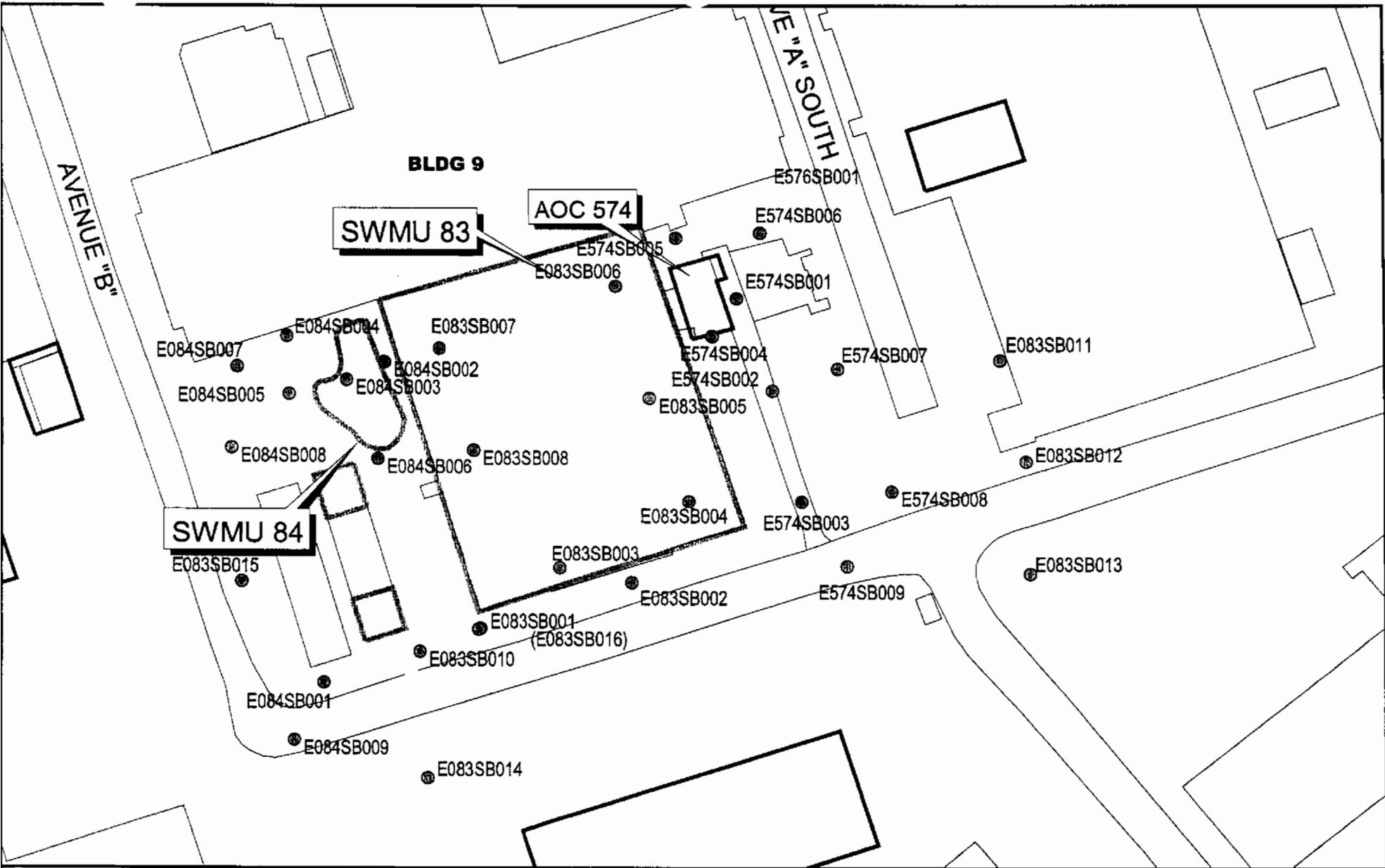


Figure 1-2
Site Location of Combined SWMU 83
Zone E
Charleston Naval Complex



- Soil Sampling Location
- ∧ Roads
- Buildings
- ▭ AOC Boundary
- ▭ SWMU Boundary

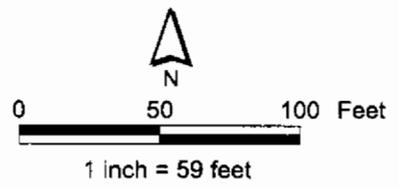
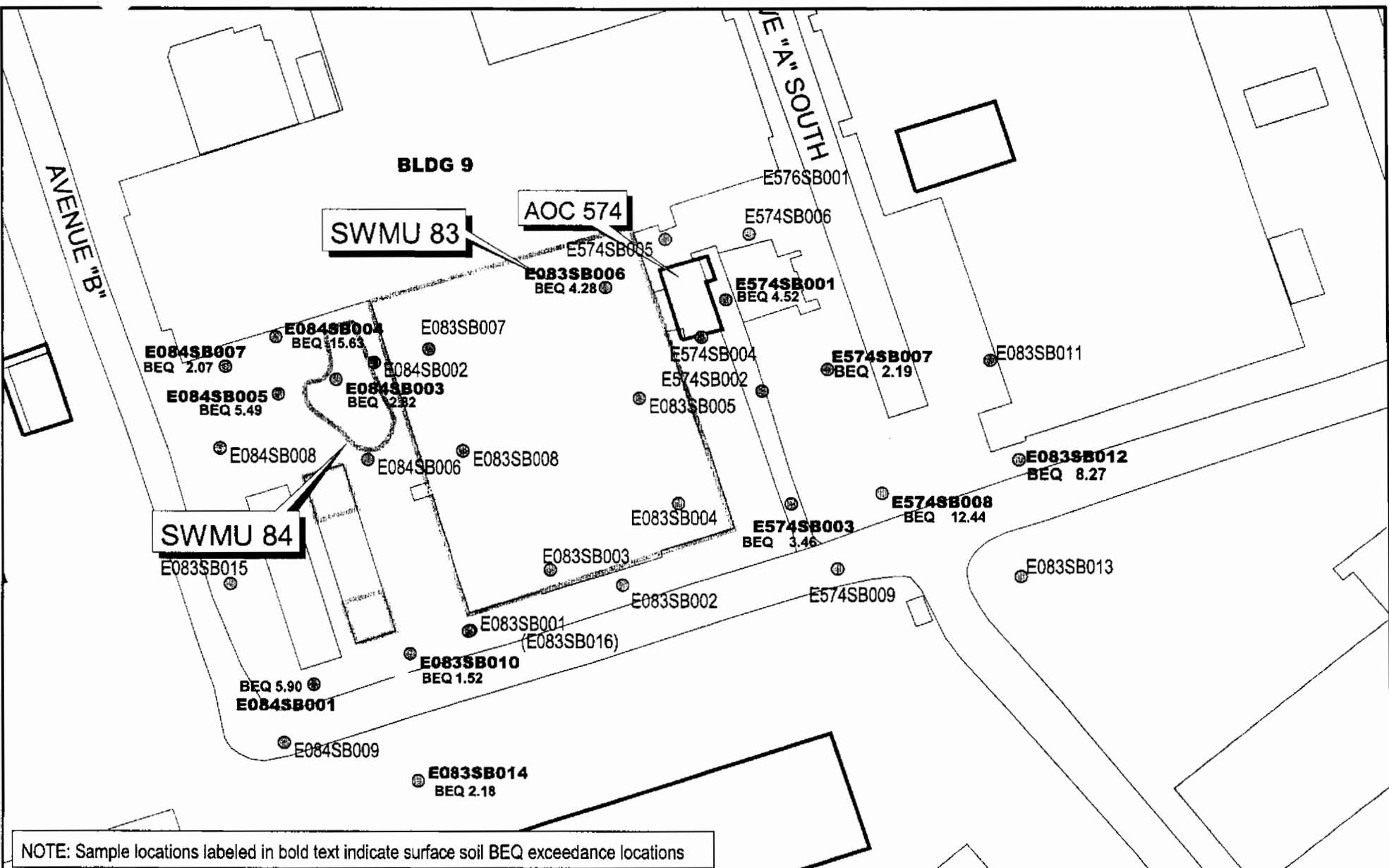


Figure 1-3
RFI and November 2001 Soil Sampling Locations
Combined SWMU 83, Zone E
Charleston Naval Complex



- ⊙ Surface Soil Sampling Locations
- ∧ Roads
- ▭ Buildings
- ▭ AOC Boundary
- ▭ SWMU Boundary

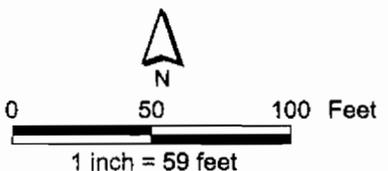


Figure 1-4
Surface Soil BEQ Exceedance Locations
Combined SWMU 83, Zone E
Charleston Naval Complex

Section 2.0

2.0 Remedial Goal Options and Proposed Media Cleanup Standards

RGOs and MCSs are typically developed at the end of the risk assessment in the RFI. RGOs can be based on a variety of criteria, such as drinking water maximum contaminant levels (MCLs), specific incremental lifetime cancer risk (ILCR) target levels (e.g., 1E-04, 1E-05, or 1E-06), target Hazard Index (HI) levels (e.g., 0.1, 1.0, 3.0), or site background concentrations. When area background concentrations are higher than the health protection-based concentrations, the background levels are the target MCSs. Achieving these goals should protect human health and the environment, while achieving compliance with applicable state and federal standards.

2.1 Remedial Action Objectives

RAOs are medium-specific goals that protect human health and the environment by preventing or reducing exposures under current and future land use conditions. In the *RFI Report Addendum and CMS Work Plan for Combined SWMU 83, Revision 0* (CH2M-Jones, 2002), the RAO for surface soil is to prevent human ingestion and direct/dermal contact with soil containing COCs at unacceptable levels.

2.2 Media Cleanup Standards

MCSs for Combined SWMU 83 were presented in the *RFI Report Addendum and CMS Work Plan*. The CNC BEQ sitewide reference concentration of 1,304 micrograms per kilogram ($\mu\text{g}/\text{kg}$) developed by the BCT was recommended in the *CMS Work Plan for Combined SWMU 83* as the MCS for BEQs in surface soil.

The MCS will be met if the site statistical estimates of concentrations are similar to background statistical estimates. For point comparisons between site and background, concentration ranges of the site may be compared with the ranges of background concentrations. Other potential RGOs, such as the 1E-06 ILCR level, were considered but regarded as not applicable because the site background concentrations of BEQs are significantly greater than this level. The background levels of these chemicals preclude the use of this area for future unrestricted (i.e., residential) land use.

