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CORRECTIVE MEASURES STUDY REPORT SOLID WASTE MANAGEMENT UNIT 24 (SWMU 24) ZONE G CNC CHARLESTON SC

3/27/2003

CH2M HILL

CORRECTIVE MEASURES STUDY REPORT

SWMU 24, Zone G

Charleston Naval Complex
North Charleston, South Carolina

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

CH2M-Jones

March 2003

Contract N62467-99-C-0960

CH2M HILL
3011 SW Williston Road
Gainesville, FL 32608-3928
PO Box 147009
Gainsville, FL 32614-7009
Tel 352.335.7991
Fax 352.335.2959

CH2MHILL

March 27, 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) – SWMU 24, Zone G

Dear Mr. Scaturo:

Enclosed please find four copies of the CMS Report (Revision 0) for SWMU 24 in Zone G 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 Casey Hudson. Please contact him at 407/423-0030, ext. 251, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: Dann Spariosu/USEPA, w/att
Rob Harrell/Navy, w/att
Gary Foster/CH2M HILL, w/att

CORRECTIVE MEASURES STUDY REPORT

SWMU 24, Zone G

Charleston Naval Complex
North Charleston, South Carolina

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

PREPARED BY
CH2M-Jones

March 2003

Revision 0
Contract N62467-99-C-0960
158814.ZG.PR.11

Certification Page for Corrective Measures Study Report (Revision 0) — SWMU 24, Zone G

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.

3/21/2003

Date

Contents

Contents, Continued

Acronyms and Abbreviations

AOC	Area of concern
AST	Aboveground storage tank
BEQ	Benzo[a]pyrene equivalent
BRAC	Base Realignment and Closure Act
CA	Corrective action
CMS	Corrective measures study
CNC	Charleston Naval Complex
COC	Chemical of concern
COPC	Chemical of potential concern
EnSafe	EnSafe, Inc.
EPA	U.S. Environmental Protection Agency
FDS	Fuel distribution system
ft^2	Square feet
ft bls	Feet below land surface
HI	Hazard index
ILCR	Incremental Lifetime Cancer Risk
µg/kg	Micrograms per kilogram
LUC	Land use control
LUCMP	land use control management plan
MCL	Maximum contaminant level
MCS	Media cleanup standard
NAVBASE	Naval Base
PCB	Polychlorinated biphenyl
PPE	Personal protective equipment
RAO	Remedial action objective

Acronyms and Abbreviations, Continued

RCRA	Resource Conservation and Recovery Act
RDA	Redevelopment Authority
RFI	RCRA Facility Investigation
RGO	Remedial goal option
SCDHEC	South Carolina Department of Health and Environmental Control
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit
VOC	Volatile organic compound
yd^3	Cubic yard

1.0 Introduction

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

Corrective Action (CA) activities are being conducted under the Resource Conservation and Recovery Act (RCRA), with the South Carolina Department of Health and Environmental Control (SCDHEC) as the lead agency for CA activities at the CNC. All RCRA CA activities are performed in accordance with the Final Permit (Permit No. SC0 170 022 560). In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC.

A RCRA Facility Investigation (RFI) Report Addendum and Corrective Measures Study (CMS) Work Plan (RFIRA/CMSWP) were prepared for Solid Waste Management Unit (SWMU) 24 in Zone G of the CNC (CH2M-Jones, 2003). The RFIRA/CMSWP presented the remedial action objectives (RAOs) and media cleanup standards (MCSs) proposed for SWMU 24. This CMS report has been prepared by CH2M-Jones to complete the next stage of the CA process for SWMU 24.

1.1 Corrective Measures Study Report Purpose and Scope

This CMS report evaluates corrective measure (remedial) alternatives for preventing unacceptable exposure to contamination from benzo[a]pyrene equivalents (BEQs) found in the soil at SWMU 24. BEQs in surface soil are the only chemicals of concern (COCs) identified at SWMU 24 under the unrestricted (i.e., residential) and industrial land use scenarios. Figure 1-1 illustrates the location of SWMU 24 within Zone G.

This CMS report consists of: 1) the identification of a set of corrective measure alternatives that are considered to be technically appropriate for addressing soil contaminated with COCs; 2) an evaluation of the alternatives using standard criteria from U.S. Environmental Protection Agency (EPA) RCRA guidance; and 3) the selection of a recommended (preferred) corrective measure alternative for the site.

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

1.2 Background Information

This section of the CMS report presents background information on the facility, site history, and a summary of the nature and extent of the COCs at the site. This information is important to the understanding of the remedial goal options (RGOs), MCSs, and ultimately the evaluation of corrective measure alternatives for SWMU 24. Additional information on the site and hydrogeology in the Zone G area of the CNC is provided in the *Zone G RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1998).

1.2.1 Facility Description

SWMU 24, the former fuel reclamation facility for the CNC, consists of tanks 39-A and 39-D. The facility is located south of Hobson Avenue and east of Wood Street. Included within the boundary of SWMU 24 is SWMU 3, which is a former pesticide mixing area. SWMU 3 was investigated separately from SWMU 24, and the RFIRA/CMSWP for this site has been submitted under separate cover. Figure 1-2 presents the layout of SWMU 24, which includes the location of SWMU 3.

Tanks 39-A and 39-D operated as settling tanks to which recovered diesel fuel from military ships returning from sea operations, which contained water and presumably other impurities, was delivered through a pipeline system. The tanks were used to separate and store both the water and oil phase liquids. The recovered fuel was reused. Separated wastewater was subsequently discharged to the sanitary sewer system. The waste materials potentially associated with site operations include waste oil and petroleum products. SWMU 24 was originally investigated under the petroleum program as part of the fuel distribution system (FDS), but was transferred to the RCRA program to characterize metals in site groundwater.

