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FINAL ACTION MEMORANDUM AREA OF CONCERN 7 (AOC 7) DRUM DISPOSAL AREA  
AND CAN PIT CHEATHAM ANNEZ FISC WILLIAMSBURG VA

4/1/2014  
CH2M HILL

Final

**Action Memorandum  
Area of Concern 7 – Drum Disposal Area and Can Pit**

**Naval Weapons Station Yorktown Cheatham Annex  
Williamsburg, Virginia**

**Contract Task Order WE38**

**April 2014**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**NAVFAC CLEAN 1000 Program  
Contract N62470-08-D-1000**

Prepared by



**CH2MHILL**

**Virginia Beach, Virginia**

**FINAL**

**ACTION MEMORANDUM FOR AREA OF CONCERN 7 – DRUM DISPOSAL AREA AND CAN PIT**

**Naval Weapons Station Yorktown, Cheatham Annex  
Williamsburg, Virginia**

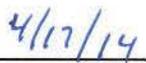
**DATE:** March 2014  
**SUBJECT:** Non-Time-Critical Removal Action at Area of Concern 7, the Drum Disposal Area and Can Pit, Naval Weapons Station Yorktown, Cheatham Annex  
**FROM:** Commander, Mid-Atlantic Division, Naval Facilities Engineering Command  
**TO:** Captain Paul C. Haebler  
Commanding Officer  
Naval Weapons Station Yorktown

This Action Memorandum documents approval for a surface soil and subsurface debris removal action as described herein for Area of Concern (AOC) 7, the Drum Disposal Area and Can Pit, at Naval Weapons Station Yorktown, Cheatham Annex, in Williamsburg, Virginia. This Action Memorandum serves as the Decision Document for selection of the Non-Time-Critical Removal Action (NTCRA), as evaluated in the Engineering Evaluation/Cost Analysis for AOC 7, prepared under separate cover and developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site. The NTCRA is not intended to represent the final remedial action decision for the site.

Conditions at AOC 7 meet the NCP Section 300.415(b) (2) criteria for a removal action. The Naval Facilities Engineering Command, Mid-Atlantic recommends approval of the proposed NTCRA. The total project ceiling, if approved, is estimated to be \$423,000. Response actions should commence as soon as practical to expedite the removal of surface soil and subsurface debris at the site.

Approved by:

  
\_\_\_\_\_  
Paul C. Haebler  
Captain, U.S. Navy  
Commanding Officer  
Naval Weapons Station Yorktown

  
\_\_\_\_\_  
Date

# Contents

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<b>Acronyms and Abbreviations .....</b>	<b>vii</b>
<b>I Purpose .....</b>	<b>1</b>
<b>II Site Conditions and Background .....</b>	<b>1</b>
A. Site Description .....	2
1 Removal Site Evaluation .....	2
2 Physical Location.....	3
3 Site Characteristics.....	3
4 Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant .....	3
5 National Priorities List Status.....	3
6 Maps, Pictures, and Other Graphic Representations .....	3
B. Other Actions .....	4
1 Previous Actions .....	4
2 Current Actions .....	4
C. State and Local Authorities' Roles .....	4
1 State and Local Actions to Date .....	4
2 Potential for Continued State/Local Response .....	4
<b>III Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities</b>	<b>4</b>
<b>IV Endangerment Determination .....</b>	<b>4</b>
<b>V Proposed Actions and Estimated Costs .....</b>	<b>5</b>
A. Proposed Actions .....	5
1 Proposed Action Description .....	5
2 Contribution to Remedial Performance .....	6
3 Description of Alternative Technologies.....	6
4 Applicable or Relevant and Appropriate Requirements.....	6
5 Project Schedule .....	6
B. Estimated Costs .....	6
<b>VI Expected Change in the Situation Should Action Be Delayed or Not Taken.....</b>	<b>7</b>
<b>VII Outstanding Policy Issues .....</b>	<b>7</b>
<b>VIII Enforcement.....</b>	<b>7</b>
<b>IX Recommendation .....</b>	<b>8</b>
<b>X References.....</b>	<b>8</b>

## Attachments

- A Final Engineering Evaluation/Cost Analysis for AOC 7
- B Public Notices and Responsiveness Summary

## Tables

- 1 AOC 7 – Drum Disposal Area and Can Pit Removal Action Cost – Alternative 3

## Figures

- 1 Location of CAX and AOC 7
- 2 AOC 7 Layout
- 3 NTCRA Proposed Removal Action Areas

# Acronyms and Abbreviations

AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CAX	Cheatham Annex
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CLEAN	Comprehensive Long-term Environmental Action – Navy
EE/CA	Engineering Evaluation/Cost Analysis
ERP	Environmental Restoration Program
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTCRA	Non-Time Critical Removal Action
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	Site Investigation
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
WPNSTA	Naval Weapons Station Yorktown
yd <sup>3</sup>	cubic yards

# I Purpose

This Action Memorandum documents approval for the non-time-critical removal action (NTCRA) to address surface soil and subsurface debris for Area of Concern (AOC) 7, the Drum Disposal Area and Can Pit, at Naval Weapon Station Yorktown (WPNSTA), Cheatham Annex (CAX), in Williamsburg, Virginia.

The Engineering Evaluation/Cost Analysis (EE/CA) for AOC 7 (**Attachment A**) focused on addressing metals in a surface soil “hotspot” at the Drum Disposal Area, surface soil within the Can Pit, and buried debris within the Can Pit. Potentially unacceptable risks to human health and the environment from exposure to site groundwater were not evaluated in the EE/CA, and will be addressed as part of the final remedy for AOC 7, as necessary.

This Action Memorandum serves as the Decision Document for the selection of the NTCRA, as formulated and evaluated in the EE/CA (**Attachment A**), and for the Department of the Navy (Navy) to conduct the work proposed therein. The alternatives evaluated in the EE/CA are summarized as follows:

- Alternative #1 – No action
- Alternative #2 – Excavation and Backfill (Drum Disposal Area Hot Spot) and Cover Installation and Land Use Controls (Can Pit)
- Alternative #3 – Excavation and Backfill (Drum Disposal Area Hot Spot and Can Pit)

This Action Memorandum was completed in accordance with the remedial program requirements defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the U.S. Environmental Protection Agency’s (USEPA’s) *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993).