- 1 The focus of this CMS is to evaluate alternatives that will achieve the RAOs described
- 2 above. The corrective measure alternatives evaluated include:
 - 3 1) Soil removal and offsite disposal with LUCs, and
 - 4 2) LUCs
- 5 These alternatives are discussed in Section 4.0 of this CMS report.

1 **3.0 Overall Approach for Evaluating Focused** 2 **Alternatives for Combined SWMU 83**

3 **3.1 Preferred Remedies**

4 A variety of corrective measure approaches are conceptually feasible for addressing BEQs in
5 soil at Combined SWMU 83. However, remedy selection at the CNC has focused on a few
6 demonstrated technologies. For contaminants in soil that are limited in area, the preferred
7 technologies that are expected to be effective at the CNC include: 1) soil excavation and
8 offsite disposal, and 2) LUCs. Generally, at sites with limited soil contamination, a
9 preference exists for implementing one of these remedies to expedite the remedy selection
10 and implementation processes, improve predictability of the remedy, and lower costs. These
11 candidate alternatives are screened and evaluated using the conventional criteria presented
12 below.

13 In this focused CMS, these two alternatives will be described (in Section 4.0), evaluated in
14 detail (in Section 5.0), and one alternative will be proposed as a recommended alternative
15 (in Section 6.0).

16 **3.2 Evaluation Criteria**

17 According to the EPA RCRA CA guidance, corrective measure alternatives should be
18 evaluated using the following five criteria:

- 19 1. Protection of human health and the environment
- 20 2. Attainment of MCSs
- 21 3. The control of the source of releases to minimize future releases that may pose a threat
22 to human health and the environment
- 23 4. Compliance with applicable standards for the management of wastes generated by
24 remedial activities
- 25 5. Other factors, including (a) long-term reliability and effectiveness; (b) reduction in
26 toxicity, mobility, or volume of wastes; (c) short-term effectiveness; (d)
27 implementability; and (e) cost

28 Each of these criteria is defined in more detail below:

- 1 **1. Protection of human health and the environment.** The alternatives will be evaluated on
2 the basis of their ability to protect human health and the environment. The ability of an
3 alternative to achieve this criterion may or may not be independent of its ability to
4 achieve the other criteria. For example, an alternative may be protective of human
5 health, but may not be able to attain the MCSs if the MCSs were not developed based on
6 human health protection factors.
- 7 **2. Attainment of MCSs.** The alternatives will be evaluated on the basis of their ability to
8 achieve the MCS defined in this CMS. Another aspect of this criterion is the time frame
9 required to achieve the MCS. Estimates of the time frame for the alternatives to achieve
10 RGOs will be provided.
- 11 **3. The control of the source of releases.** This criterion deals with the control of releases of
12 contamination from the source (the area in which the contamination originated) and the
13 prevention of future migration to uncontaminated areas.
- 14 **4. Compliance with applicable standards for management of wastes.** This criterion deals
15 with the management of wastes derived from implementing the alternatives (i.e.,
16 treatment or disposal of contaminated soil removed from excavations). Corrective
17 measure alternatives will be designed to comply with all standards for management of
18 wastes. Consequently, this criterion will not be explicitly included in the detailed
19 evaluation presented in the CMS, but such compliance would be incorporated into the
20 cost estimates for which this criterion is relevant.
- 21 **5. Other factors.** Five other factors are to be considered if an alternative is found to meet
22 the four criteria described above. These other factors are as follows:
 - 23 a. Long-term reliability and effectiveness
24 Corrective measure alternatives will be evaluated on the basis of their reliability and
25 the potential impact should the alternative fail. In other words, a qualitative
26 assessment will be made as to the chance of the alternative's failing and the
27 consequences of that failure.
 - 28 b. Reduction in the toxicity, mobility, or volume of wastes
29 Alternatives with technologies that reduce the toxicity, mobility, or volume of the
30 contamination will be generally favored over those that do not. Consequently, a
31 qualitative assessment of this factor will be performed for each alternative.
 - 32 c. Short-term effectiveness

1 Alternatives will be evaluated on the basis of the risk they create during the
2 implementation of the remedy. Factors that may be considered include fire,
3 explosion, and exposure of workers to hazardous substances.

4 d. Implementability

5 The alternatives will be evaluated for their implementability by considering any
6 difficulties associated with conducting the alternatives (such as the construction
7 disturbances they may create), operation of the alternatives, and the availability of
8 equipment and resources to implement the technologies comprising the alternatives.

9 e. Cost

10 A net present value of each alternative will be developed. These cost estimates will
11 be used for the relative evaluation of the alternatives, not to bid or budget the work.
12 The estimates will be based on information available at the time of the CMS and on a
13 conceptual design of the alternative. They will be "order-of-magnitude" estimates
14 with a generally expected accuracy of -50 percent to +100 percent for the scope of
15 action described for each alternative. The estimates will be categorized into capital
16 costs and operations and maintenance costs for each alternative.

4.0 Description of Candidate Corrective Measure Alternatives

4.1 General Description of Alternatives

Two candidate corrective measure alternatives were selected for this site:

- Alternative 1: Soil Excavation and Offsite Disposal with LUCs
- Alternative 2: LUCs

The implementation of Alternative 1 would involve the removal of soil at three large excavation areas encompassing 13 locations where surface soil BEQ concentrations exceed the MCS, as shown in Figure 4-1.

With the exception of four sampling locations, E084SB004, E084SB007, E083SB012, E574SB012, all other sampled areas at the site are under asphalt and concrete pavement. Removal and replacement of the pavement would be required to complete the soil removal. The sample location E084SB004 is adjacent to a large Sugarberry (*celtus laevigata*) tree that will have to be removed in order for excavation to be conducted safely at this location. This tree is approximately 60 feet high, and is probably 30 to 40 years old, judging from its size. In addition, due to the long period of existence and operation of Building 9, a considerable number of buried utilities are likely to be encountered during the soil excavation. These utilities will need to be restored if they are affected by the soil removal operations. The open areas outside Building 9 are currently used to store scrap metal, old equipment, and machine parts. These equipment and materials will also need to be moved prior to excavation.

The estimated soil area necessary for removal to achieve the MCS for Alternative 1 is shown in Figure 4-1. A 30-percent scope contingency is also assumed and included in the cost for this alternative.

Additionally, because Combined SWMU 83 is located within Zone E of the CNC, LUCs will be applied to this site even after excavation and removal of the BEQ-impacted soil. Thus, LUCs (as described below) will also be an integral part of the remedy for this site, even after the soil excavation.

1 For Alternative 2, it is assumed that the LUCs will include the following administrative
2 controls:

- 3 • Restrictions limiting the property land use to non-residential activities.
- 4 • Restrictions to maintain the extent of paved area, unless a demonstration is made that
5 changing a currently paved area to unpaved status will not cause one of the RAOs to not
6 be met.

7 The sections below describe each alternative in detail.

8 **4.2 Alternative 1: Soil Excavation and Offsite Disposal with** 9 **Land Use Controls**

10 **4.2.1 Description of Alternative**

11 This alternative will remove contaminated soil in areas that exceed the MCS established in
12 Section 2.0. Exceedance locations will involve soil removal in the areas shown in Figure 4-1.
13 It is assumed that asphalt and concrete pavement would be removed to access surface soil
14 exceeding the MCS and then be replaced.

15 Excavated soil would be transported to a permitted landfill facility for long-term disposal,
16 and the excavation would be filled with clean fill from an offsite borrow source. Once the
17 soil is removed, the site would be acceptable for unrestricted land use, with no long-term
18 monitoring required. However, because the site is located in Zone E, there will continue to
19 be LUCs that apply to the entire zone. These LUCs are expected to include restrictions of the
20 property to non-residential activities.

21 The proposed excavation area involves removal of soil from three areas encompassing 13
22 sampling locations, with 9 sampling locations under asphalt and concrete pavement and
23 four sampling locations in an unpaved area.

24 The large Sugarberry tree adjacent to the exceedance location E084SB004 will have to be
25 removed in order to conduct the excavation in this area safely. This will require the services
26 of a tree-removal subcontractor to prune the branches, cut the trunk, and transport the logs
27 and chips offsite.

28 The total extent of the three excavation areas is approximately 24,905 square feet (ft²), as
29 calculated by the CNC Environmental Geographic Information System (EGIS) tool. The
30 removal and replacement of the asphalt or concrete pavement will be required to access the
31 soil proposed for removal. For an assumed average depth of soil excavation of 1 ft below
32 land surface (bls), the total in-place volume of soil to be removed from the three areas is
33 about 923 cubic yards (yd³). Approximately 1-ft thick pavement structure will be excavated

1 over an estimated area of 23,105 ft², with an estimated volume of pavement material of 855
2 yd³. Confirmation sampling would involve five samples (four sidewall samples and one
3 floor sample) in each excavation area. An equal amount of clean backfill will be required to
4 replace the volume of soil removed from the excavated area and of concrete and bituminous
5 asphalt to replace the volume of pavement removed from these areas.

6 **4.2.2 Other Considerations**

7 Coordination with the CNC Redevelopment Authority (RDA) and the utility companies
8 would be required for site restrictions during excavation, and traffic control is needed for
9 the haul trucks. The potential for expansion of scope during confirmation testing is
10 moderate. Due to the potential of unknown buried utilities associated with Building 9,
11 which was constructed in 1906, there is a significant potential for the excavations to be
12 expanded in order to remove/replace utilities impacted by the excavation. Thus, a 40-
13 percent contingency is assumed.