Most of the area surrounding SWMU 24 is unpaved (vegetative), with a paved area primarily between tanks 39-A and 39-D and in the immediate area of Building 249. The surface of the secondary containment berms around tanks 39-A and 39-D and ground surface around the tanks are also covered with an old, somewhat degraded asphaltic material. The site is zoned M-1, for light industrial use. This area is expected to remain in industrial and commercial use, similar to the current use for the area. The CNC RCRA Permit identified the SWMU 24 site as requiring an RFI.

The RFIRA/CMSWP, prepared by CH2M-Jones, identified BEQs as COCs in surface soil at SWMU 24. Detailed information on the analytical results and the screening of those results for the determination of COCs can be found in the *Zone G RFI Report, Revision 0* (EnSafe, 1998), and the *RFI Report Addendum and CMS Work Plan for SWMU 24, Zone G, Revision 1* (CH2M-Jones, 2003).

1.2.2 Soil COC Summary

Soil sampling was conducted during a single event under the original RFI conducted in 1996, and during two subsequent RFI addendum investigations completed in 1999. The surface and subsurface RFI soil sample locations are presented in Figure 1-3. During the original RFI field work, four sample locations, identified as GFDSSH024 through GFDSSH027, were used to characterize the surface soil in select locations of the FDS. The four samples were analyzed for total petroleum hydrocarbons and two of the four samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and cyanide. During the second event completed in July 1999, four additional surface and subsurface soil samples were collected to evaluate potential soil contamination for the FDS in the areas west, south, and southeast of tank 39-A. The soil samples collected from these four locations, identified as GFDSSH028 through GFDSSH031, were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. As a result of the data obtained from these soil samples, an additional investigation was conducted by EnSafe as recommended in the *Zone G RFI Work Plan Addendum* (EnSafe, 2000) to delineate the extent of BEQs in surface and subsurface soil at SWMU 24. Nine additional surface soil and subsurface soil samples were collected in December 1999 and January 2000 to evaluate the extent of BEQs in surface soil surrounding GFDSSH026, GFDSSH029, and GFDSSH030. Soil samples collected from these locations, identified as G024SB001 through G024SB007, G024SB009, and G024SB010, were analyzed for SVOCs. In addition, the surface and subsurface soil samples collected from G024SB005 through G024SB007 were analyzed for metals.

Based on SCDHEC comments concerning the lack of soil data in the immediate area of a fuel distribution line at SWMU 24, four additional subsurface soil samples were collected along a pipeline that once serviced tanks 39-A, 39-D, and 3915. This pipeline runs underground along the north side of the tanks. The four subsurface soil samples collected from locations G024SB011 through G024SB014 were collected on October 10, 2002 and analyzed for VOCs and SVOCs.

The analytical results from these investigations and chemical of potential concern (COPC) screening were presented in *RFI Report Addendum and CMS Work Plan for SWMU 24, Revision 1* (CH2M-Jones, 2003). The RFIRA/CMSWP identified BEQs in surface soil as the only COCs for this site. No COCs were identified in subsurface soil or any other media. Figure 1-4 shows locations where BEQ concentrations exceed the BEQ screening criteria.

1.3 Report Organization

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

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

2.0 Remedial Goal Options and Proposed Media Cleanup Standards — Defines the RGOs and proposed MCSs for SWMU 24, in addition to the criteria used in evaluating the corrective measure alternatives for the site.

3.0 Overall Approach for Evaluating Focused Alternatives for SWMU 24 — Describes the alternative development process and presents the detailed evaluation criteria.

4.0 Description of Candidate Corrective Measure Alternatives — Describes each of the candidate corrective measure alternatives for addressing BEQs in soil.

5.0 Evaluation and Comparison of Corrective Measure Alternatives — Evaluates each alternative relative to standard criteria, then compares the alternatives and the degree to which they meet or achieve the evaluation criteria.

6.0 Recommended Corrective Measure Alternative — Describes the preferred corrective measure alternative to achieve the MCS and RGOs for BEQs in soil based on a comparison of the alternatives.

7.0 References — Lists the references used in this document.

Appendix A contains cost estimates developed for the proposed corrective measure alternatives.