The Navy has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out removal actions when the release is on, or the sole source of the release is from, a Navy Installation. The Navy and Marine Corps Environmental Restoration Program (ERP) was initiated to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps installations. This Action Memorandum follows the guidelines published in the Navy/Marine Corps Installation Restoration Manual (Naval Facilities Engineering Service Center, 2001) as well as the guidelines published in the *Navy Environmental Restoration Program Manual* (NAVFAC, 2006) and the *Superfund Removal Guidance for Preparing Action Memoranda* (USEPA, 2009).

# II Site Conditions and Background

On January 2, 2001, CAX was placed on USEPA’s National Priorities List (NPL) and is identified in the USEPA’s Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) as VA3170024605.

The following subsections describe the features and history of CAX and AOC 7. They also discuss the findings from previous site investigations, a site investigation for groundwater currently underway, and the detected contaminants that necessitated the preparation of the EE/CA.

## A. Site Description

CAX (**Figure 1**) is located on the site of the former Penniman Shell Loading Plant, a large powder and shell loading facility operated by the DuPont Company during World War I, which closed in 1918 and was dismantled shortly thereafter. Between 1923 and 1943, the property was used for farming or remained idle until CAX was commissioned in 1943 as a satellite unit of the Naval Supply Depot to provide bulk storage facilities and to serve as an assembly and overseas shipping point during World War II. The facility is divided into two separate parcels, with the larger parcel situated along the banks of the York River. Almost all of the activities at CAX (administration, training, maintenance, support, and housing) take place in the larger parcel. The smaller parcel is used mainly as a watershed protection area. In 1987, CAX was designated the Hampton Roads Navy Recreational Complex. In 1998, control of CAX was transferred from Fleet and Industrial Supply Center to WPNSTA Yorktown. The current mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel.

AOC 7 was identified in April 2004 when the Navy discovered two small debris disposal areas in the woods behind the CAX warehouse area. One of the debris disposal areas, referred to as the Drum Disposal Area, contained several empty, rusted pails and two empty, rusted 55-gallon drums on the ground surface. The other debris disposal area, referred to as the Can Pit, is an approximately 30-by-20-foot pit open to a depth of 4 feet below the ground surface (bgs). The Can Pit contained numerous empty, 5-gallon rusted cans labeled "tetrachloroethane" on the ground surface within the pit.

### 1 Removal Site Evaluation

In March and April 2006, a housekeeping effort was performed to remove the surface debris from the Drum Disposal Area and Can Pit. Following the housekeeping removal effort, all recovered surface debris from AOC 7 was transported offsite for proper disposal (Shaw, 2006). The Can Pit was encircled with an orange safety fence and left open following the housekeeping removal effort.

A site inspection (SI) was conducted at AOC 7 in October 2008. Test pits were excavated around both the Drum Disposal Area and the Can Pit and one test pit was excavated within the Can Pit to determine whether subsurface debris was present. No subsurface debris was found in the Drum Disposal Area. Subsurface debris was found to be present within the Can Pit, but no subsurface debris was found outside the Can Pit. Surface and subsurface soil and groundwater samples were also collected. The analytical data from these samples were used to perform human health and ecological risk screenings. The SI indicated potential unacceptable human health and ecological risks in surface soil (CH2M HILL, 2012).

In 2014, the EE/CA was completed to evaluate options to address potential unacceptable human health and ecological risks from exposure to contaminants in surface soil and to address an assumed potential for future impacts to site media, and therefore, an assumed potential future risk to human health and the environment, due to the presence of subsurface debris within the Can Pit. The EE/CA is included as **Attachment A**.

The EE/CA contains information concerning the nature and extent of contamination in the soil, as well as a description of the objectives of the NTCRA and analysis of various removal alternatives that were considered for AOC 7.

## 2 Physical Location

CAX consists of approximately 2,300 acres of land on the York-James Peninsula, northwest of WPNSTA Yorktown (**Figure 1**). It is located on the south bank of the York River within Williamsburg, Virginia. AOC 7 is located within a wooded area of CAX, along a hiking and nature trail immediately south of one of the southern fingers of Cheatham Pond (**Figure 2**).

## 3 Site Characteristics

AOC 7 consists of two small debris disposal areas. The topography of AOC 7 generally slopes northeast, towards Cheatham Pond, and surface runoff from precipitation is expected to flow northeast toward Cheatham Pond as well. There are no wetlands or surface water bodies located within AOC 7. In general, the uppermost soil layer within the vicinity of AOC 7 is predominantly silt with varying degrees of sand and clay. A thin layer of organic material (0.5 foot thick) was observed between 7 and 10 feet bgs. Below this layer, sands were observed. The first encountered groundwater underlying AOC 7 is the Yorktown-Eastover aquifer, found at depths ranging from approximately 9 to 20 feet bgs. Groundwater is expected to flow toward Cheatham Pond based on the surface topography.

## 4 Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant

Based on the data and results of the SI (CH2M HILL, 2012), it was determined there are potentially unacceptable risks to human health and the environment from exposure to metals in surface soil within the Can Pit (arsenic, chromium, iron, lead, and manganese) and at a localized surface soil hot spot (at SI soil location CAA07-SS03) within the Drum Disposal Area (arsenic, chromium, iron, lead, manganese, and zinc). In addition, there is an assumed potential for future impacts to site media, and therefore, an assumed potential future risk to human health, due to the subsurface debris within the Can Pit. There are no potential human health or ecological risks associated with subsurface soil at either the Drum Disposal Area or the Can Pit.

For groundwater, the SI data indicated potentially unacceptable risk to human health from exposure to ethylbenzene, aluminum, arsenic, chromium, iron, manganese, and vanadium. However, maximum concentrations were primarily associated with total metals and groundwater samples collected upgradient of the site. An Expanded SI is being conducted to further evaluate groundwater. Therefore, groundwater was not addressed in the EE/CA.