14 **4.3 Alternative 2: Land Use Controls**

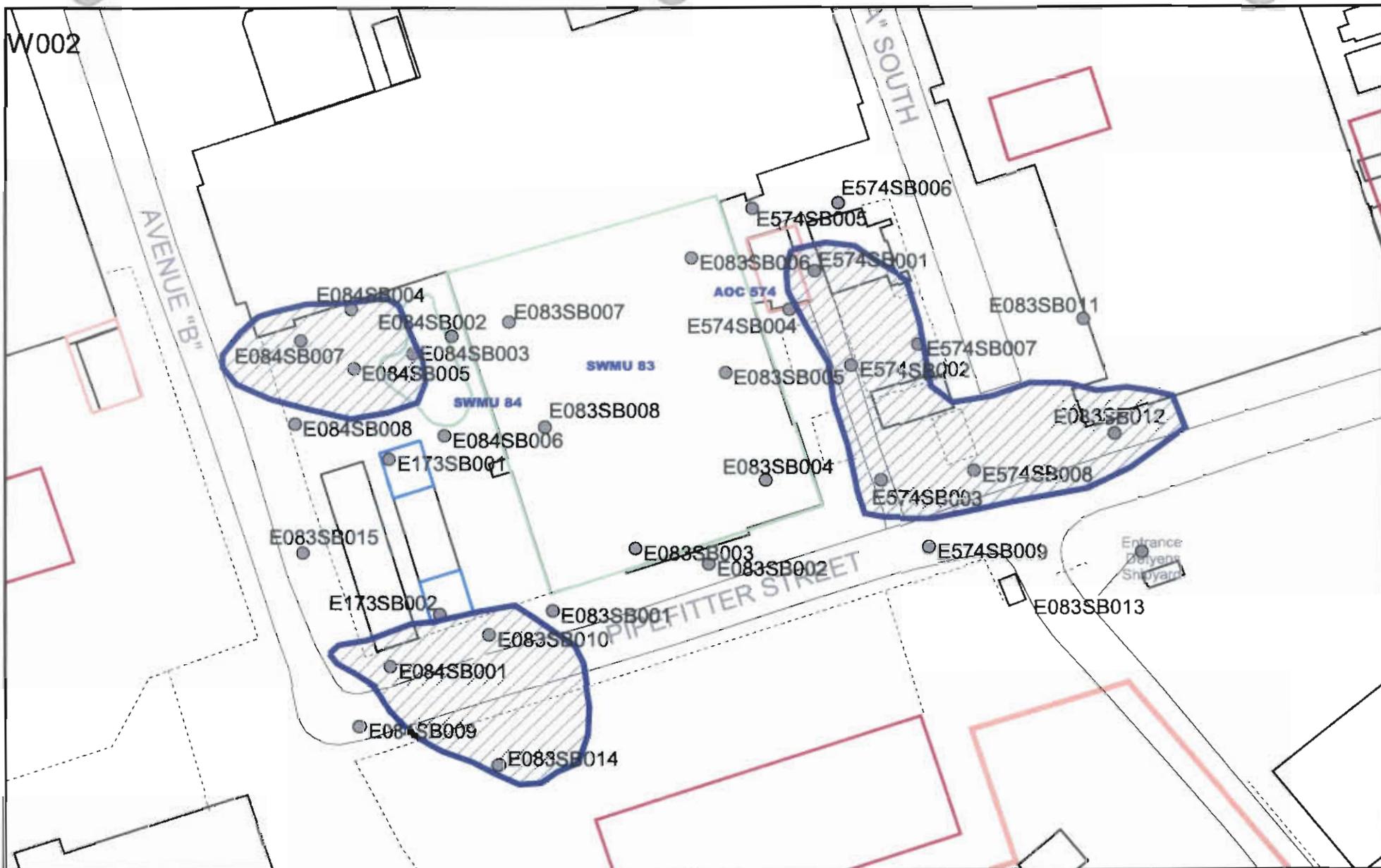
15 **4.3.1 Description of Alternative**

16 This alternative involves leaving the contaminated soil (and co-located overlying pavement)
17 in place and instituting administrative/legal controls to restrict future use of the land. The
18 controls would limit land use to activities that present less frequent exposure by sensitive
19 populations to surface soil and preclude uncontrolled disturbance of the contaminated soil,
20 thus minimizing the potential for human exposure to the contamination. The addition of
21 restrictions on soil disturbance and site occupancy would minimize potential for human
22 exposure that could occur in a residential or industrial setting. The controls may be in the
23 form of deed restrictions and/or easements (property interests retained by the Navy during
24 property transfer to assure protectiveness of the remedy). Periodic monitoring would be
25 required to assure controls are maintained; periodic site inspections would be required to
26 assure compliance with the institutional controls. Controls may be layered (multiple
27 controls at the same time) to enhance protectiveness. The Navy is negotiating a
28 comprehensive Land Use Control Implementation Plan (LUCIP) for the CNC.

29 **4.3.2 Other Considerations**

30 Currently, the Navy is the property owner and land use in Zone E in the CNC is restricted
31 to non-residential. Existing engineering controls include pavement and structures that
32 prevent or limit access to contaminated soil. The location and proximity of the site to other
33 industrial properties make residential use highly unlikely, and the substantial dock

- 1 structures hinder access to the soil by commercial/industrial users. Periodic monitoring of
- 2 the deed controls and the site would be required. For the purpose of developing a
- 3 representative cost estimate for this process, an annual evaluation that would include a site
- 4 inspection is assumed.



- Soil Boring Locations
- Excavation Areas
- ∩ Roads
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary

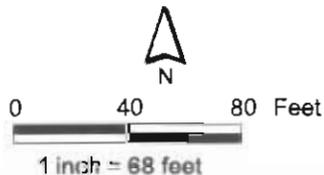


Figure 4-1
 Locations of Excavation Areas - CMS Alternative 1
 Combined SWMU 83, Zone E
 Charleston Naval Complex

5.0 Evaluation and Comparison of Corrective Measure Alternatives

The corrective measure alternatives were evaluated relative to the criteria previously described in Section 2.0 and then subjected to a comparative evaluation. A cost estimate for each alternative was also developed; the assumptions and unit costs used for these estimates are included in Appendix A.

5.1 Alternative 1: Soil Excavation and Offsite Disposal with Land Use Controls

The following assumptions were made for Alternative 1:

- Three large areas would be targeted for soil excavation, as shown in Figure 4-1.
- A total of 923 yd³ of soil (in-place measurement) would be excavated for offsite disposal at a Subtitle D facility and replaced with clean backfill.
- Approximately 23,105 ft² of pavement would be removed and replaced with an approximate volume of 1,112 yd³.
- Excavations would include known exceedances plus extrapolated areas to account for uncertainty.
- Confirmation testing will validate that the extent of contaminated soil is limited to that shown in Figure 4-1, plus a maximum contingency of 30 percent to account for unknown buried utilities which may need to be removed and replaced in order to complete the excavations.
- A large Sugarberry tree adjacent to E084SB004 will have to be removed in order to conduct excavation of soils at this location.

5.1.1 Protection of Human Health and the Environment

This alternative is effective at protecting human health and the environment because it removes soil with BEQ concentrations that exceed the MCS from the site. The replacement soil will have concentrations of BEQs below the MCS.

5.1.2 Attain MCS

This alternative will permanently remove soil with BEQ concentrations that exceed the MCS. The MCS will be achieved at the completion of soil removal actions.

1 **5.1.8 Other Factors (d) Implementability**

2 This alternative will be moderately difficult to implement. Most of the required activities
3 have been implemented at other sites using standard equipment and procedures. Unknown
4 buried utilities and structures could be encountered, due to length of operation of Building
5 9, which was constructed in 1906. Also, a considerable amount of scrap metal and
6 equipment, in addition to storage sheds, will need to be removed and replaced in order to
7 make room for excavation equipment and staging areas. The removal of the large tree next
8 to E084SB004 will require removing existing scrap metal and equipment, and additional
9 protection will need to be provided for Building 9, which is being preserved due to its
10 historic importance. Utility clearance, subcontracting, waste characterization, and base
11 approval are other customary activities. The field implementation of this remedy is
12 estimated to require 6 to 8 weeks, and the benefits will be immediate. There is ample offsite
13 capacity for disposal (and treatment, if required) of the contaminated soil.

14 **5.1.9 Other Factors (e) Cost**

15 Appendix A presents the overall cost estimate for implementing this remedy. These costs
16 reflect soil removal based on available RFI sample results, plus removal and replacement of
17 pavement. A scope contingency (30 percent) is added to cover additional excavation that
18 may be required per results of confirmation testing. In summary, the costs include the
19 following:

- 20 • Removing soil at each occurrence of MCS exceedance.
- 21 • Performing confirmation tests in each area to confirm compliance with MCS.
- 22 • Applying 30 percent contingency for additional scope that may be required based on
23 compliance tests.

24 Using the assumptions listed above, the total present value of Alternative 1 is \$755,000.

25 **5.2 Alternative 2: Land Use Controls**

26 The assumptions for Alternative 2 include the following:

- 27 • A base-wide LUCIP will be developed for the CNC. The plan will allow for restrictions
28 on the use of land at Combined SWMU 83 and other areas, and the plan will be
29 developed outside the scope of this CMS.
- 30 • Periodic monitoring will be performed for 30 years. The monitoring will consist of an
31 annual site visit to confirm that site use(s) are consistent with the LUCIP.

1 **5.2.1 Protection of Human Health and the Environment**

2 This alternative is effective at protecting human health because it restricts future use of the
3 site that would be inappropriate for the MCS exceedances at the site. The point risk
4 estimates for each of the 13 soil boring locations included for excavation under Alternative 1
5 are shown in Table 5-1. These estimates are within the range of 1E-06 and 1E-04, which has
6 been established by the EPA as an acceptable risk range. This area is expected to continue to
7 be used for industrial use in the future. Leaving in place the 13 isolated surface soil
8 locations of BEQ exceedances (with only 4 of these locations being in unpaved areas and
9 thus available for direct exposure) does not pose an unacceptable risk to future workers
10 under the industrial reuse scenario.

11 **5.2.2 Attain MCS**

12 This alternative would not achieve the MCS for BEQs.

13 **5.2.3 Control the Source of Releases**

14 There are no ongoing sources of releases at Combined SWMU 83; therefore, this issue is not
15 applicable.

16 **5.2.4 Compliance with Applicable Standards for the Management of Generated
17 Wastes**

18 Alternative 2 does not generate any wastes that would require special management.

19 **5.2.5 Other Factors (a) Long-term Reliability and Effectiveness**

20 This alternative provides some level of protection that has long-term reliability and
21 effectiveness. The risk of failure is low, provided the LUCIP is enforced by the responsible
22 entity. If LUCs were not enforced, unpermitted use of the site may result in human exposure
23 to BEQs above the MCS.

24 **5.2.6 Other Factors (b) Reduction in the Toxicity, Mobility, or Volume of
25 Wastes**

26 This alternative involves no treatment and does not reduce the toxicity, mobility, or volume
27 of contaminated soil at Combined SWMU 83.

28 **5.2.7 Other Factors (c) Short-term Effectiveness**

29 The Navy retains ownership and control of the site's use until LUCs are implemented. This
30 alternative does not involve any site activities; thus, no short-term risks are created.

1 **5.2.8 Other Factors (d) Implementability**

2 Alternative 2 is relatively easy to implement since it requires only the development of LUCs
3 and an appropriate monitoring program.

4 **5.2.9 Other Factors (e) Cost**

5 Alternative 2 is not costly to implement since it requires no construction of treatment
6 facilities or disposal of wastes. The cost for this alternative is for administrative/legal
7 services and periodic monitoring/review for 30 years. Longer monitoring would likely be
8 required, but its cost impact to present value of this alternative is minimal.