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

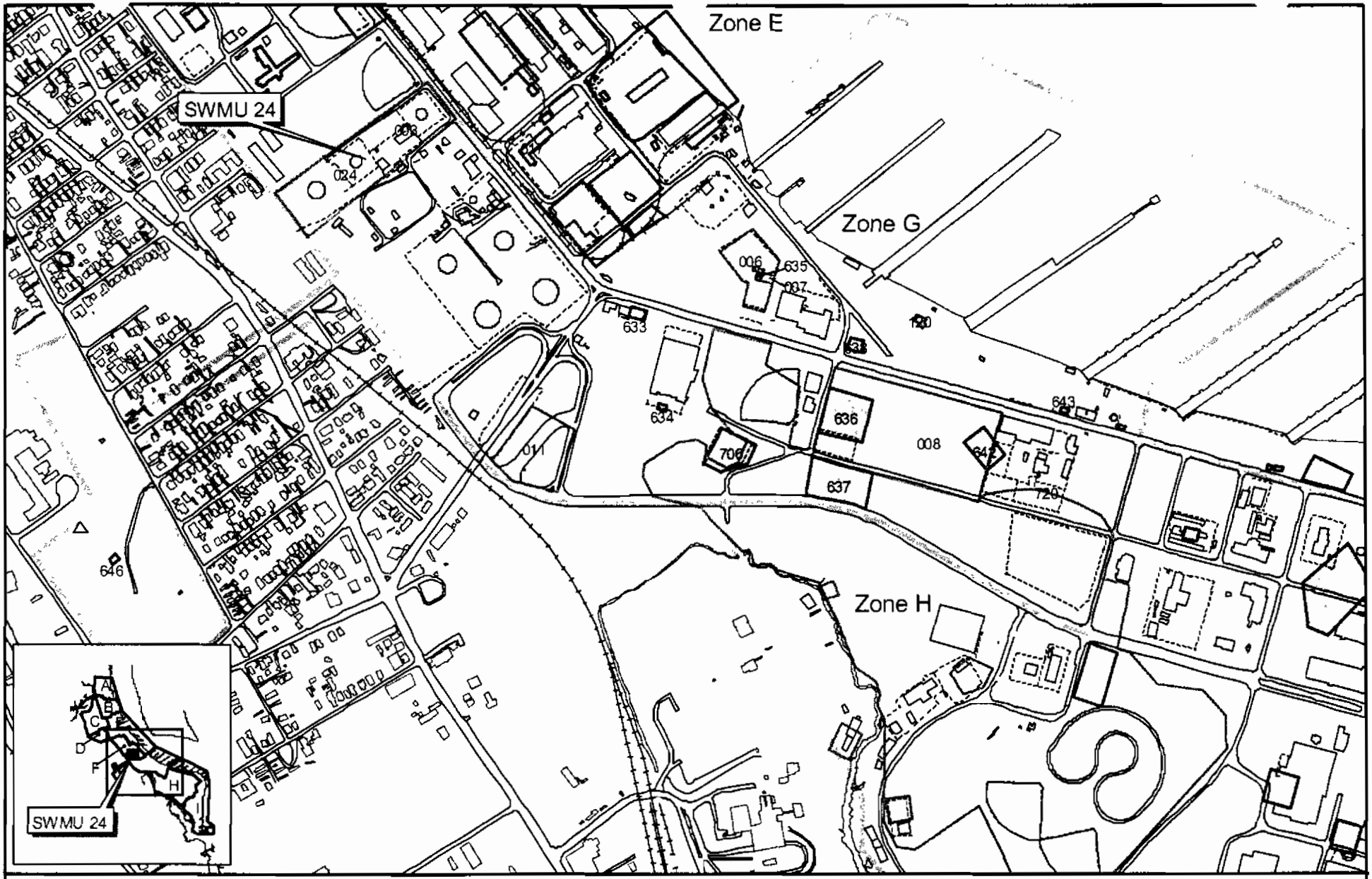

Figure 1-1
Site Location
SWMU 24, Zone G
Charleston Naval Complex

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File Path: C:\18gis\Projects\Zone_G\zoneg_location.fig apr. Date: 18 Nov 2002 7:31 User: NMOUDRY, SWMU 3 Figure 1-1 Zone G within CNC