## 5 National Priorities List Status

On January 2, 2001, CAX was placed on USEPA's NPL. AOC 7 is among the ERP sites being addressed under CERCLA at CAX.

## 6 Maps, Pictures, and Other Graphic Representations

**Figure 1** and **Figure 2** illustrate the location of AOC 7 within CAX and the layout of AOC 7, respectively. **Figure 3** presents the proposed removal action areas to be addressed during the NTCRA. Additional figures included as part of the EE/CA (**Attachment A**) are:

**Figure 2-3** - AOC 7 Comprehensive Investigation Locations

**Figure 2-4** - AOC 7 Conceptual Site Model

**Figure 2-5** - Locations with COPCs and Subsurface Debris

**Figure 4-1** - Removal Action Alternatives Layout

## B. Other Actions

### 1 Previous Actions

No previous actions have been completed for AOC 7.

### 2 Current Actions

No current actions are being completed for AOC 7.

## C. State and Local Authorities' Roles

### 1 State and Local Actions to Date

Under Executive Order 12580, the President delegates authority to undertake CERCLA response actions to the Department of Defense. Congress further outlined this authority in the Defense Environmental Restoration Program Amendments, under 10 United States Code Sections 2701 through 2705. CERCLA Section 120 requires the Navy to apply state removal and remedial action law requirements at its facilities.

### 2 Potential for Continued State/Local Response

The Navy will continue to be the lead agency, and the Navy's ERP will continue to be the exclusive source of funding for remedial actions on CAX property. As members of the CAX Tier 1 Partnering Team, USEPA and the Virginia Department of Environmental Quality (VDEQ) will continue to be consulted until all necessary actions are complete.

## III Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities

Section 300.415 of the NCP lists the factors to be considered in determining the appropriateness of an NTCRA. Paragraph (b)(2)(i) of Section 300.415 applies to the conditions as follows:

**300.415(b)(2)(i)** "Actual or potential exposures to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants."

Based on the data and results of the SI (CH2M HILL, 2012), it was determined there are potentially unacceptable risks to human health and the environment from exposure to metals in surface soil within the Can Pit (arsenic, chromium, iron, lead, and manganese) and at a localized surface soil hot spot (at SI soil location CAA07-SS03) within the Drum Disposal Area (arsenic, chromium, iron, lead, manganese, and zinc). In addition, there is an assumed potential for future impacts to site media, and therefore, an assumed potential future risk to human health, due to the subsurface debris within the Can Pit. There are no potential human health or ecological risks associated with subsurface soil at either the Drum Disposal Area or the Can Pit.

Potentially unacceptable risk to human health from exposure to ethylbenzene, aluminum, arsenic, chromium, iron, manganese, and vanadium in groundwater were also identified in the SI. An Expanded SI is being conducted to further evaluate AOC 7 groundwater; therefore, groundwater was not addressed in the EE/CA and is not addressed by the NTCRA.

## IV Endangerment Determination

Actual or threatened releases of hazardous substances from AOC 7, if not addressed by implementing the NTCRA discussed in this Action Memorandum, may present an endangerment to human health and the environment.

## V Proposed Actions and Estimated Costs

### A. Proposed Actions

The scope of the removal action to be initiated at AOC 7 consists of excavation of a surface soil “hotspot” (SI soil sample location CAA07-SO03) at the Drum Disposal Area and excavation of surface soil and subsurface debris within the Can Pit. Potentially unacceptable risks associated with AOC 7 groundwater will be addressed, as necessary, as part of the final remedy for the site, following completion of the Expanded SI.

#### 1 Proposed Action Description

The preferred removal action alternative for surface soil and subsurface debris at AOC 7, as presented in the EE/CA (**Attachment A**), is Alternative 3, which consists of surface soil and subsurface debris excavation and offsite disposal, and replacement with clean fill, as needed.

Alternative 3 includes pre-excavation confirmation sampling to determine the removal action limits of excavation, mobilization, excavation, off-site disposal, and site restoration, summarized as follows and detailed in the EE/CA (**Attachment A**).

#### Drum Disposal Area

Pre-excavation confirmation samples will be collected to delineate the horizontal extent of the Drum Disposal Area “hot spot” removal action area (estimated to be a 25-foot radius or less around SI sample location CAA07-SS03). The surface soil within the Drum Disposal Area “hot spot” will be excavated to a depth of 6 inches bgs. For cost-estimating purposes, the size of the excavation area is estimated to be 2,000 ft<sup>2</sup> (removal of approximately 40 cubic yards (yd<sup>3</sup>) of soil). Post-excavation confirmation samples will not be required because the vertical extent of contamination is known (0 to 6 inches), and the horizontal extent of contamination will be delineated prior to excavation through the pre-excavation confirmation samples. An estimated total of approximately 50 loose yd<sup>3</sup> of clean topsoil will be used to backfill the excavation area to restore pre-existing conditions to support vegetation growth.

#### Can Pit

The soil and subsurface debris within the 600-ft<sup>2</sup> Can Pit will be excavated to the visible extent of the debris, estimated to be present to a maximum depth of 14 feet bgs (which is 10 feet below the surface of the open pit). Although subsurface soil within the Can Pit did not pose a potential risk to human health or the environment, given the relatively small removal volume, it is easier and less costly to remove and dispose of all soil down to the extent of the debris rather than try to segregate out the subsurface soil. An estimated total of 220 yd<sup>3</sup> of material will be excavated. As discussed in the EE/CA, post-removal confirmation samples will not be required. An estimated total of approximately 390 loose yd<sup>3</sup> of clean fill material will be brought in (approximately 20 yd<sup>3</sup> of topsoil and approximately 370 yd<sup>3</sup> of general fill) to be used to backfill the excavation area to match the surrounding grade. General fill will be used to bring the grade to within 6 inches of the final grade, followed by the placement of a 6-inch topsoil layer to better support vegetation growth.

Prior to the offsite transporting of excavated soil and debris from the Drum Disposal Area and Can Pit, waste characterization sampling will be conducted in accordance with the requirements of the disposal facility. Any materials classified as hazardous will be appropriately transported and disposed in accordance with applicable requirements. All materials will be disposed in a state-permitted disposal facility that is approved by the Navy and is permitted to accept CERCLA waste.