9 Using the assumptions described earlier, the total present value of Alternative 2 is \$20,000.

10 **5.3 Comparative Ranking of Corrective Measure Alternatives**

11 The overall ability of each corrective measure alternative to meet the evaluation criteria is
12 described above. In Table 5-1, a comparative evaluation of the degree to which each
13 alternative meets a particular criteria is presented. Alternative 2 (LUCs) is the preferred
14 alternative. It provides a protective and reliable remedy at a lower cost.

TABLE 5-1
 Point Estimates of Risk for the Industrial Reuse Scenario Surface Soil COC Locations
 at Combined SWMU 83
 CMS Report, Combined SWMU 83, Zone E, Charleston Naval Complex

Station ID	Surface Soil BEQ Conc. ($\mu\text{g}/\text{kg}$)	Risk (E-06)
E083SB010	1,523.30	5.13
E083SB012	8270	28.5*
E083SB014	2180	7.5*
E084SB001	5,904.30	19.88
E084SB003	2,823.80	9.5
E084SB004	15,629.00	52.62
E084SB005	5,491.30	18.49
E084SB007	2,070.20	6.97
E574SB001	4,517.00	15.21
E574SB002	1,258.66	4.3*
E574SB003	3,458.20	11.64
E574SB007	2,191.40	7.38
E574SB008	12,438.40	41.88

$\mu\text{g}/\text{kg}$ micrograms per kilogram

Source of risk estimates - Zone E RFI Report, Revision 0 (EnSafe, 1997)

* Risk estimates calculated based on May 2003 soil sampling analytical results.

TABLE 5-2
Qualitative Comparison of Corrective Measure Alternatives
CMS Report, Combined SWMU 83, Zone E, Charleston Naval Complex

Criterion	Alternative 1	Alternative 2
	Soil Excavation and Offsite Disposal with LUCs	LUCs
Overall Protection of Human Health and the Environment	Protects human health and the environment	Protects human health and the environment
Attainment of MCS	Would achieve MCS	Would not achieve MCS
Control of the source of releases	N/A	N/A
Compliance with applicable standards for the management of wastes	Complies with applicable standards	Complies with applicable standards
Long-term Reliability and Effectiveness	Reliable and effective long term	Reliable and effective long term, provided periodic inspections are performed
Reduction of Toxicity, Mobility, or Volume through Treatment	Reduces mobility via placement of soil in landfill	Does not reduce toxicity, mobility, or volume
Short-term Effectiveness	Effective in short term	Effective in short term
Implementability	Moderately difficult to implement due to need to remove/replace concrete and asphalt pavement and work in busy industrial area. Additional effort needed to remove and stage large amount of scrap metal and equipment currently stored outside Building 9.	Easy to implement
Cost Ranking	Comparatively expensive	Inexpensive
Estimated Cost	\$755,000	\$20,000

1 **6.0 Recommended Corrective Measure** 2 **Alternative**

3 Two corrective measure alternatives were evaluated using the criteria described in Section
4 2.0 of this CMS report. These alternatives include:

- 5 • Alternative 1: Soil Excavation and Offsite Disposal with LUCs
- 6 • Alternative 2: LUCs

7 The preferred corrective measure alternative is Alternative 2 (LUCs). The remedy would be
8 protective at a moderate cost.

9 Alternative 2 would provide protection of human health and the environment by
10 maintaining the current and planned future use of the site as industrial/commercial.
11 Limitations would prevent residential and other unrestricted land use that could expose
12 sensitive populations.

13 Engineering controls to minimize future releases are already in place. Most of the area is
14 paved or covered by structures. Planning is already underway to develop and implement
15 administrative controls that would limit future site activities to those that would not involve
16 unrestricted exposures. The expected reliability of this alternative is good.

17 There are no community safety issues associated with implementation of this remedy, and
18 the controls would be relatively easy to implement. This alternative provides long-term
19 effectiveness for the planned industrial/commercial use and relies on administrative
20 controls to prevent future residential use.

1 **7.0 References**

- 2 CH2M-Jones. *Preliminary Results for Additional Background PAH Sampling from CNC Main*
- 3 *Base Railroad Lines and Annex (Zone K)*. Technical Memorandum. May 3, 2001.
- 4 CH2M-Jones. *RFI Report Addendum and CMS Work Plan, Combined SWMU 83, Zone E.*
- 5 *Revision 0*. August 2002.
- 6 CH2M-Jones. *CMS Report, Combined SWMU 83, Zone E. Revision 0*. January 2003.
- 7 EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, NAVBASE Charleston*. June 6,
- 8 1995.
- 9 EnSafe Inc. *Zone E RFI Report, NAVBASE Charleston. Revision 0*. November 1997.

Appendix A

COMPARISON OF TOTAL COST OF REMEDIAL SOLUTIONS

Site:	Charleston Naval Complex	Base Year:	2003
Location:	Combined SWMU 83	Date:	01/08/03
Phase:	Corrective Measures Study		

	Alternative Number 1	Alternative Number 2
Total Project Duration (Years)	<1	30
Capital Cost	\$129,000	\$6,000
Annual O&M Cost	\$0	\$1,100
Total Present Value of Solution	\$149,000	\$20,000

Disclaimer: The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -50 to +100 percent of the actual project costs.

Alternative: **Number 1**
 Elements: **Soil Excavation and Offsite Disposal**

COST ESTIMATE SUMMARY

Site: Charleston Naval Complex
 Location: Combined SWMU 83
 Phase: Corrective Measures Study
 Base Year: 2003
 Date: 01/08/03

Description: Excavation of contaminated soil, disposal offsite at permitted landfill, backfill with clean soil. Extent includes RFI sample points plus 30% scope contingency.

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Confirmation Sampling	1	EA	\$12,800	\$12,800	See Confirmation Worksheet
Soil, Asphalt and Tree Removal, Disposal and Backfill	1	EA	\$62,000	\$62,000	See Excavation 1 Worksheet
				\$0	
SUBTOTAL				\$74,800	
Contingency	30%		\$74,800	\$22,440	
SUBTOTAL				\$97,240	
Project Management	8%		\$97,240	\$7,779	USEPA 2000, p. 5-13, \$100K-\$500K
Remedial Design	15%		\$97,240	\$14,586	USEPA 2000, p. 5-13, \$100K-\$500K
Construction Management	10%		\$97,240	\$9,724	USEPA 2000, p. 5-13, \$100K-\$500K
SUBTOTAL				\$32,089	
TOTAL CAPITAL COST				\$129,000	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SUBTOTAL				\$0	
Allowance for Misc. Items	20%		\$0	\$0	
SUBTOTAL				\$0	
TOTAL ANNUAL O&M COST				\$0	

PRESENT VALUE ANALYSIS

Discount Rate = 7%

End Year	COST TYPE	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
0	CAPITAL COST	\$129,000	\$129,000	1.000	\$129,000	
	ANNUAL O&M COST	\$0	\$0	0.000	\$0	
	TOTAL COST	\$129,000			\$129,000	
	PRESENT VALUE OF LUC				\$20,000	
	TOTAL PRESENT VALUE OF ALTERNATIVE				\$149,000	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Number 2**
 Elements: **Land Use Controls**

COST ESTIMATE SUMMARY

Site: Charleston Naval Complex
 Location: Combined SWMU 83
 Phase: Corrective Measures Study
 Base Year: 2003
 Date: 01/08/03

Description: Implementation of base-wide land use management plan to put institutional controls in place to restrict site use to commercial/industrial.

Assumes this site is part of a multi-site implementation, and costs are shared among all the sites.

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Deed Restrictions - Attorney Record Deed	4	hour	\$200	\$800	
LUC Implementation	4	each	\$500	\$2,000	
	24	hours	\$75	\$1,800	
SUBTOTAL				\$4,600	
Contingency	20%		\$4,600	\$920	
SUBTOTAL				\$5,520	
Project Management	10%		\$5,520	\$552	USEPA 2000, p. 5-13, <\$100K
Remedial Design	0%		\$5,520	\$0	Not applicable.
Construction Management	0%		\$5,520	\$0	Not applicable.
SUBTOTAL				\$552	
TOTAL CAPITAL COST				\$6,000	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Annual Evaluation	12	hour	\$75	\$900	
SUBTOTAL				\$900	
Allowance for Misc. Items	20%		\$900	\$180	
SUBTOTAL				\$1,080	
TOTAL ANNUAL O&M COST				\$1,100	