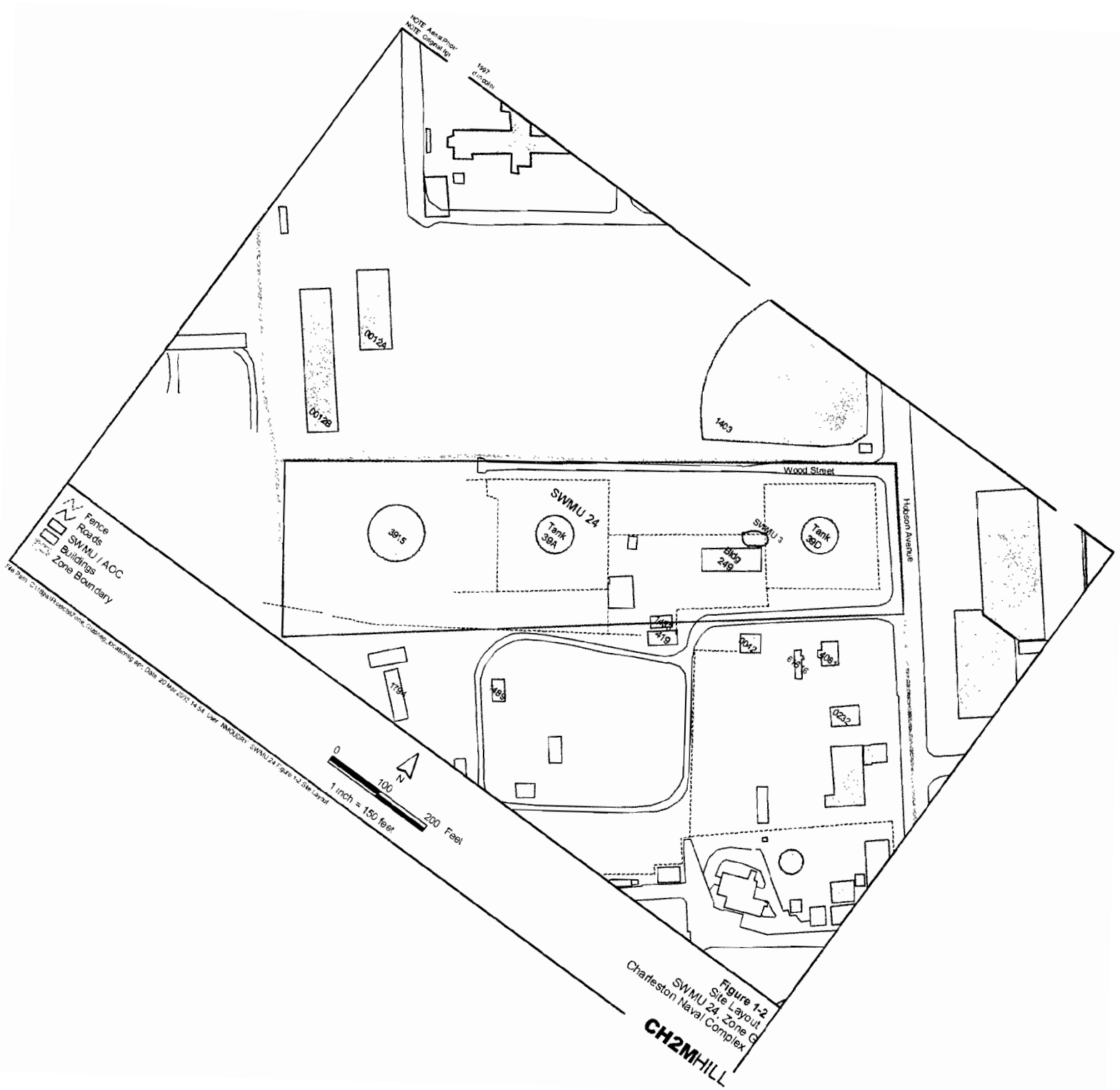

Figure 1-2
Site Layout
SWMU 24 - Zone G
Charleston Naval Complex

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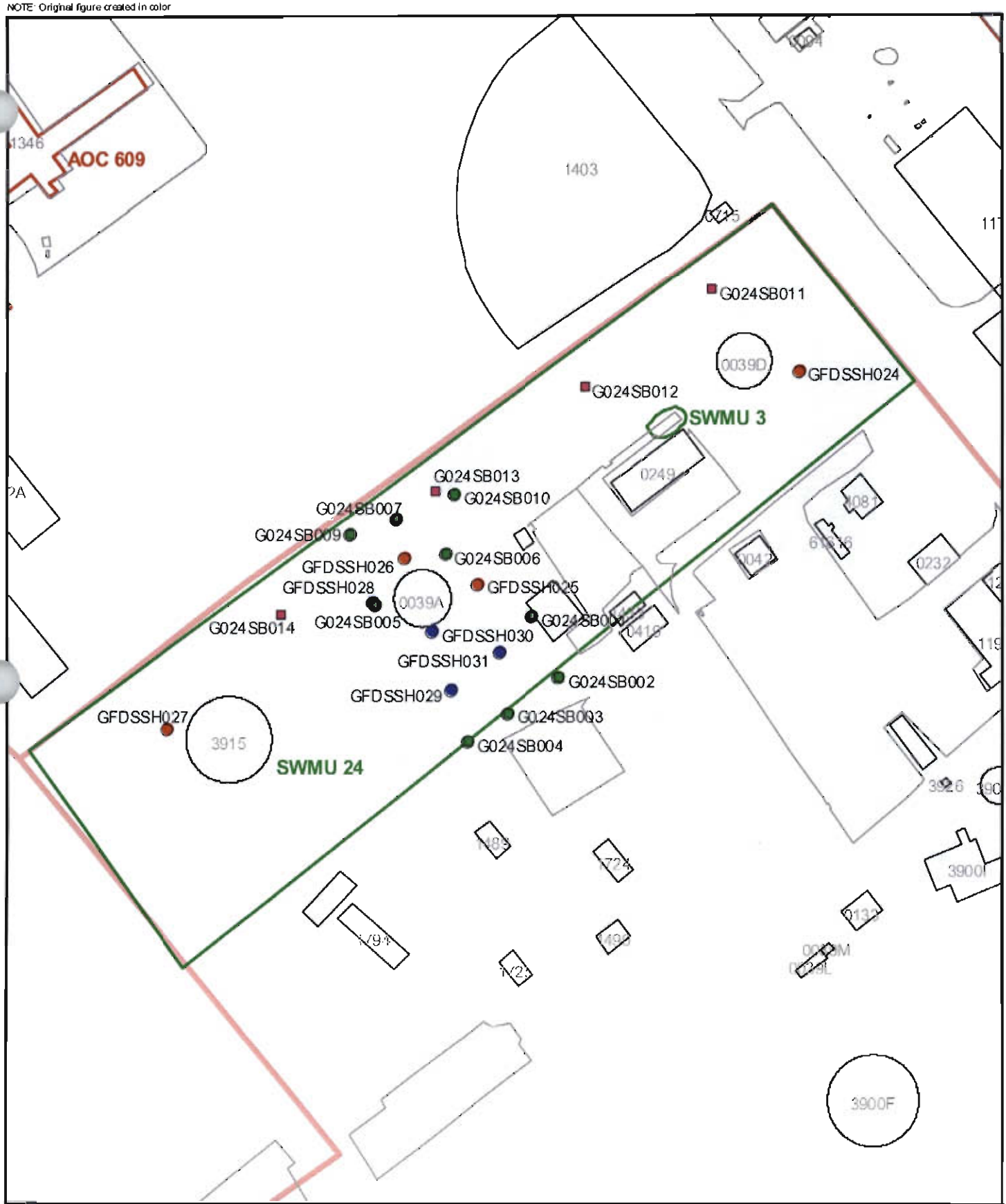

- Surface Soil RFI 10/96 (GFDSSH024-027)
- Surface Soil RFI Addendum 07/99 (GFDSSH028-031)
- Subsurface Soil RFI Addendum 12/99-01/00 (G024SB*)
- Surface Soil RFI Addendum 12/99-01/00 (G024SB*)
- Subsurface Soil RFI Addendum 10/02 (G024SB011-014)
- Pavement
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary

Figure 1-3
RFI and October 2002 Soil Sample Locations
SWMU 24, Zone G
Charleston Naval Complex