## 2 Contribution to Remedial Performance

This NTCRA will mitigate the potential unacceptable human health and ecological risks from exposure to surface soil, and the assumed potential for future impacts to site media and assumed future risk to human health from subsurface debris. Soil excavation will be deemed complete when the lateral (to be defined through pre-excavation confirmation sampling) and vertical (0 to 6 inches) extents of removal have been achieved. Debris excavation will be deemed complete through visual confirmation that native soil has been reached. As a result, confirmation samples are not required upon completion of NTCRA activities.

Groundwater will be addressed, as necessary, separately and as part of the final remedy for the site. Removal of impacted surface soil and removal of subsurface debris during the NTCRA will contribute to the effectiveness of a long-term site remedy by eliminating exposure pathways for soil, mitigating potentially unacceptable risks, and minimizing the potential for the migration of contaminants from soil to groundwater.

## 3 Description of Alternative Technologies

Three alternatives were assessed for addressing the surface soil and subsurface debris. These alternatives were evaluated and compared based upon their effectiveness, implementability, and cost. The EE/CA (**Attachment A**) describes the considered alternatives in greater detail, as well as the process by which the alternatives were selected, evaluated, and compared.

## 4 Applicable or Relevant and Appropriate Requirements

The NCP requires that removal actions attain federal and state applicable or relevant and appropriate requirements (ARARs) to the extent practicable, with limited exception. Analysis of the removal action alternatives for AOC 7 with the applicable ARARs is presented in the attached EE/CA (**Attachment A**). The NTCRA set forth in this Action Memorandum will comply with ARARs to the extent practicable.

## 5 Project Schedule

The public notice of availability for the EE/CA was published on February 15, 2014 and February 16, 2014 in the *Virginia Gazette* and *Daily Press*, respectively. The EE/CA was made available for public review and comment from February 15, 2014 through March 18, 2014. The public notice and responsiveness summary are included as **Attachment B**. No public comments were received.

The proposed project schedule for the removal action is:

- Pre-excavation confirmation sampling, subcontracting, work plan, and mobilization—10 months
- Removal action—1 month
- CERCLA documentation—4 months

## B. Estimated Costs

The NCP 40 Code of Federal Regulations Part 300.415 dictates statutory limits of \$2 million and 12 months for USEPA fund-financed removal actions, with statutory exemption for emergencies and actions consistent with the removal action to be taken. This removal action will not be USEPA fund-financed. The Navy's ERP does not limit the cost or duration of the removal action (Navy, 2006).

## Response Action Contract

The Navy will contract with an environmental remediation contractor to perform the required work associated with AOC 7. The estimated costs are itemized in **Table 1**. Detailed cost estimates are provided in the EE/CA (**Attachment A**). The estimated costs are provided to an accuracy of +50 percent and -30 percent.

**Table 1**

AOC 7 Drum Disposal Area and Can Pit Removal Action Cost – Alternative 3

Work Planning Documents	\$47,000
Mobilization/Demobilization, Site Setup, and Site Restoration Total	\$39,235
Construction Crew and Heavy Equipment Total	\$78,945
Pre-Excavation Confirmation Sampling (Drum Disposal Area)	\$2,970
Material (top soil and general fill) and delivery	\$6,967
T&D of Excavated Soil and Debris	\$31,018
Waste Characterization Sampling	\$2,070
<b>Subtotal</b>	<b>\$208,205</b>
Contingency (15%)	\$31,231
Construction Management (10%)	\$20,820
Project Management (8%)	\$16,656
<b>Subtotal</b>	<b>\$276,912</b>
Performance Bond (2%)	\$5,538
<b>TOTAL CAPITAL COST of ALTERNATIVE 3</b>	<b>\$282,000</b>
-30 percent	\$197,000
+50 percent	\$423,000

## VI Expected Change in the Situation Should Action Be Delayed or Not Taken

If the proposed NTCRA is not taken at this time or is delayed, the human health and ecological risks from the surface soil and assumed potential future impact to site media and human health risk from the subsurface debris will remain. The groundwater will be addressed separately as part of the final remedy for the site. Groundwater is not used as a potable resource at CAX or AOC 7; CAX receives its potable water from the City of Newport News, VA.

## VII Outstanding Policy Issues

There are no outstanding policy issues regarding this action.

## VIII Enforcement

The Navy can and will perform the proposed response actions promptly and properly.

## IX Recommendation

This Action Memorandum documents the selected removal action for surface soil and subsurface debris at AOC 7, CAX, in Williamsburg, Virginia, developed in accordance with CERCLA, as amended, and consistent with the NCP. The technical foundation for this decision is based on the results of an SI documented in the Administrative Record file for CAX.

Conditions at the site meet the NCP section 300.415(b)(2) criteria for a removal action. Naval Facilities Engineering Command Mid-Atlantic, in cooperation with USEPA Region 3 and VDEQ, recommends approval of the proposed removal action. If approved, the total project ceiling will be \$423,000 (using +50 percent of the cost estimate as provided in the EE/CA). The response action is necessary due to the potential threat to human health and the environment from AOC 7 and should commence as soon as practical to mitigate potential unacceptable human health and ecological risks.

## X References

CH2M HILL, 2011. *Final Background Study Report, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia*. May.

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USEPA. 2009. *Superfund Removal Guidance for Preparing Action Memoranda*.