PRESENT VALUE ANALYSIS - 20 years

Discount Rate = 7%

End Year	COST TYPE	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
0	CAPITAL COST	\$6,000	\$6,000	1.000	\$6,000	
30	ANNUAL O&M COST	\$33,000	\$1,100	12.409	\$13,650	
		\$39,000			\$19,650	
	TOTAL PRESENT VALUE OF ALTERNATIVE				\$20,000	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Antimony	083SB00101	E083SB001	0.5	UJ	11/30/1995	82	3.1	0.5 - 7.4	2.5
	083SB00201	E083SB002	0.5	UJ	12/18/1995				
	083SB00301	E083SB003	0.5	UJ	12/14/1995				
	083SB00401	E083SB004	0.5	UJ	12/14/1995				
	083SB00501	E083SB005	0.5	UJ	12/18/1995				
	083SB00601	E083SB006	0.5	U	12/19/1995				
	083SB00701	E083SB007	3.7	J	12/14/1995				
	083SB00801	E083SB008	0.4	UJ	12/14/1995				
	083SB01001	E083SB010	3.4	UJ	05/28/1996				
	084SB00101	E084SB001	0.6	J	11/29/1995				
	084SB00201	E084SB002	0.4	UJ	12/01/1995				
	084SB00301	E084SB003	2.1	J	12/01/1995				
	084SB00401	E084SB004	1.6	J	12/01/1995				
	084SB00501	E084SB005	0.6	J	12/01/1995				
	084SB00601	E084SB006	0.4	UJ	12/01/1995				
	084SB00701	E084SB007	10.7	J	05/24/1996				
	084SB00801	E084SB008	0.9	J	05/24/1996				
	084SB00901	E084SB009	3.5	UJ	05/28/1996				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
 RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Antimony	574SB00101	E574SB001	1.4	UJ	11/30/1995	82	3.1	0.5 - 7.4	2.5
	574SB00201	E574SB002	5.0	J	11/30/1995				
	574SB00301	E574SB003	9.1	J	11/30/1995				
	574SB00401	E574SB004	0.9	J	11/30/1995				
	574SB00501a	E574SB005	3.0	J	11/30/1995				
	574SB00501c	E574SB005*	10.7	J	05/21/1996				
	574SB00601	E574SB006	2.9	J	05/22/1996				
	574SB00701	E574SB007	7.1	J	05/22/1996				
	574SB00801	E574SB008	7.5	J	05/22/1996				
	574SB00901	E574SB009	0.6	J	05/22/1996				
	083SB01101	E083SB011	2.34	J	11/19/2001				
	083SB01201	E083SB012	1.96	J	11/19/2001				
	083SB01301	E083SB013	0.54	UJ	11/19/2001				
	083SB01401	E083SB014	0.81	J	11/19/2001				
Surface Soil Average Concentration			2.46						
Arsenic	083SB00101	E083SB001	2.5	=	11/30/1995	3.8	0.43	0.95 - 68	14.5
	083SB00201	E083SB002	1.9	=	12/18/1995				
	083SB00301	E083SB003	2.8	=	12/14/1995				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Arsenic	083SB00401	E083SB004	2.7	=	12/14/1995	3.8	0.43	0.95 - 68	14.5
	083SB00501	E083SB005	1.3	=	12/18/1995				
	083SB00601	E083SB006	9.3	=	12/19/1995				
	083SB00701	E083SB007	2.8	=	12/14/1995				
	083SB00801	E083SB008	1.3	=	12/14/1995				
	083SB01001	E083SB010	5.40	J	05/28/1996				
	084SB00101	E084SB001	2.2	=	11/29/1995				
	084SB00201	E084SB002	0.87	J	12/01/1995				
	084SB00301	E084SB003	6.8	=	12/01/1995				
	084SB00401	E084SB004	6.2	=	12/01/1995				
	084SB00501	E084SB005	5.9	=	12/01/1995				
	084SB00601	E084SB006	0.5	U	12/01/1995				
	084SB00701	E084SB007	25.0	=	05/24/1996				
	084SB00801	E084SB008	4.8	=	05/24/1996				
	084SB00901	E084SB009	2.90	J	05/28/1996				
	574SB00101	E574SB001	3.2	=	11/30/1995				
	574SB00201	E574SB002	9.9	=	11/30/1995				
	574SB00301	E574SB003	6.7	=	11/30/1995				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
 RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Arsenic	574SB00401	E574SB004	2.3	=	11/30/1995	3.8	0.43	0.95 - 68	14.5
	574SB00501a	E574SB005*	9.2	=	11/30/1995				
	574SB00501c	E574SB005*	8.8	=	05/21/1996				
	574SB00601	E574SB006	11.9	=	05/22/1996				
	574SB00701	E574SB007	22.1	=	05/22/1996				
	574SB00801	E574SB008	5.9	=	05/22/1996				
	574SB00901	E574SB009	2.4	=	05/22/1996				
Copper	083SB00101	E083SB001	107.0	=	11/30/1995	8,176	313	0.47 - 866	530 ^a
	083SB00201	E083SB002	136.0	=	12/18/1995				
	083SB00301	E083SB003	5.0	=	12/14/1995				
	083SB00401	E083SB004	18.3	=	12/14/1995				
	083SB00501	E083SB005	142.0	=	12/18/1995				
	083SB00601	E083SB006	8.0	=	12/19/1995				
	083SB00701	E083SB007	243.0	=	12/14/1995				
	083SB00801	E083SB008	22.7	=	12/14/1995				
	083SB01001	E083SB010	439.0	J	05/28/1996				
	084SB00101	E084SB001	16.3	=	11/29/1995				
	084SB00201	E084SB002	4.2	J	12/01/1995				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPARegion	EPA Region	Zone E	SSL (DAF=10)
						III Industrial RBC	III Residential RBC	Surface Soil Background Range	
Copper	084SB00301	E084SB003	332.0	J	12/01/1995	8,176	313	0.47 - 866	530 ^a
	084SB00401	E084SB004	476.0	J	12/01/1995				
	084SB00501	E084SB005	90.4	J	12/01/1995				
	084SB00601	E084SB006	6.9	J	12/01/1995				
	084SB00701	E084SB007	942.0	=	05/24/1996				
	084SB00801	E084SB008	9.1	=	05/24/1996				
	084SB00901	E084SB009	10.1	J	05/28/1996				
	574SB00101	E574SB001	1,180.0	=	11/30/1995				
	574SB00201	E574SB002	868.0	=	11/30/1995				
	574SB00301	E574SB003	1,260.0	=	11/30/1995				
	574SB00401	E574SB004	292.0	=	11/30/1995				
	574SB00501a	E574SB005*	610.0	=	11/30/1995				
	574SB00501c	E574SB005*	729.0	=	05/21/1996				
	574SB00601	E574SB006	602.0	=	05/22/1996				
	574SB00701	E574SB007	631.0	=	05/22/1996				
	574SB00801	E574SB008	933.0	=	05/22/1996				
	574SB00901	E574SB009	20.4	=	05/22/1996				
	083SB01101	E083SB011	135	=	11/19/2001				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
 RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Copper	083SB01201	E083SB012	278	=	11/19/2001	8,176	313	0.47 - 866	530 ^a
	083SB01301	E083SB013	37.4	=	11/19/2001				
	083SB01401	E083SB014	309	=	11/19/2001				
Surface Soil Average Concentration			340.4						
Lead	083SB00101	E083SB001	30.2	J	11/30/1995	1,300	400	1.0 - 400	400
	083SB00201	E083SB002	49.6	J	12/18/1995				
	083SB00301	E083SB003	25.3	J	12/14/1995				
	083SB00401	E083SB004	22.7	J	12/14/1995				
	083SB00501	E083SB005	40.1	J	12/18/1995				
	083SB00601	E083SB006	9.6	=	12/19/1995				
	083SB00701	E083SB007	94.2	J	12/14/1995				
	083SB00801	E083SB008	11.8	J	12/14/1995				
	083SB01001	E083SB010	1,400	J	05/28/1996				
	084SB00101	E084SB001	89.9	J	11/29/1995				
	084SB00201	E084SB002	8.7	=	12/01/1995				
	084SB00301	E084SB003	408.0	=	12/01/1995				
	084SB00401	E084SB004	317.0	=	12/01/1995				
	084SB00501	E084SB005	281.0	=	12/01/1995				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Lead	084SB00601	E084SB006	2.9	=	12/01/1995	1,300	400	1.0 - 400	400
	084SB00701	E084SB007	644.0	J	05/24/1996				
	084SB00801	E084SB008	12.7	J	05/24/1996				
	084SB00901	E084SB009	53.6	J	05/28/1996				
	574SB00101	E574SB001	110.0	J	11/30/1995				
	574SB00201	E574SB002	476.0	J	11/30/1995				
	574SB00301	E574SB003	438.0	J	11/30/1995				
	574SB00401	E574SB004	46.8	J	11/30/1995				
	574SB00501a	E574SB005*	700.0	J	11/30/1995				
	574SB00501c	E574SB005*	676.0	J	05/21/1996				
	574SB00601	E574SB006	128.0	J	05/22/1996				
	574SB00701	E574SB007	280.0	J	05/22/1996				
	574SB00801	E574SB008	411.0	J	05/22/1996				
	574SB00901	E574SB009	41.0	J	05/22/1996				
	083SB01101	E083SB011	321	=	11/29/2001				
	083SB01201	E083SB012	216	=	11/29/2001				
	083SB01301	E083SB013	74.4	=	11/29/2001				
	083SB01401	E083SB014	134	=	11/29/2001				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Surface Soil Average Concentration			236						
BEQs	083SB00101	E083SB001	1.29	=	11/30/1995	0.78 ^b	0.087 ^b	1.304 ^c	NA
	083SB00201	E083SB002	0.88	U	12/18/1995				
	083SB00301	E083SB003	0.92	U	12/14/1995				
	083SB00401	E083SB004	0.67	=	12/14/1995				
	083SB00501	E083SB005	0.75	=	12/18/1995				
	083SB00601	E083SB006	4.28	=	12/19/1995				
	083SB00701	E083SB007	0.92	U	12/14/1995				
	083SB00801	E083SB008	0.83	U	12/14/1995				
	083SB01001	E083SB010	1.52	=	05/28/1996				
	084SB00101	E084SB001	5.90	=	11/29/1995				
	084SB00201	E084SB002	0.83	U	12/01/1995				
	084SB00301	E084SB003	2.82	=	12/01/1995				
	084SB00401	E084SB004	15.63	=	12/01/1995				
	084SB00501	E084SB005	5.49	=	12/01/1995				
	084SB00601	E084SB006	0.54	=	12/01/1995				
	084SB00701	E084SB007	2.07	=	05/24/1996				
	084SB00801	E084SB008	1.15	=	05/24/1996				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
 RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region	EPA Region	Zone E	SSL (DAF=10)
						III Industrial RBC	III Residential RBC	Surface Soil Background Range	
BEQs	084SB00901	E084SB009	0.89	U	05/28/1996	0.78 ^b	0.087 ^b	1.304 ^c	NA
	574SB00101	E574SB001	4.52	=	11/30/1995				
	574SB00201	E574SB002	1.26	=	11/30/1995				
	574SB00301	E574SB003	3.46	=	11/30/1995				
	574SB00401	E574SB004	4.51	U	11/30/1995				
	574SB00501b	E574SB005*	0.02	U	11/30/1995				
	574SB00601	E574SB006	0.26	=	05/21/1996				
	574SB00701	E574SB007	2.19	=	05/22/1996				
	574SB00801	E574SB008	12.44	=	05/22/1996				
	574SB00901	E574SB009	0.28	=	05/22/1996				
	083SB01101	E083SB011	1.173	=	05/22/1996				
	083SB01201	E083SB012	8.277	=	11/19/2001				
	083SB01301	E083SB013	0.452	=	11/19/2001				
	083SB01401	E083SB014	2.178	=	11/19/2001				
	083SB01501	E083SB015	0.4	=	11/19/2001				
Surface Soil Average Concentration			2.62						

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Industrial RBC	EPA Region III Residential RBC	Zone E Surface Soil Background Range	SSL (DAF=10)
Methylene Chloride	084SB00401	E084SB004	0.006	U	12/01/1995	760	85	NA	0.001 (DAF=1)
	084SB00901	E084SB009	0.012	U	05/28/1996				
	084SB00501	E084SB005	0.006	U	12/01/1995				
	084SB00601	E084SB006	0.005	U	12/01/1995				
	084SB00101	E084SB001	0.010	U	11/29/1995				
	084SB00801	E084SB008	0.006	=	05/24/1996				
	083SB00601	E083SB006	0.002	J	12/19/1995				
	083SB00801	E083SB008	0.001	J	12/14/1995				
	083SB01001	E083SB010	0.011	U	05/28/1996				
	083SB00401	E083SB004	0.001	J	12/14/1995				
	083SB00301	E083SB003	0.006	U	12/14/1995				
	083SB00701	E083SB007	0.002	J	12/14/1995				
	083SB00201	E083SB002	0.006	U	12/18/1995				
	574SB00401	E574SB004	0.019	U	11/30/1995				
	574SB00301	E574SB003	0.010	U	11/30/1995				
	574SB00501a	E574SB005*	0.006	U	11/30/1995				
	083SB00101	E083SB001	0.010	U	11/30/1995				

TABLE 5-1
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Surface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region	EPA Region	Zone E	SSL (DAF=10)
						III Industrial RBC	III Residential RBC	Surface Soil Background Range	
Methylene Chloride	084SB00301	E084SB003	0.006	U	12/01/1995	760	85	NA	0.001 (DAF=1)
	084SB00201	E084SB002	0.005	U	12/01/1995				

Concentrations in bold text and outlined within the table represent exceedances of the appropriate screening criteria.