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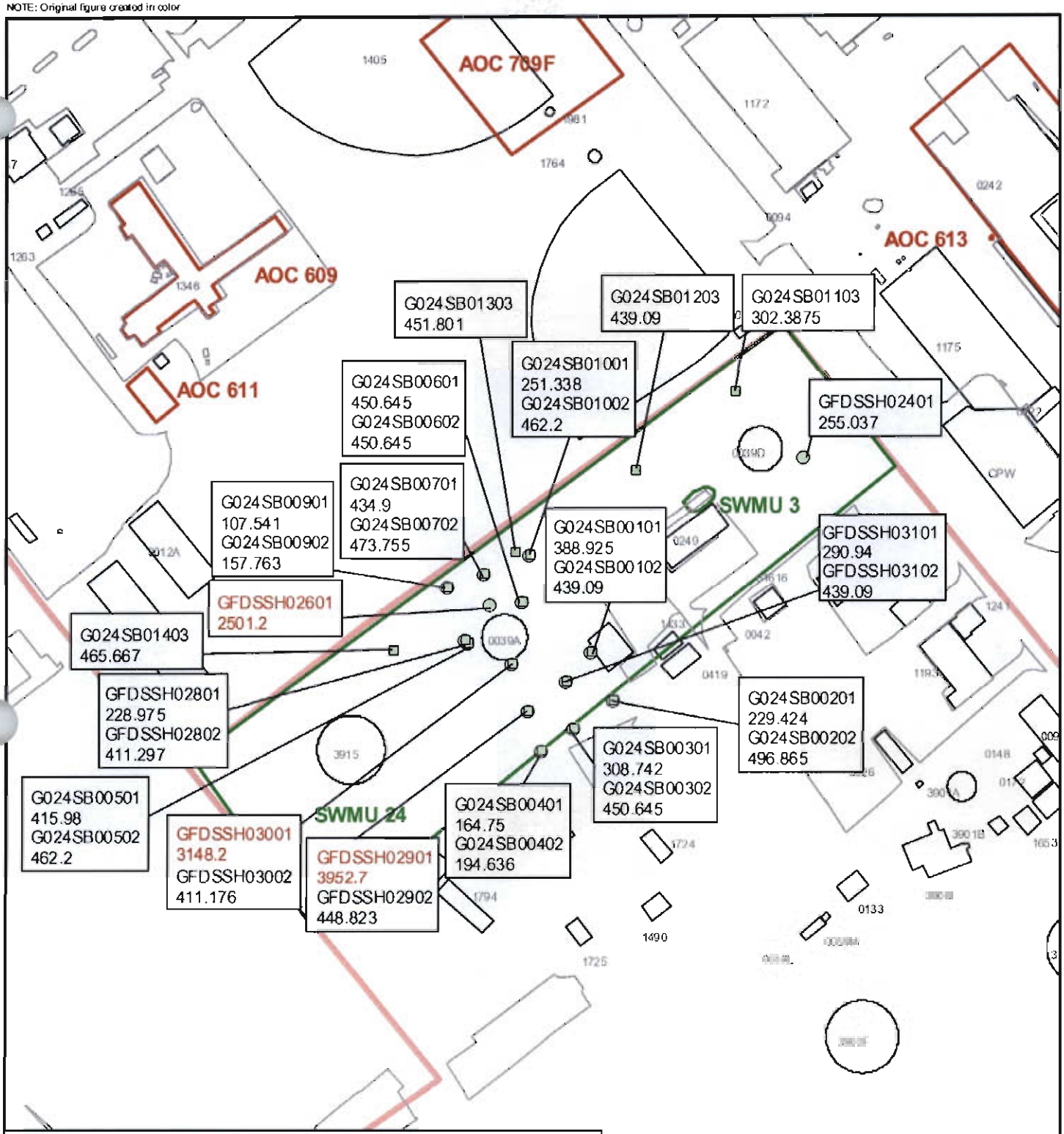
File Path: C:\16gis\Projects\Zone_G\SWMU_24\Aprs\swmu24_v2.apr, Date: 19 Mar 2003 6:32, User: NMOUDRY, Figure 1-3 Soil Samples

NOTE: Original figure created in color



NOTE:
1) BEQ background reference concentration:
Text in red highlights surface soil concentrations greater than the background reference concentration of 1304 ug/kg.
2) All concentrations are presented in ug/kg.

- Subsurface Soil
- Surface Soil
- Pavement
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary

N

0 200 400 Feet

1 inch = 200 feet

Figure 1-4
BEQs in Soil
SWMU 24, Zone G
Charleston Naval Complex

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File Path: C:\18gis\Projects\Zone_G\Swmu_24\Aprs\swmu24.apr, Date: 22 Apr 2002 12:55, User: ASPOSATO, EGIS: Charleston Naval Complex - Figure 4-2 BEQs in Soil

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 SWMU 24, Revision 1* (CH2M-Jones, 2003), the RAO for surface soil is to prevent ingestion and direct/dermal contact with soil containing COCs at unacceptable levels.

2.2 Media Cleanup Standards

MCSs for SWMU 24 were presented in the RFIRA/CMSWP. The CNC BEQ sitewide reference concentration of 1,304 micrograms per kilogram ($\mu g/kg$) developed by the BCT was recommended in the CMSWP for SWMU 24 as the MCS for BEQs in surface soil. The Technical Memorandum *Preliminary Results for Additional Background PAH Sampling from CNC Main Base Railroad Lines and Annex (Zone K)* (CH2M-Jones, 2001) summarizes the findings and results from the BEQ sitewide reference concentration evaluation.

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.

The focus of this CMS is to evaluate alternatives that will achieve the RAOs described above. The corrective measure alternatives evaluated include:

1) Soil removal and offsite disposal, and
2) LUCs

These alternatives are discussed in Section 4.0 of this CMS report.

3.0 Overall Approach for Evaluating Focused Alternatives for SWMU 24

3.1 Preferred Remedies

A variety of corrective measure approaches are conceptually feasible for addressing BEQs in soil at SWMU 24. However, remedy selection at the CNC has focused on a few demonstrated technologies. For contaminants in soil that are limited in area, the preferred technologies that are expected to be effective at the CNC include: 1) soil excavation and offsite disposal, and 2) LUCs. Generally, at sites with limited soil contamination, a preference exists for implementing one of these remedies to expedite the remedy selection and implementation processes, improve predictability of the remedy, and lower costs. These candidate alternatives are screened and evaluated using the conventional criteria presented below.

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

3.2 Evaluation Criteria

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

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

Each of these criteria is defined in more detail below:

1. **Protection of human health and the environment.** The alternatives will be evaluated on the basis of their ability to protect human health and the environment. The ability of an alternative to achieve this criterion may or may not be independent of its ability to achieve the other criteria. For example, an alternative may be protective of human health, but may not be able to attain the MCSs if the MCSs were not developed based on human health protection factors.