**Figures**

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- Legend**
- Site Boundary
  - Activity Boundaries
  - City/County Boundaries

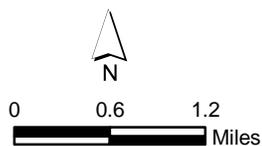
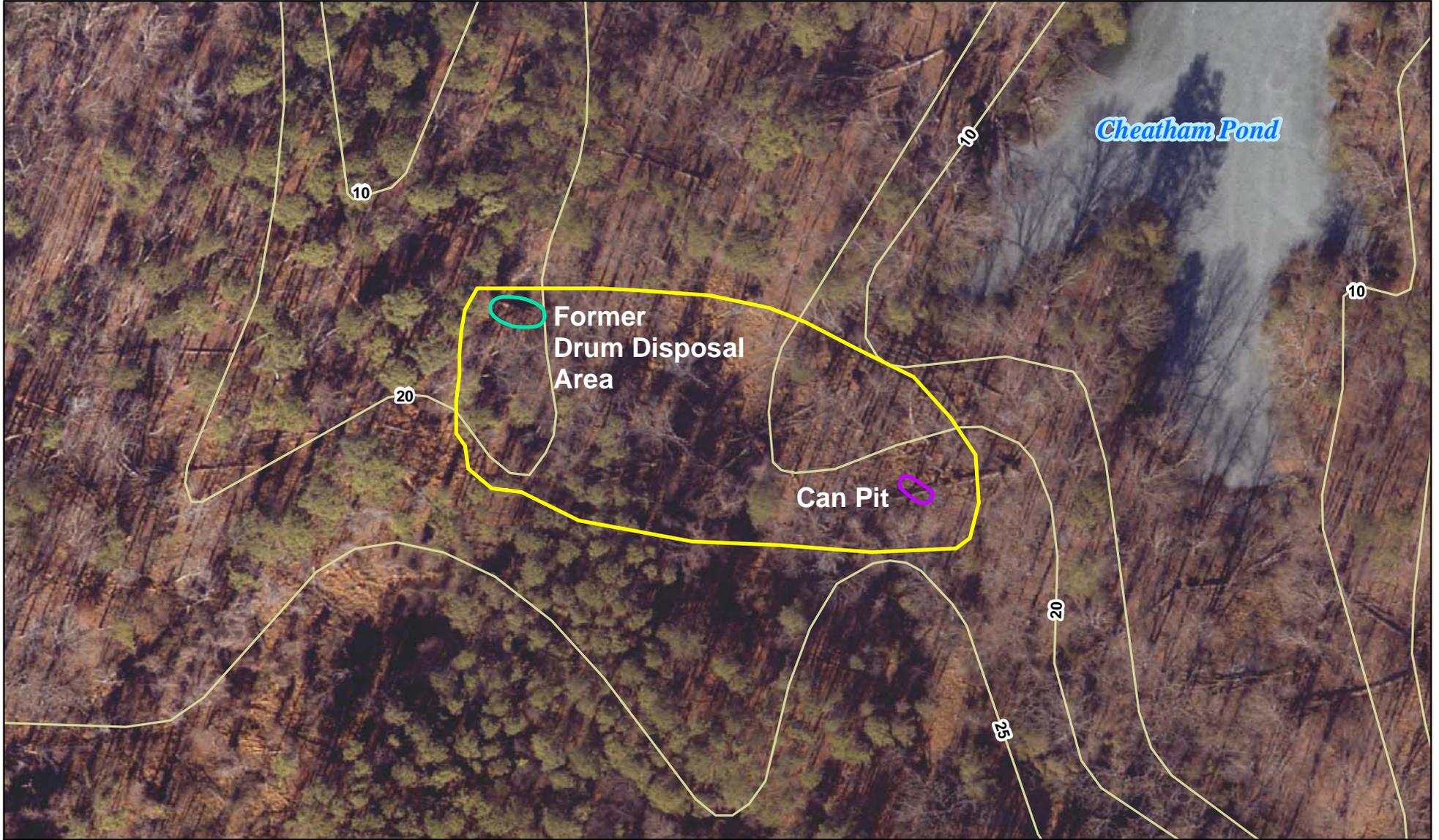


Figure 1  
Location of CAX and AOC 7  
Action Memorandum for AOC 7  
Cheatham Annex  
Williamsburg, Virginia



**Legend**

-  Approximate AOC 7 Study Area
-  Approximate Area of the Former Drum Disposal Area
-  Approximate Area of the Can Pit
-  Topographic Surface Contour (feet above mean sea level)

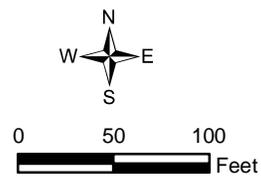
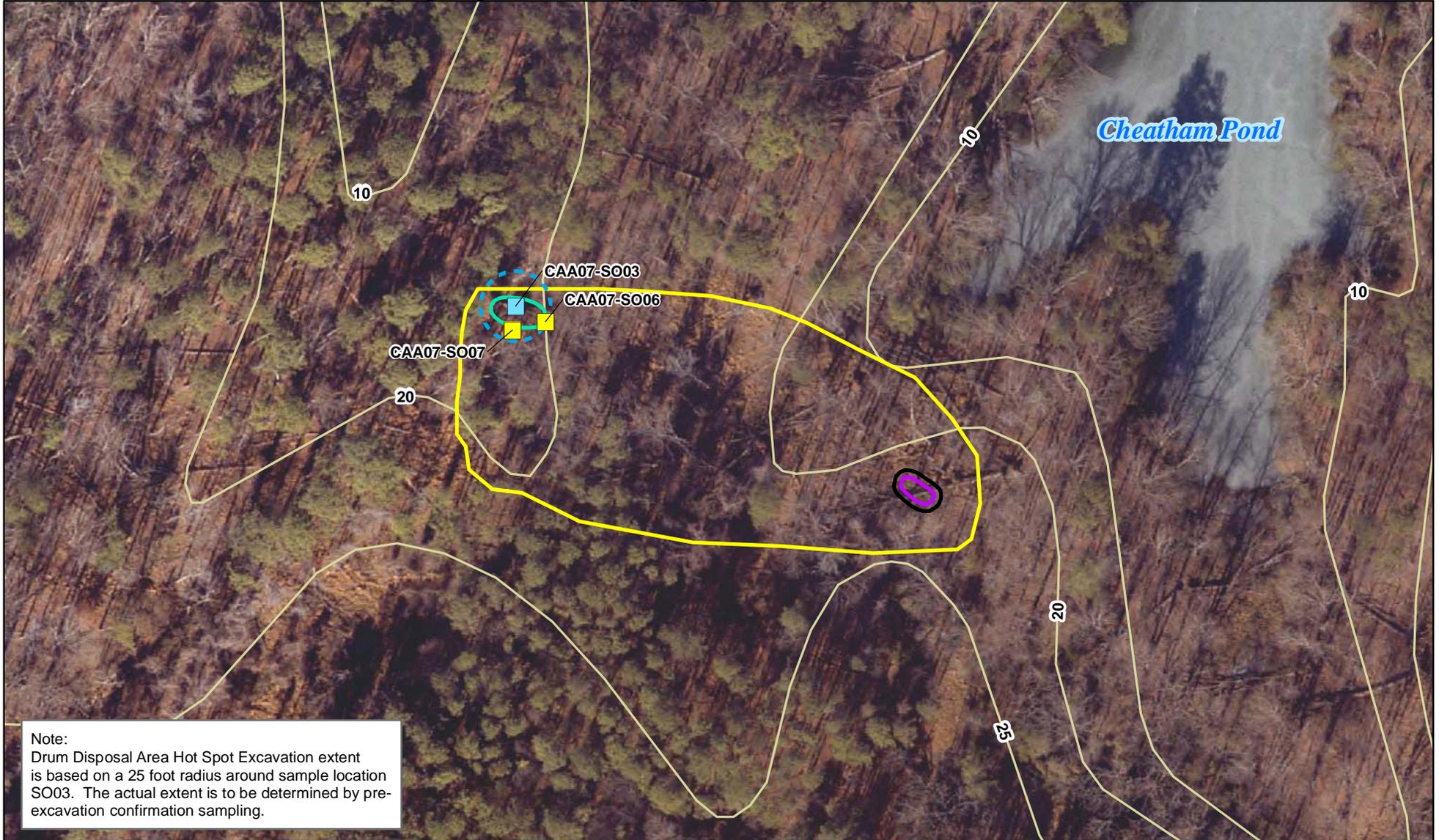