All values are presented in milligrams per kilogram (mg/kg).

^a EPA Region III generic Soil Screening Level (SSL) with a Dilution Attenuation Factor (DAF)=10, *EPA Region III RBC Tables* (October 2000).

^b RBC for benzo(a)pyrene

^c Surface Soil CNC benzo(a)pyrene equivalent (BEQ) Site-wide Reference Concentration- BEQ concentrations are derived from calculations made per the document *Technical Information for Development of Background BEQ Values* (CH2M-Jones, February 2001).

* Station removed during IM for AOC 574 (1997).

= Indicates that the analyte was detected at the concentration shown.

J Indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

NA Not applicable/not available

U Indicates that the concentration was not detected.

UJ Indicates that the concentration was not detected and is estimated.

TABLE 5-2

Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Antimony	083SB00102	E083SB001	0.52	UJ	11/30/1995	0.52 - 1.6	2.5
	083SB00202	E083SB002	0.67	UJ	12/18/1995		
	083SB00302	E083SB003	0.48	UJ	12/14/1995		
	083SB00402	E083SB004	0.49	UJ	12/14/1995		
	083SB00502	E083SB005	0.63	UJ	12/18/1995		
	083SB00602	E083SB006	0.50	U	12/19/1995		
	083SB00702	E083SB007	0.52	UJ	12/14/1995		
	083SB00802	E083SB008	0.47	UJ	12/14/1995		
	083SB01002	E083SB010	3.70	UJ	05/28/1996		
	084SB00102a	E084SB001	0.47	UJ	11/29/1995		
	084SB00202	E084SB002	0.48	UJ	12/01/1995		
	084SB00302	E084SB003	0.47	UJ	12/01/1995		
	084SB00402	E084SB004	0.49	UJ	12/01/1995		
	084SB00502	E084SB005	0.46	UJ	12/01/1995		
	084SB00602	E084SB006	0.47	UJ	12/01/1995		
	084SB00702	E084SB007	5.00	J	05/24/1996		
	084SB00802	E084SB008	0.44	UJ	05/24/1996		
	084SB00902	E084SB009	3.50	UJ	05/28/1996		
	574SB00102	E574SB001	0.71	J	11/30/1995		
	574SB00202	E574SB002	0.86	J	11/30/1995		

TABLE 5-2

Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Antimony	574SB00302	E574SB003	0.71	J	11/30/1995	0.52 - 1.6	2.5
	574SB00402	E574SB004	0.66	J	11/30/1995		
	574SB00502a	E574SB005*	7.70	J	11/30/1995		
	574SB00502b	E574SB005*	6.30	J	05/21/1996		
	574SB00602	E574SB006	2.10	J	05/22/1996		
	574SB00702	E574SB007	3.80	J	05/22/1996		
	574SB00802	E574SB008	1.20	J	05/22/1996		
	574SB00902	E574SB009	0.45	UJ	05/22/1996		
	083SB011	E083SB01	0.4	UJ	11/19/2001		
	083SB012	E083SB01	0.65	UJ	11/19/2001		
	083SB013	E083SB01	0.47	UJ	11/19/2001		
	083SB014	E083SB01	0.86	J	11/19/2001		
	Subsurface Soil Average Concentration			1.31			
Arsenic	084SB00502	E084SB005	0.81	J	12/01/1995	0.83 - 26	14.5
	084SB00802	E084SB008	0.99	J	05/24/1996		
	083SB00402	E083SB004	1.10	J	12/14/1995		
	084SB00902	E084SB009	1.80	J	05/28/1996		
	083SB00302	E083SB003	2.30	=	12/14/1995		
	084SB00402	E084SB004	2.30	=	12/01/1995		

TABLE 5-2
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Arsenic	574SB00902	E574SB009	2.50	=	05/22/1996	0.83 - 26	14.5
	084SB00302	E084SB003	3.00	=	12/01/1995		
	083SB00802	E083SB008	3.10	=	12/14/1995		
	084SB00102a	E084SB001	3.20	=	11/29/1995		
	084SB00602	E084SB006	3.20	=	12/01/1995		
	083SB00602	E083SB006	4.00	=	12/19/1995		
	083SB00702	E083SB007	4.20	=	12/14/1995		
	083SB00102	E083SB001	4.30	=	11/30/1995		
	083SB01002	E083SB010	4.70	J	05/28/1996		
	084SB00202	E084SB002	5.20	=	12/01/1995		
	574SB00102	E574SB001	6.10	=	11/30/1995		
	574SB00502a	E574SB005*	7.00	=	11/30/1995		
	083SB00502	E083SB005	7.30	=	12/18/1995		
	084SB00702	E084SB007	8.00	=	05/24/1996		
	083SB00202	E083SB002	9.00	=	12/18/1995		
	574SB00502b	E574SB005	9.20	=	05/21/1996		
	574SB00702	E574SB007	9.20	=	05/22/1996		
	574SB00602	E574SB006	9.50	=	05/22/1996		
	574SB00402	E574SB004	9.80	=	11/30/1995		
	574SB00302	E574SB003	10.50	=	11/30/1995		

TABLE 5-2

Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Arsenic	574SB00202	E574SB002	13.60	=	11/30/1995	0.83 - 26	14.5
	574SB00802	E574SB008	16.70	=	05/22/1996		
Copper	083SB00102	E083SB001	3.60	=	11/30/1995	1.3 - 192	530 ^a
	083SB00202	E083SB002	17.60	=	12/18/1995		
	083SB00302	E083SB003	292.00	=	12/14/1995		
	083SB00402	E083SB004	19.80	=	12/14/1995		
	083SB00502	E083SB005	49.90	=	12/18/1995		
	083SB00602	E083SB006	5.70	=	12/19/1995		
	083SB00702	E083SB007	3.00	J	12/14/1995		
	083SB00802	E083SB008	1.70	J	12/14/1995		
	083SB01002	E083SB010	2.70	J	05/28/1996		
	084SB00102a	E084SB001	1.50	J	11/29/1995		
	084SB00202	E084SB002	1.10	J	12/01/1995		
	084SB00302	E084SB003	2.50	J	12/01/1995		
	084SB00402	E084SB004	7.50	J	12/01/1995		
	084SB00502	E084SB005	6.80	J	12/01/1995		
	084SB00602	E084SB006	1.30	J	12/01/1995		
	084SB00702	E084SB007	541.00	=	05/24/1996		
084SB00802	E084SB008	3.30	=	05/24/1996			

TABLE 5-2

Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Copper	084SB00902	E084SB009	1.20	UJ	05/28/1996	1.3 - 192	530 ^a
	574SB00102	E574SB001	141.00	=	11/30/1995		
	574SB00202	E574SB002	21.90	=	11/30/1995		
	574SB00302	E574SB003	31.90	=	11/30/1995		
	574SB00402	E574SB004	99.50	=	11/30/1995		
	574SB00502a	E574SB005*	493.00	=	11/30/1995		
	574SB00502b	E574SB005*	761.00	=	05/21/1996		
	574SB00602	E574SB006	431.00	=	05/22/1996		
	574SB00702	E574SB007	428.00	=	05/22/1996		
	574SB00802	E574SB008	22.80	=	05/22/1996		
574SB00902	E574SB009	4.00	=	05/22/1996			
Subsurface Soil Average Concentration			121.30				
Lead	083SB00102	E083SB001	19.90	J	11/30/1995	1.80 - 322	400
	083SB00202	E083SB002	23.60	J	12/18/1995		
	083SB00302	E083SB003	88.80	J	12/14/1995		
	083SB00402	E083SB004	9.10	J	12/14/1995		
	083SB00502	E083SB005	39.70	J	12/18/1995		
	083SB00602	E083SB006	5.70	=	12/19/1995		
	083SB00702	E083SB007	9.20	J	12/14/1995		

TABLE 5-2

Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Lead	083SB00802	E083SB008	3.20	J	12/14/1995	1.80 - 322	400
	083SB01002	E083SB010	17.70	J	05/28/1996		
	084SB00102a	E084SB001	4.00	J	11/29/1995		
	084SB00202	E084SB002	3.50	=	12/01/1995		
	084SB00302	E084SB003	6.80	=	12/01/1995		
	084SB00402	E084SB004	17.60	=	12/01/1995		
	084SB00502	E084SB005	15.00	=	12/01/1995		
	084SB00602	E084SB006	2.90	=	12/01/1995		
	084SB00702	E084SB007	675.00	J	05/24/1996		
	084SB00802	E084SB008	4.00	J	05/24/1996		
	084SB00902	E084SB009	2.60	UJ	05/28/1996		
	574SB00102	E574SB001	25.30	J	11/30/1995		
	574SB00202	E574SB002	19.80	J	11/30/1995		
	574SB00302	E574SB003	17.80	J	11/30/1995		
	574SB00402	E574SB004	19.60	J	11/30/1995		
	574SB00502a	E574SB005*	466.00	J	11/30/1995		
	574SB00502b	E574SB005*	602.00	J	05/21/1996		
	574SB00602	E574SB006	45.60	J	05/22/1996		
	574SB00702	E574SB007	106.00	J	05/22/1996		