2. **Attainment of MCSs.** The alternatives will be evaluated on the basis of their ability to achieve the MCS defined in this CMS. Another aspect of this criterion is the time frame required to achieve the MCS. Estimates of the time frame for the alternatives to achieve RGOs will be provided.

3. **The control of the source of releases.** This criterion deals with the control of releases of contamination from the source (the area in which the contamination originated) and the prevention of future migration to uncontaminated areas.

4. **Compliance with applicable standards for management of wastes.** This criterion deals with the management of wastes derived from implementing the alternatives (i.e., treatment or disposal of contaminated soil removed from excavations). Corrective measure alternatives will be designed to comply with all standards for management of wastes. Consequently, this criterion will not be explicitly included in the detailed evaluation presented in the CMS, but such compliance would be incorporated into the cost estimates for which this criterion is relevant.

5. **Other factors.** Five other factors are to be considered if an alternative is found to meet the four criteria described above. These other factors are as follows:

    a. Long-term reliability and effectiveness

    Corrective measure alternatives will be evaluated on the basis of their reliability and the potential impact should the alternative fail. In other words, a qualitative assessment will be made as to the chance of the alternative's failing and the consequences of that failure.

    b. Reduction in the toxicity, mobility, or volume of wastes

    Alternatives with technologies that reduce the toxicity, mobility, or volume of the contamination will be generally favored over those that do not. Consequently, a qualitative assessment of this factor will be performed for each alternative.

    c. Short-term effectiveness

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

d. Implementability

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

e. Cost

A net present value of each alternative will be developed. These cost estimates will be used for the relative evaluation of the alternatives, not to bid or budget the work. The estimates will be based on information available at the time of the CMS and on a conceptual design of the alternative. They will be "order-of-magnitude" estimates with a generally expected accuracy of -50 percent to +100 percent for the scope of action described for each alternative. The estimates will be categorized into capital 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
- Alternative 2: LUCs

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

These three locations are within or near the secondary containment berm around tank 39-A. The surface of the berm area is covered with an old, somewhat degraded asphaltic material. There are storm sewer lines in the area of tank 39-A, and as a result, buried utilities may be encountered during the soil excavation. These utilities will need to be restored if they are impacted by the soil removal operations.

The estimated soil area necessary for removal to achieve the MCS for Alternative 1 is shown in Figure 4-1. A 20-percent scope contingency is also assumed and included in the cost for this alternative.

Because SWMU 24 is located outside Zone E of the CNC, LUCs will not be applied to the site after excavation and offsite disposal of BEQ-impacted soil.

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

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

The sections below describe each alternative in detail.

4.2 Alternative 1: Soil Excavation and Offsite Disposal

4.2.1 Description of the Alternative

This alternative will remove contaminated soil in areas that exceed the MCS established in Section 2.0. Exceedance locations will involve soil removal in the areas shown in Figure 4-1.

Excavated soil would be transported to a permitted landfill facility for long-term disposal, and the excavation would be filled with clean fill from an offsite borrow source. Once the soil is removed, the site would be acceptable for unrestricted land use, with no long-term monitoring required.

The proposed excavation area involves removal of soil from three locations. If encountered, asphaltic material in these three areas of elevated BEQ concentration may also be removed during excavation activities.

The extent of each excavation is approximately 10 feet by 10 feet for a total excavated area of 300 square feet (ft^2). For an assumed average depth of soil excavation of 1 ft below land surface (bls), the total in-place volume of soil to be removed from each area is about 3.7 cubic yards (yd^3). The total volume of soil to be removed from all excavation areas is 11.1 yd^3. Confirmation sampling would involve five samples (four sidewall samples and one floor sample) in each excavation area. An equal amount of clean backfill will be required to replace the volume of soil removed from the excavated area. Since each area of excavation is unpaved (vegetative), concrete or bituminous asphalt replacement is not required.

4.2.2 Other Considerations

Coordination with the CNC Redevelopment Authority (RDA) and the utility companies would be required for site restrictions during excavation, and traffic control is needed for the haul trucks. The potential for expansion of scope during confirmation testing is moderate. Because tank 39-A operated as a settling tank where water and oil phase liquid were separated and stored, there is a potential for the excavations to be expanded. Thus, a 20-percent contingency is assumed.

4.3 Alternative 2: Land Use Controls

4.3.1 Description of the Alternative

This alternative involves leaving the contaminated soil in place and instituting administrative/legal controls to restrict future use of the land. The controls would limit land use to activities that present less frequent exposure by sensitive populations to surface soil

and preclude uncontrolled disturbance of the contaminated soil, thus minimizing the potential for human exposure to the contamination. The addition of restrictions on soil disturbance and site occupancy would minimize potential for human exposure that could occur in a residential or industrial setting. The controls may be in the form of deed restrictions and/or easements (property interests retained by the Navy during property transfer to assure protectiveness of the remedy). Periodic monitoring would be required to assure controls are maintained; periodic site inspections would be required to assure compliance with the institutional controls. Controls may be layered (multiple controls at the same time) to enhance protectiveness. The Navy is negotiating a comprehensive LUCMP for the CNC.

4.3.2 Other Considerations

Currently, the Navy is the property owner and land use at the site, including the immediate area, is zoned for future light industrial use. Existing engineering controls include a berm and structures that prevent or limit access to contaminated soil. The location and proximity of the site to other industrial properties make residential use highly unlikely, and the berm structures hinder access to the soil by commercial/industrial users. Periodic monitoring of the deed controls and the site would be required. For the purpose of developing a representative cost estimate for this process, an annual evaluation that would include a site inspection is assumed.