Figure 2  
AOC 7 Layout  
Action Memorandum for AOC 7  
Cheatham Annex  
Williamsburg, Virginia



Note:  
 Drum Disposal Area Hot Spot Excavation extent is based on a 25 foot radius around sample location SO03. The actual extent is to be determined by pre-excavation confirmation sampling.

**Legend**

- Groundwater, Surface Soil (0-6"), and Shallow Subsurface Soil (6-24") Sample Location
- Surface Soil (0-6"), Shallow Subsurface Soil (6-24"), and Deep Subsurface Soil (10') Sample Location
- Topographic Surface Contour (feet above mean sea level)
- Approximate AOC 7 Study Area
- Approximate area of the Former Drum Disposal Area
- Approximate area of the Can Pit
- Approximate Extent of Can Pit Soil Cover (Alternative 1) or Excavation (Alternative 2)
- Approximate Extent of Drum Disposal Area Hot Spot Excavation (Alternative 1 and 2)

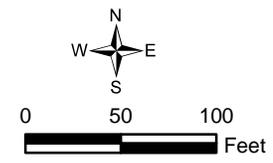


Figure 3  
 Removal Action Alternatives Layout  
 Action Memorandum for AOC 7  
 Cheatham Annex  
 Williamsburg, Virginia

**Attachment A**  
**Final EE/CA AOC 7**  
**(Drum Disposal Area and Can Pit)**

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Final

**Engineering Evaluation and Cost Analysis for  
Area of Concern 7—Drum Disposal Area and Can Pit**

**Naval Weapons Station Yorktown Cheatham Annex  
Williamsburg, Virginia**

**Contract Task Order WE38**

**March 2014**

Prepared for

**Department of the Navy  
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Prepared by



**CH2MHILL**

**Virginia Beach, Virginia**

# Executive Summary

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This report presents an Engineering Evaluation and Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) at Area of Concern (AOC) 7, Naval Weapons Station (WPNSTA) Yorktown, Cheatham Annex, Williamsburg, Virginia. AOC 7 consists of the Drum Disposal Area and Can Pit. A Site Investigation conducted at AOC 7 has identified potential unacceptable risk to human health and the environment posed by exposure to contaminants in surface soil and subsurface debris.

The goals of the EE/CA are to identify the objectives of the removal action, identify removal action alternatives to achieve those objectives, and evaluate the effectiveness, implementability, and cost of those alternatives. The removal action objectives are to:

- Prevent exposure to contaminants in subsurface debris and surface soil at concentrations potentially posing unacceptable risks to human health and the environment.
- Minimize the potential for the migration of contaminants from the surface soil and subsurface debris to groundwater.

The following three removal action alternatives were identified and evaluated:

1. No action: No action would be conducted; the site would remain “as is.”
2. Excavation and backfill (Drum Disposal Area Hot Spot) and soil cover and land use controls (LUCs) (Can Pit): Excavation of the Drum Disposal Area Hot Spot vertically to 6 inches below ground surface (bgs) and horizontally to the extent delineated by pre-excavation confirmation samples; backfill of the Drum Disposal Area Hot Spot; and construction of a soil cover over the surface soil and subsurface debris posing human health and ecological risks within the Can Pit. Future actions would include periodic inspections and maintenance of the soil cover and implementation of LUCs to prevent unauthorized disturbance of the cover.
3. Excavation and backfill (Drum Disposal Area Hot Spot and Can Pit): Excavation of the Drum Disposal Area Hot Spot vertically to 6 inches bgs and horizontally to the extent delineated by pre-excavation confirmation samples; excavation of the surface soil and subsurface debris posing human health and ecological risks within the Can Pit; and backfill of the Drum Disposal Area Hot Spot and Can Pit.

Alternative 1 does not meet the objectives of the removal action; however, it is provided as a basis for comparison. Alternative 2 would be less protective than Alternative 3 because subsurface debris within the Can Pit that may present the potential for future impacts to site media would be left in place under Alternative 2, resulting in a greater magnitude of risk than Alternative 3 remaining after the removal action. However, LUCs and Operation and Maintenance would be conducted as part of Alternative 2 to ensure the removal action remains protective of human health and the environment over time. Alternative 3 would be more difficult to implement than Alternative 2 because the Can Pit would be excavated to an assumed maximum depth of 14 feet bgs, which would require sloping or shoring of the excavation; however, Alternative 3 is less expensive than Alternative 2. Alternative 3 is the recommended removal action alternative because it results in the complete removal of debris and impacted surface soil, plus it is the lowest cost alternative that meets removal action objectives.