TABLE 5-2
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Lead	574SB00802	E574SB008	27.10	J	05/22/1996	1.80 - 322	400
	574SB00902	E574SB009	9.50	J	05/22/1996		
	E083SB01102	E083SB011	432	=	11/19/2001		
	E083SB01202	E083SB012	36	=	11/19/2001		
	E083SB01302	E083SB013	20.7	=	11/19/2001		
	E083SB01402	E083SB014	76.8	=	11/19/2001		
Subsurface Soil Average Concentration			89.14				
BEQs	083SB00102	E083SB001	7.83	=	11/30/1995	1.4 ^b	NA
	083SB00202	E083SB002	1.16	U	12/18/1995		
	083SB00302	E083SB003	0.90	U	12/14/1995		
	083SB00402	E083SB004	0.94	U	12/14/1995		
	083SB00502	E083SB005	7.16	U	12/18/1995		
	083SB00602	E083SB006	3.78	=	12/19/1995		
	083SB00702	E083SB007	1.02	U	12/14/1995		
	083SB00802	E083SB008	0.90	U	12/14/1995		
	083SB01002	E083SB010	0.92	U	05/28/1996		
	084SB00102a	E084SB001	0.90	U	11/29/1995		
	084SB00202	E084SB002	0.90	U	12/01/1995		
	084SB00302	E084SB003	0.60	=	12/01/1995		

TABLE 5-2

Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
BEQs	084SB00402	E084SB004	0.64	=	12/01/1995	1.4 ^b	NA
	084SB00502	E084SB005	0.89	U	12/01/1995		
	084SB00602	E084SB006	0.90	U	12/01/1995		
	084SB00702	E084SB007	0.64	=	05/24/1996		
	084SB00802	E084SB008	0.84	U	05/24/1996		
	084SB00902	E084SB009	0.88	U	05/28/1996		
	574SB00102	E574SB001	1.09	U	11/30/1995		
	574SB00202	E574SB002	1.39	U	11/30/1995		
	574SB00302	E574SB003	0.86	=	11/30/1995		
	574SB00402	E574SB004	2.54	U	11/30/1995		
	574SB00502a	E574SB005*	1.15	=	11/30/1995		
	574SB00602	E574SB006	0.47	U	05/21/1996		
	574SB00702	E574SB007	1.06	=	05/22/1996		
	574SB00802	E574SB008	0.73	=	05/22/1996		
	574SB00902	E574SB009	0.43	U	05/22/1996		
	E083SB01102	E083SB011	1.312	=	05/22/1996		
	E083SB01202	E083SB012	0.671	=	11/19/2001		
	E083SB01302	E083SB013	0.662	=	11/19/2001		
	E083SB01402	E083SB014	0.335	=	11/19/2001		
	E083SB01502	E083SB015	0.332	=	11/19/2001		

TABLE 5-2
 Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Subsurface Soil Average Concentration			1.02				
Methylene Chloride	084SB00102a	E084SB001	0.010	U	11/29/1995	NA	0.001 (DAF=1)
	084SB00402	E084SB004	0.032	U	12/01/1995		
	084SB00702	E084SB007	0.007	=	05/24/1996		
	084SB00802	E084SB008	0.006	=	05/24/1996		
	084SB00602	E084SB006	0.006	U	12/01/1995		
	083SB00802	E083SB008	0.006	UJ	12/14/1995		
	083SB00302	E083SB003	0.002	J	12/14/1995		
	083SB00602	E083SB006	0.790	U	12/19/1995		
	083SB00702	E083SB007	0.007	UJ	12/14/1995		
	083SB01002	E083SB010	0.012	U	05/28/1996		
	083SB00202	E083SB002	0.008	U	12/18/1995		
	574SB00502a	E574SB005*	0.007	=	11/30/1995		
	574SB00102	E574SB001	0.009	UJ	11/30/1995		
	574SB00302	E574SB003	0.009	U	11/30/1995		
	574SB00402	E574SB004	0.009	U	11/30/1995		
	574SB00202	E574SB002	0.012	U	11/30/1995		
084SB00902	E084SB009	0.011	U	05/28/1996			

TABLE 5-2

Detected Concentrations of Antimony, Arsenic, BEQs, Copper, Lead, and Methylene Chloride in Subsurface Soil
RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex

Parameter	Sample ID	Station ID	Concentration (mg/kg)	Qualifier	Date Collected	Zone E Subsurface Soil Background Range	SSL (DAF=10)
Methylene Chloride	084SB00502	E084SB005	0.006	U	12/01/1995	NA	0.001 (DAF=1)
	084SB00302	E084SB003	0.006	U	12/01/1995		
	084SB00202	E084SB002	0.006	U	12/01/1995		
	083SB00102	E083SB001	0.006	U	11/30/1995		

Concentrations in bold text and outlined within the table represent exceedances of the appropriate screening criteria.

All values are presented in milligrams per kilogram (mg/kg).

^a EPA Region III generic Soil Screening Level (SSL) with a Dilution Attenuation Factor (DAF)=10, *EPA Region III RBC Tables* (October 2000).

^b Subsurface Soil CNC BEQ Sitewide Reference Concentration.

= Indicates that the analyte was detected at the concentration shown.

J Indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

NA Not applicable/not available

U Indicates that the concentration was not detected.

UJ Indicates that the concentration was not detected and is estimated.

TABLE 5-3
 Leachate Transport Analysis Model
 RFI Report Addendum & CMS Work Plan, Combined SWMU 83, Zone E, Charleston Naval Complex
 Parameter Methylene chloride

Chemical Specific Input Parameters		Parameter	Methylene chloride
Cw =	Target groundwater concentration MCL (mg/L)		5.00E-03
H =	Henry's Law Constant, dimensionless		8.98E-02
ks =	Soil-water sorption coefficient (cm ³ water/g soil = L/kg) = Koc x foc where		4.33E-01
	koc = organic carbon-water sorption coefficient, (cm ³ (ml) water)/(g soluble organic carbon)		1.17E+01
			0.037
Site Specific Input Parameters			
Sw =	Width of Source Parallel to Groundwater Flow Direction (impacted soil zone)	15.2 m	50 ft
da =	Aquifer Thickness	7.3 m	24 ft
d =	Groundwater Mixing Zone thickness (paved)	1.66 m	5.5 ft
	(unpaved)	2.38 m	7.8 ft
i =	Groundwater Gradient	3.9E-03	(unitless)
Ks =	Saturated Hydraulic Conductivity	667.5 m/yr	2190.0 ft/yr
θw =	Volumetric Water Content of Soil Pore Space	0.3 cm ³ vapor/cm ³ soil	0.3 in ³ vapor/in ³ soil
θv =	Volumetric Vapor Content of Soil Pore Space	0.15 cm ³ vapor/cm ³ soil	0.15 in ³ vapor/in ³ soil
ρs =	Soil Bulk Density	1.5 g/cm ³	93.64 lb _m /ft ³
qi =	Water Infiltration Rate (paved)	0.0086 m/yr	0.0283 ft/yr
	(unpaved)	0.1372 m/yr	0.4500 ft/yr
Partition Term, Cw/Csoil, (L/kg)			6.42E-01
Dilution Term, dimensionless (paved)		$\frac{C_{soil}}{C_w} = \left(\frac{\theta_w + K_s \rho_s + H\theta_v}{\rho_s} \right) \left(\frac{K_s i d + q_i S_w}{q_i S_w} \right)$	3.35E+01
(unpaved)			3.93E+00
Csoil/Cw = Partition term * Dilution term (mg/kg / mg/L) = L/kg (paved)			2.15E+01
(unpaved)			2.52E+00
Calculated Site Specific Target Level for Soil			
Csoil calculated source soil concentration (SSL, mg/kg) Cw*(partion term)*(dilution term) (paved)			0.107
(unpaved)			0.013
Cwt	is the MCL from EPA National Drinking Water Standards (March 2001) or US EPA Region III RBCs (October, 2000).		
H	from Table 36 of the Soil Screening Guidance; Technical Background Document (EPA, 1996).		
ks	= koc x foc.		
koc	from Table 39 of the Soil Screening Guidance; Technical Background Document (EPA, 1996).		
foc	calculated as the mean foc from TOC measurements from Zone E.		
Sw	Estimated as the distance along gw flow path (length, NW-SE) of AOC 563 (120 ft).		
d	is calculated as $M = (0.0112 L^{-0.5}) + da(1 - e^{-L/(Ks da)})$ or da, whichever is less.		
da	is based on top of Ashley (-20 ft, GIS) and nearest isocontour line for groundwater level (3.25 ft msl, GIS).		
i	Calculated from isocontour groundwater map for Zone E ((3.11-2.89)/38.5 ~ 0.005, CH2MHill, 2002).		
Ks	Based on CH2MHill's hydraulic conductivity theme in the GIS (6 ft/d).		
θw	is the default value presented in the Soil Screening Guidance: User's Guide (EPA, 1996)		
θv	is calculated as total porosity (0.45, assumed) - qw (0.3) = 0.15.		
ρs	is the default value presented in the Soil Screening Guidance: User's Guide (EPA, 1996)		
qi	is a derived value (unpaved, 5.4 in/yr or paved, 0.34 in/yr) based on annual precipitation, evapo-transportation, and runoff coefficient values for the Charleston area.		

Appendix C

CH2MHILL TRANSMITTAL

To: Jerry Stamps
South Carolina Department of Health
and Environmental Control
Bureau of Land and Waste
Management
2600 Bull Street
Columbia, SC 29201

From: Dean Williamson/CH2M-Jones
(352) 335-5877 ext. 2280

Date: May 2, 2003

Re: CH2M-Jones' Responses to Comments by EPA regarding the *CMS Report, Combined SWMU 83, Zone E, Revision 0*

Quantity	Description
4	CH2M-Jones' Responses to Comments by EPA regarding the <i>CMS Report, Combined SWMU 83, Zone E, Revision 0</i> – Originally Submitted on January 24, 2003

If material received is not as listed, please notify us at once.

Remarks:

Copy To:

Tim Frederick/Gannett Fleming, Inc., w/att
Dann Spariosu/USEPA, w/att
Rob Harrell/Navy, w/att
Gary Foster/CH2M-Jones, w/att

Comments Prepared by EPA Regarding the *CMS Report, Combined SWMU 83, Zone E, Revision 0* (CH2M-Jones, January 2003)

Specific Comments

1. Page 1-4, Line 6. The text states that a second sampling event was conducted based on exceedances from a prior sampling event. The text should specify what screening criteria was used during screening, human health, ecological, or both.

CH2M-Jones Response:

This text refers to the sampling conducted during the initial RFI by the Navy/EnSafe team. As stated in the Revision 0 RFI Report Addendum and CMS Work Plan for Combined SWMU 83 (CH2M-Jones, 2002), Section 2.1, the screening criteria used during the initial RFI to compare the detections in surface soil were the EPA Region III industrial risk-based concentrations (RBCs), and additionally, for inorganics, the Zone E surface soil background reference concentrations (BRCs). Subsurface soil detections were compared with generic soil screening levels (SSLs) (with a dilution attenuation factor [DAF]=10), and additionally, for inorganics, the Zone E subsurface soil BRCs. These criteria are human-health risk-based. This information can be added to page 1-4 to clarify.