NOTE Original figure created in color

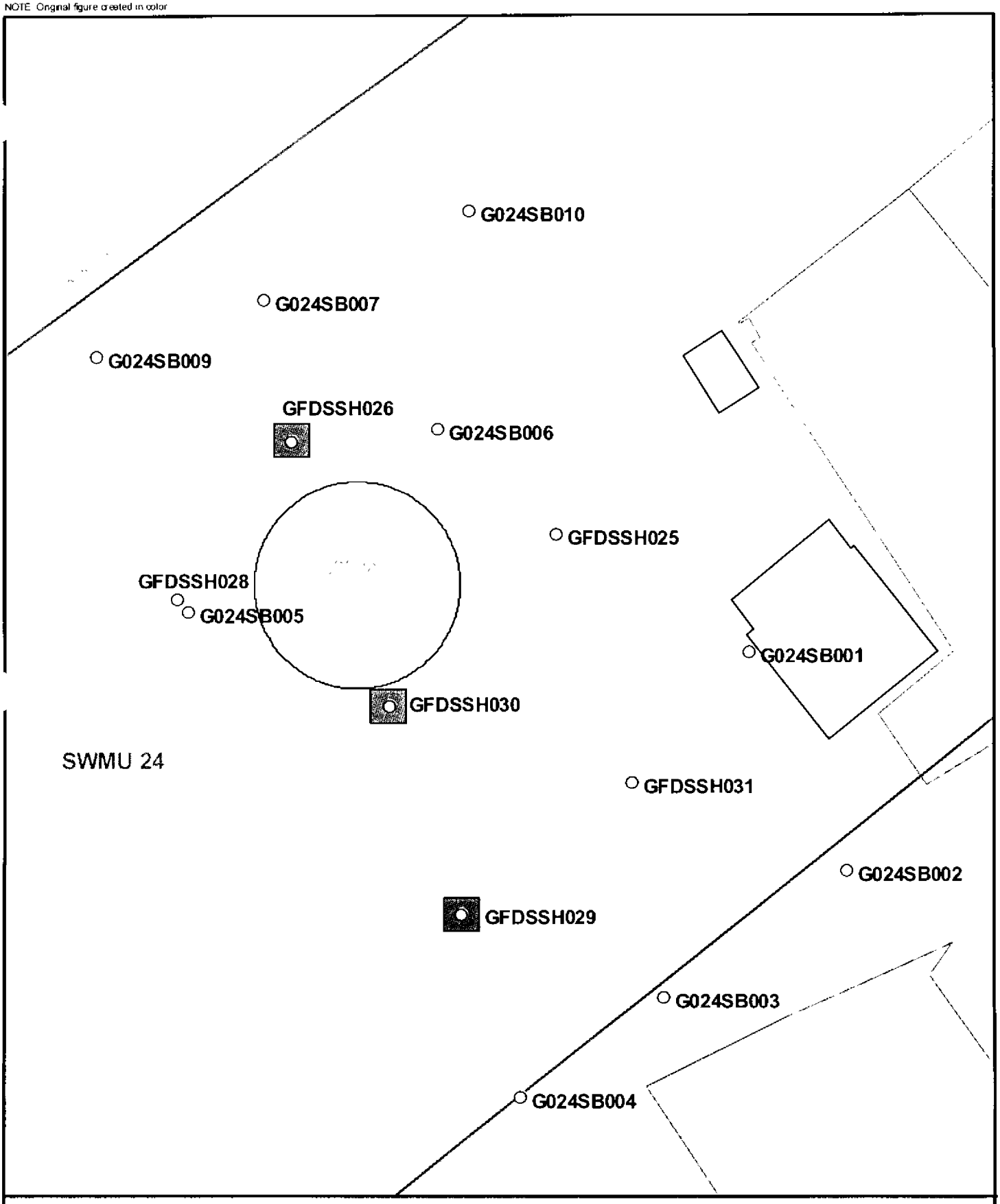

Figure 4-1
Proposed Soil Excavation Areas - CMS Alternative 1
SWMU 24, Zone G
Charleston Naval Complex

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File Path: c:\18gis\projects\zone_g\swmu_24\aprs\swmu24_v2.apr, Date: 17 Mar 2003 13:59, User: NMOUDRY, Figure 4-1 Proposed Soil Excavation Areas - CMS Alternative 1

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

The following assumptions were made for Alternative 1:

- Three areas would be targeted for soil excavation, as shown in Figure 4-1.
- A total of 11.1 yd^3 of soil (in-place measurement) would be excavated for offsite disposal at a Subtitle D facility and replaced with clean backfill.
- Any asphaltic material inadvertently recovered during soil excavation activities would be hauled with the BEQ-impacted soil to a Subtitle D facility.
- 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 20 percent.

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.

5.1.3 Control the Source of Releases

There are no ongoing sources of releases at SWMU 24; therefore, this issue is not applicable.

5.1.4 Compliance with Applicable Standards for the Management of Generated Wastes

Excavated soil will be sampled and analyzed for waste characterization prior to disposal. Soil, decontamination waste, and personal protective equipment (PPE) will be disposed in accordance with applicable regulations and permits. Offsite transportation and disposal will be performed by properly permitted and licensed subcontractors.

5.1.5 Other Factors (a) Long-term Reliability and Effectiveness

This alternative would have long-term reliability and be effective for the site, as long as all exceedances are removed. The removal of contamination from the site would be permanent. Uncertainty in the distribution of BEQs in soil is addressed by expanding the excavations beyond the RFI delineation, thus reducing the risk of failure of this alternative. Confirmation sampling would confirm that the excavations have removed soil exceedances. It is much less likely that any significant amount of soil with BEQ concentrations above the MCS will be left in place; sitewide average concentrations will be below the unrestricted MCS.

5.1.6 Other Factors (b) Reduction in the Toxicity, Mobility, or Volume of Wastes

Alternative 1 reduces the mobility of the contaminated soil by transporting it to a regulated containment facility (landfill). Treatment will not be required unless the soil exhibits toxicity characteristics per 40 CFR 261.24. If required, soil will be treated (stabilized/fixated) at the disposal facility to further reduce mobility of the BEQs.