In accordance with the National Oil and Hazardous Substance Pollution Contingency Plan, this EE/CA will be placed in the Administrative Record and notice of its availability for public review, along with a brief summary of the EE/CA, will be published in the local newspaper. The EE/CA will then be available for review during a 30-day public comment period. A public information session may be held during or immediately following the public comment period, if requested. Following the public comment period, if comments are received, a Responsiveness Summary documenting responses to significant comments will be prepared and included in an Action Memorandum, which will be placed in the Administrative Record.

# Contents

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<b>Executive Summary</b> .....	<b>iii</b>
<b>Acronyms and Abbreviations</b> .....	<b>vii</b>
<b>1 Introduction</b> .....	<b>1-1</b>
1.1 Regulatory Background .....	1-1
1.2 Purpose and Objectives .....	1-2
<b>2 Site Characterization</b> .....	<b>2-1</b>
2.1 Facility Background and Description .....	2-1
2.2 Area of Concern 7 Background and Description.....	2-1
2.2.1 Previous Environmental Activities.....	2-1
2.2.2 Nature and Extent of Contamination .....	2-2
2.2.3 Risk Summary .....	2-2
2.3 Determination of Removal Action Areas.....	2-3
2.4 Development of Cleanup Goals.....	2-4
<b>3 Identification of Removal Action Objectives</b> .....	<b>3-1</b>
3.1 Statutory Limits on Removal Action .....	3-1
3.2 Removal Action Objectives and Scope .....	3-1
3.3 Determination of Removal Action Schedule .....	3-1
3.4 Applicable or Relevant and Appropriate Requirements.....	3-2
3.5 General Disposal Requirements .....	3-2
<b>4 Description and Evaluation of Removal Action Alternatives</b> .....	<b>4-1</b>
4.1 Description of Removal Action Alternatives.....	4-1
4.1.1 Alternative 1: No Action .....	4-1
4.1.2 Alternative 2: Excavation and Backfill (Drum Disposal Area Hot Spot) and Soil Cover and Land Use Controls (Can Pit) .....	4-1
4.1.2.1 Drum Disposal Area Hot Spot.....	4-1
4.1.2.2 Can Pit.....	4-2
4.1.2.3 Site Restoration .....	4-2
4.1.3 Alternative 3: Excavation and Backfill (Drum Disposal Area Hot Spot and Can Pit).....	4-3
4.1.3.1 Drum Disposal Area Hot Spot .....	4-3
4.1.3.2 Can Pit.....	4-3
4.1.3.3 Activities Common to Both Removal Areas.....	4-3
4.2 Evaluation of Alternatives.....	4-4
4.2.1 Evaluation Criteria .....	4-4
4.2.2 Effectiveness.....	4-4
4.2.3 Implementability .....	4-4
4.2.4 Cost.....	4-5
4.2.5 Evaluation of Alternatives .....	4-5
<b>5 Comparative Analysis of Removal Action Alternatives</b> .....	<b>5-1</b>
5.1 Effectiveness.....	5-1
5.2 Implementability.....	5-1
5.3 Cost.....	5-1
<b>6 Recommended Removal Action Alternative</b> .....	<b>6-1</b>
<b>7 References</b> .....	<b>7-1</b>

## **Appendixes**

- A Applicable or Relevant and Appropriate Requirements Tables
- B Sustainability Assessment
- C Cost Estimates

## **Tables**

- 2-1 Surface Soil Preliminary Remediation Goals for the Drum Disposal Area Hot Spot
- 4-1 Evaluation of Removal Action Alternatives
- 5-1 Removal Action Alternative Comparison

## **Figures**

- 2-1 Location of CAX and AOC 7
- 2-2 AOC 7 Layout
- 2-3 AOC 7 Comprehensive Investigation Locations
- 2-4 AOC 7 Conceptual Site Model
- 2-5 Locations with COPCs and Subsurface Debris
- 4-1 Removal Action Alternatives Layout

# Acronyms and Abbreviations

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AOC	Area of Concern
AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CAX	Cheatham Annex
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	constituent of potential concern
E&S	erosion and sediment
EE/CA	Engineering Evaluation and Cost Analysis
ft <sup>2</sup>	square foot
kg	kilogram
LUC	land use control
mg	milligram
mg/day	milligram per day
mg/kg	milligram per kilogram
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NTCRA	non-time-critical removal action
O&M	operation and maintenance
PRG	preliminary remediation goal
RAO	removal action objective
RSL	regional screening level
SARA	Superfund Amendments and Reauthorization Act
USEPA	United States Environmental Protection Agency
WPNSTA	Naval Weapons Station
yd <sup>3</sup>	cubic yard

## SECTION 1

# Introduction

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This report presents an Engineering Evaluation and Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) to address potential unacceptable human health and ecological risks from exposure to contaminants in surface soil and subsurface debris at Area of Concern (AOC) 7, the Drum Disposal Area and Can Pit, Naval Weapons Station (WPNSTA) Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. Potential risks from exposure to contaminants in groundwater will be evaluated as part of a separate investigation and are not addressed as part of this EE/CA. This EE/CA has been prepared under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Contract N62470-08-D-1000, Comprehensive Long-term Environmental Action - Navy 1000, Contract Task Order WE38.