2. Page 1-4, Line 15. The location of the analytical results from earlier investigations is cited as the RFI Report Addendum and CMS Work Plan for this unit. However, to better understand the concentrations detected and exceedances of screening values determined, a summary table should be presented at the end of this chapter. This table should supplement the data presented in Figure 1-4.

CH2M-Jones Response:

Tables 5-1, 5-2, and 5-3 from the Revision 0 RFI Report Addendum and CMS Work Plan for Combined SWMU 83 will be added as an Appendix to the Revision 1 of the CMS Report and referenced in Section 1.2 of the revised text.

3. Page 2-1, Line 15. The text states that the RAO for surface soil is to prevent ingestion and direct/dermal contact with soil containing COCs at unacceptable levels. The text should clarify that the RAO is based on human exposure.

CH2M-Jones Response:

This information is stated in the previous sentence, on lines 12-14 on Page 2-1. The word "human" will be added to line 15 before the word "ingestion" in Revision 1 of this document.

4. Page 4-1, Line 11. It is stated that a large tree is located adjacent to sample location E084SB004. The species, size, and approximate age of this tree should be provided.

CH2M-Jones Response:

*The species is a sugarberry (*celtus laevigata*), a member of the elm family. It is approximately 60 feet high, and is probably on the order of 30 to 40 years old. The requested information regarding the tree will be provided in the Revision 1 of the CMS Report.*

5. Page 4-2, Line 5. This section describes alternative 1: soil excavation and offsite disposal with land use controls. Earlier in Section 4.0, it is stated that a large tree is located adjacent to sample location E084SB004 and that this tree may have to be removed in order for excavation to be conducted safely. If this tree is to be removed, then it is assumed that it must be cut down and disposed of in some manner. The text of this alternative should include a discussion about the tree removal and consideration about cost and disposal.

CH2M-Jones Response:

This information will be added to the text and cost tables for Alternative 1 in the Revision 1 of this CMS Report.

6. Page 5-1, Line 7. This section summarizes the assumptions made for Alternative 1. Tree removal and disposal should be to added as an additional bullet.

CH2M-Jones Response:

Comment noted. Please see response to Comment No. 5 above. A line item for tree removal and disposal will be added to the Revision 1 document.

COMPARISON OF TOTAL COST OF REMEDIAL SOLUTIONS

Site:	Charleston Naval Complex	Base Year:	2003
Location:	Combined SWMU 83	Date:	12/02/2003
Phase:	Corrective Measures Study		

	Alternative Number 1	Alternative Number 2
Total Project Duration (Years)	<1	30
Capital Cost	\$735,000	\$6,000
Annual O&M Cost	\$0	\$1,100
Total Present Value of Solution	\$755,000	\$20,000

Disclaimer: The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -50 to +100 percent of the actual project costs.

Alternative: Number 1 **COST ESTIMATE SUMMARY**
Elements: Soil Excavation and Offsite Disposal

Site: Charleston Naval Complex **Description:** Excavation of contaminated soil, disposal offsite at permitted landfill, backfill with clean soil. Extent includes RFI sample points plus 30% scope contingency.
Location: Combined SWMU 83
Phase: Corrective Measures Study
Base Year: 2003
Date: 12/02/2003

CAPITAL COSTS					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Confirmation Sampling	1	EA	\$9,000	\$9,000	See Confirmation Worksheet
Removal, Disposal and Backfill	1	EA	\$491,000	\$491,000	See Excavation 1 Worksheet
				\$0	
SUBTOTAL				\$500,000	
Contingency	30%		\$500,000	\$150,000	
SUBTOTAL				\$650,000	
Project Management	8%		\$650,000	\$52,000	USEPA 2000, p. 5-13, \$100K-\$500K
Remedial Design	2%		\$650,000	\$13,000	
				\$19,500	USEPA 2000, p. 5-13, \$100K-\$500K
Construction Management	3%		\$650,000	\$84,500	
SUBTOTAL				\$84,500	
TOTAL CAPITAL COST				\$735,000	

OPERATIONS AND MAINTENANCE COST					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SUBTOTAL				\$0	
Allowance for Misc. Items	20%		\$0	\$0	
SUBTOTAL				\$0	
TOTAL ANNUAL O&M COST				\$0	

PRESENT VALUE ANALYSIS						
			Discount Rate =	7%		
End Year	COST TYPE	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
0	CAPITAL COST	\$735,000	\$735,000	1.000	\$735,000	
	ANNUAL O&M COST	\$0	\$0	0.000	\$0	
	PRESENT VALUE OF LUC	\$735,000			\$735,000	
	TOTAL PRESENT VALUE OF ALTERNATIVE				\$755,000	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative:	Number 2	COST ESTIMATE SUMMARY
Elements:	Land Use Controls	

Site:	Charleston Naval Complex	Description: Implementation of base-wide land use management plan to put institutional controls in place to restrict site use to commercial/industrial.
Location:	Combined SWMU 83	
Phase:	Corrective Measures Study	
Base Year:	2003	Assumes this site is part of a multi-site implementation, and costs are shared among all the sites.
Date:	12/02/2003	

CAPITAL COSTS						
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES	
Deed Restrictions - Attorney	4	hour	\$200	\$800		
Record Deed	4	each	\$500	\$2,000		
LUC Implementation	24	hours	\$75	\$1,800		
SUBTOTAL				\$4,600		
Contingency	20%		\$4,600	\$920		
SUBTOTAL				\$5,520		
Project Management	10%		\$5,520	\$552	USEPA 2000, p. 5-13, <\$100K	
Remedial Design	0%		\$5,520	\$0	Not applicable.	
Construction Management	0%		\$5,520	\$0	Not applicable.	
SUBTOTAL				\$552		
TOTAL CAPITAL COST				\$6,000		

OPERATIONS AND MAINTENANCE COST						
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES	
Annual Evaluation	12	hour	\$75	\$900		
SUBTOTAL				\$900		
Allowance for Misc. Items	20%		\$900	\$180		
SUBTOTAL				\$1,080		
TOTAL ANNUAL O&M COST				\$1,100		

PRESENT VALUE ANALYSIS - 20 years						
			Discount Rate =		7%	
End Year	COST TYPE	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
0	CAPITAL COST	\$6,000	\$6,000	1.000	\$6,000	
30	ANNUAL O&M COST	\$33,000	\$1,100	12.409	\$13,650	
		\$39,000			\$19,650	
	TOTAL PRESENT VALUE OF ALTERNATIVE				\$20,000	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Subtask** **COST WORKSHEET 1**
 Element: **Confirmation Testing**

Site: Charleston Naval Complex
 Location: Combined SWMU 83
 Phase: Corrective Measures Study
 Base Year: 2003

Prepared By: SN
 Date: 12/02/2003

Checked By:
 Date:

WORK STATEMENT

Costs for soil confirmation sample collection, shipment and analysis on a per event basis.
 Total of 40 samples: 1 sidewall sample every 50 ft along a total perimeter of approximately 1200 LF = 24
 1 floor sample per 50 ft x 50 ft excavated area= 10 samples
 Add 6 QA/QC samples

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Equipment & Labor					
Jar Kits	40	EA	\$10	\$400	CH2M-Jones Est.
Coolers	6	EA	\$10	\$60	CH2M-Jones Est.
Disposable Gloves	5	BOXES	\$20	\$100	CH2M-Jones Est.
Collection of samples	30	HR	\$68	\$2,040	CH2M-Jones Est.
Sample Shipment	6	EA	\$20	\$120	CH2M-Jones Est.
Sample Analysis (SVOCs)	40	SAMPLE	\$95	\$3,800	GEL, PEL, STL average
Data Validation	10	HR	\$100	\$1,000	CH2M-Jones Est.
SUBTOTAL				\$7,520	
Allowance for Misc. Items	20%		\$7,520	\$1,504.00	
SUBTOTAL				\$9,024	
TOTAL COST				\$9,000	

OPERATION AND MAINTENANCE COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SUBTOTAL				\$0	
Allowance for Misc. Items	20%		\$0	\$0	
SUBTOTAL				\$0	
TOTAL O&M COST				\$0	

Source of Cost Data

1. Analytical Bid Form - Charleston Naval Complex - Level II

Alternative: **Subtask**
 Element: **Soil Excavation and Disposal**

COST WORKSHEET 2

Site: Charleston Naval Complex
 Location: Combined SWMU 83
 Phase: Corrective Measures Study
 Base Year: 2003

Prepared By: SN
 Date: 12/02/2003

Checked By: DFW
 Date: 12/02/03

WORK STATEMENT

Excavate soil and haul to disposal area; backfill with clean soil and restore surface to original condition.
 Remove and replace pavement.
 See quantity calcs

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mob/demob/decon	4	EA	\$1,000	\$1,500	
Utility checks and permits	32	HR	\$100	\$3,200	CH2M-Jones Est.
Air monitoring and sampling					
Asphalt cutting	1186	LF	\$1.15	\$1,364	CH2M-Jones Est.
Pavement removal	23105	SF	\$5.00	\$115,525	CH2M-Jones Est.
Excavation (soil) - machine	3	weeks	\$3,000	\$9,000	CH2M-Jones Est.
Pavement disposal - Non-Haz	1779	tons	\$45	\$80,055	CH2M-Jones Est.
Clean Fill	1061	CY	\$15	\$15,912	CH2M-Jones Est.
Compaction machine	5	day	\$50	\$250	CH2M-Jones Est.
Replace asphalt	23105	SF	\$2	\$46,210	CH2M-Jones Est.
Site Operator-Oversight	150	HR	\$100	\$15,000	CH2M-Jones Est.
Waste characterization TCLP	5	EA	\$150	\$750	
Contam Soil disposal - Non-Haz	1379	Tons	\$45	\$62,055	CH2M-Jones Est.
SUBTOTAL				\$350,820	
Allowance for Misc. Items	40%		\$350,820	\$140,328	30% Scope + 10% Bid
SUBTOTAL				\$491,149	
TOTAL UNIT COST				\$491,000	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SUBTOTAL				\$0	
Allowance for Misc. Items	20%		\$0	\$0	
SUBTOTAL				\$0	
TOTAL ANNUAL O&M COST				\$0	

Source of Cost Data

- Means. 2002. Environmental Remediation Cost Data - Assemblies, 8th Edition. R.S. Means Company
Kingston, MA.
- CH2M-Jones -historic costs for CNC excavations at other sites, 2001-2002.