5.1.7 Other Factors (c) Short-term Effectiveness

The excavation and hauling of contaminated soil in this alternative has the potential to create dust containing contaminated soil particles. However, standard engineering controls such as dust suppression during excavation, tarp covers on trucks, and worker PPE to prevent dust inhalation will be implemented. Thus, with controls, the alternative provides short-term effectiveness in preventing ingestion of or contact with the contaminated soil and minimizes the potential for migration of soil particles. The technologies for dust control and worker protection are well-established and robust. No unmanageable hazards would be created during implementation.

5.1.8 Other Factors (d) Implementability

Even though the three proposed soil excavation areas are within or near the berm area, this alternative will be moderately simple to implement. Most of the required activities have been routinely implemented at other sites using standard equipment and procedures. Utility

clearance, subcontracting, waste characterization, and base approval are other customary activities. The field implementation of this remedy is estimated to require 4 to 6 weeks, and the benefits will be immediate. There is ample offsite capacity for disposal (and treatment, if required) of the contaminated soil.

5.1.9 Other Factors (e) Cost

Appendix A presents the overall cost estimate for implementing this remedy. These costs reflect soil removal based on available RFI sample results. A scope contingency (20 percent) is added to cover additional excavation that may be required per results of confirmation testing. In summary, the costs include the following:

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

Using the assumptions listed above, the total present value of Alternative 1 is $54,000.

5.2 Alternative 2: Land Use Controls

The assumptions for Alternative 2 include the following:

- A basewide LUCMP will be developed for the CNC. The plan will allow for restrictions on the use of land at SWMU 24 and other areas, and the plan will be developed outside the scope of this CMS.
- Periodic monitoring will be performed for 30 years. The monitoring will consist of an annual site visit to confirm that site use(s) are consistent with the LUCMP.

5.2.1 Protection of Human Health and the Environment

This alternative is effective at protecting human health because it restricts future use of the site that would be inappropriate for the MCS exceedances at the site.

5.2.2 Attain MCS

This alternative would not achieve the MCS for BEQs.

5.2.3 Control the Source of Releases

There are no ongoing sources of releases at SWMU 24; therefore, this issue is not applicable.

5.2.4 Compliance with Applicable Standards for the Management of Generated Wastes

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

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

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

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

This alternative involves no treatment and does not reduce the toxicity, mobility, or volume of contaminated soil at SWMU 24.

5.2.7 Other Factors (c) Short-term Effectiveness

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

5.2.8 Other Factors (d) Implementability

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

5.2.9 Other Factors (e) Cost

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

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

5.3 Comparative Ranking of Corrective Measure Alternatives

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

TABLE 5-1
Qualitative Comparison of Corrective Measure Alternatives
Corrective Measures Study Report, SWMU 24, Zone G, Charleston Naval Complex

Criterion	Alternative 1 Soil Excavation and Offsite Disposal	Alternative 2 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	Not Applicable	Not Applicable
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 simple to implement due to site berm structure limiting ease of mobility.	Easy to implement
Cost Ranking	Moderately expensive	Inexpensive
Estimated Cost	$54,000	$20,000

6.0 Recommended Corrective Measure Alternative

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

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

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

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

Engineering controls to minimize future releases are already in place. Access to areas of elevated BEQ-impacted surface soil is restricted due to the existing berm structures. Planning is already underway to develop and implement administrative controls that would limit future site activities to those that would not involve unrestricted exposures. The expected reliability of this alternative is good.

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

7.0 References

CH2M-Jones. *Preliminary Results for Additional Background PAH Sampling from CNC Main Base Railroad Lines and Annex (Zone K).* Technical Memorandum. May 3, 2001.

CH2M-Jones. *RFI Report Addendum and CMS Work Plan, SWMU 24, Zone G.* Revision 1. January 17, 2003.

EnSafe Inc. *Zone G RFI Report, NAVBASE Charleston.* Revision 0. February 20, 1998.

EnSafe, Inc. *Zone G RFI Report Work Plan Addendum, NAVBASE Charleston.* Revision 0. January 17, 2000.

COMPARISON OF TOTAL COST OF REMEDIAL SOLUTIONS

Site:	Charleston Naval Complex	**Base Year:**	2003
Location:	SWMU 24	**Date:**	03/12/03
Phase:	Corrective Measures Study		

	Alternative Number 1	Alternative Number 2
Total Project Duration (Years)	<1	30
Capital Cost	$34,000	$6,000
Annual O&M Cost	$0	$1,100
Total Present Value of Solution	$54,000	$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

Location: SWMU 24
Phase: Corrective Measures Study
Base Year: 2003
Date: 03/12/03

Description: Excavation of contaminated soil, disposal offsite at permitted landfill, backfill with clean soil. Extent includes RFI sample points plus 20% scope contingency

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Confirmation Sampling	1	EA	$5,900	$5,900	See Confirmation Worksheet
Removal, Disposal and Backfill	1	EA	$14,000	$14,000	See Excavation 1 Worksheet
				$0	
SUBTOTAL				$19,900	
Contingency	30%		$19,900	$5,970	
SUBTOTAL				**$25,870**	
Project Management	8%		$25,870	$2,070	USEPA 2000, p. 5-13, $100K-$500K
Remedial Design	15%		$25,870	$3,881	USEPA 2000, p. 5 13, $100K-$500K
Construction Management	10%		$25,870	$2,587	USEPA 2000, p 5-13, $100K-$500K
SUBTOTAL				**$8,537**	
TOTAL CAPITAL COST				**$34,000**	

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	$34,000	$34,000	1 000	$34,000	
	ANNUAL O&M COST	$0	$0	0.000	$0	
		$34,000			$34,000	
	PRESENT VALUE OF LUC				$20,000	
	TOTAL PRESENT VALUE OF ALTERNATIVE				$54,000	

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: SWMU 24
Phase: Corrective Measures Study
Base Year: 2003
Date: 03/12/03

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	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).