The following information is presented within this EE/CA:

- Site characterization
- Identification of the removal action objectives (RAOs)
- Schedule for the removal action
- Description of removal action elements
- Identification of the removal action alternatives and technologies
- Recommendation of a preferred removal action

## 1.1 Regulatory Background

This document is issued by the United States Department of the Navy (Navy), the lead agency responsible for environmental remediation at AOC 7, in partnership with the United States Environmental Protection Agency (USEPA) Region 3 and the Virginia Department of Environmental Quality, under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

Section 104 of CERCLA and SARA allows an authorized agency to provide for remedial action and to remove, or arrange for removal of, hazardous substances, pollutants, or contaminants at any time, or to take any other response measures consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) as deemed necessary to protect public health or welfare and the environment. The NCP, Title 40 of the Code of Federal Regulations (CFR), Section 300, provides regulations for implementing CERCLA and SARA and regulations specific to removal actions. The NCP defines a removal action as:

*[The] cleanup or removal of released hazardous substances from the environment, such actions as may be necessary to monitor, assess, and evaluate the threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release.*

An NTCRA is being considered for AOC 7 to mitigate potential unacceptable human health and ecological risks from exposure to surface soil and subsurface debris. NTCRAs are defined in 40 CFR 300.415(b)(4) as “actions pertaining to an imminent threat to human health and the environment [...] that have planning periods of 6 months or more.” Under 40 CFR 300.415, the lead agency is required to conduct an EE/CA when an NTCRA is planned for a site. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process. Where the extent of the contamination is well defined and limited in extent, NTCRAs also allow for the expedited cleanup of sites in comparison to the remedial action process under CERCLA.

Community involvement requirements for NTCRAs include making the EE/CA available for public review and a comment period of 30 days. An announcement of the public review and comment period is required in a local newspaper. Written responses to significant comments will be summarized in a Responsiveness Summary that will be included in an Action Memorandum, which will be placed in the Administrative Record (AR) file for CAX.

## 1.2 Purpose and Objectives

Submittal of this EE/CA is the first step in fulfilling the requirements for NTCRAs defined by CERCLA, SARA, and the NCP. This EE/CA has been prepared in accordance with USEPA's guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). The purposes of this EE/CA are to:

- Satisfy environmental review and public information requirements for removal actions
- Satisfy AR requirements for documenting the removal action selection
- Provide a framework for evaluating and selecting removal action alternative technologies

The objective of this removal action is to implement measures to mitigate potential unacceptable risks to human health and ecological receptors from exposure to contaminants in the surface soil and subsurface debris at AOC 7. Following completion of the removal action, no further action will be required for soil. Groundwater will be addressed under a separate action, if necessary.

This EE/CA compares the following three removal action alternatives based on their technical feasibility, ability to protect human health and the environment, ability to prevent the potential continued or future release of hazardous constituents, and cost:

- **Alternative 1**—No Action
- **Alternative 2**—Excavation and Backfill (Drum Disposal Area Hot Spot) and Cover Installation and Land Use Controls (LUCs) (Can Pit)
- **Alternative 3**—Excavation and Backfill (Drum Disposal Area Hot Spot and Can Pit)

## SECTION 2

# Site Characterization

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This section provides background information on the facility and AOC 7, including environmental activities that have taken place at AOC 7, focusing on soil and subsurface debris. Additional detailed background information is provided in the *Final Site Inspection Report for AOCs 1, 2, 6, 7, 8, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia* (CH2M HILL, 2012).

## 2.1 Facility Background and Description

CAX is located on the site of the former Penniman Shell Loading Plant, a large powder and shell loading facility operated by the DuPont Company during World War I. The Penniman Shell Loading Plant closed in 1918 and was dismantled between 1918 and 1923. Between 1923 and 1943, the property was used for farming or remained idle. CAX was commissioned in 1943 as a satellite unit of the Naval Supply Depot to provide bulk storage facilities and to serve as an assembly and overseas shipping point during World War II. In 1987, CAX was designated the Hampton Roads Navy Recreational Complex. In 1998, control of CAX was transferred from Fleet and Industrial Supply Center to WPNSTA Yorktown. The current mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel.

CAX consists of approximately 2,300 acres of land on the York-James Peninsula, northwest of WPNSTA Yorktown (**Figure 2-1**). The facility is divided into two separate parcels, with the larger parcel situated along the banks of the York River. Almost all of the activities at CAX (administration, training, maintenance, support, and housing) take place in the larger parcel. The smaller parcel is used mainly as a watershed protection area.

## 2.2 Area of Concern 7 Background and Description

AOC 7 was identified in April 2004 when the Navy discovered two debris disposal areas in the woods behind the CAX warehouse area. One of the debris disposal areas, referred to as the Drum Disposal Area, contained several empty rusted pails and two empty, rusted, 55-gallon drums on the ground surface. The other debris disposal area, referred to as the Can Pit, is an approximately 30-by-20-foot pit open to a depth of 4 feet below ground surface (bgs). The Can Pit contained numerous empty, 5-gallon<sup>1</sup>, rusted cans labeled “tetrachloroethane” on the ground surface within the pit.

AOC 7 is located within a wooded area of CAX, along a hiking and nature trail immediately south of one of the southern fingers of Cheatham Pond (**Figure 2-2**). There are no wetlands or surface water bodies located within AOC 7. The topography generally slopes northeast, towards Cheatham Pond, and surface runoff is expected to flow northeast toward Cheatham Pond as well. In general, the uppermost soil within the vicinity of AOC 7 is predominantly silt with varying degrees of sand and clay. A thin layer of organic material (0.5 foot thick) was observed between 7 and 10 feet bgs. Below this layer, sands were observed. The first encountered groundwater underlying AOC 7 is the Yorktown-Eastover aquifer, at depths ranging from approximately 9 to 20 feet bgs. Groundwater is expected to flow toward Cheatham Pond.

### 2.2.1 Previous Environmental Activities

#### Housekeeping Removal Effort

In March 2006, surface debris was removed from the Can Pit. In April 2006, approximately 20 rusty pails and two empty 55-gallon drums were removed from the ground surface at the Drum Disposal Area. Following the housekeeping removal effort, all surface debris from AOC 7 was transported offsite for proper disposal (Shaw,

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<sup>1</sup>Mistakenly reported in the CAX Site Management Plan and the AOC 1, 2, 6, 7, and 8 Site Inspection report as 10-gallon cans; however, the correct size is 5-gallon.

2006). The Can Pit was encircled with an orange safety fence and left open following the housekeeping removal effort.

### Site Inspection

A Site Inspection (SI) was conducted in October 2008, which included sample collection and test pitting activities. Test pits were excavated around both the Drum Disposal Area and the Can Pit and one test pit was excavated within the Can Pit to determine whether subsurface debris was present. No subsurface debris was found in the Drum Disposal Area. Subsurface debris is present within the Can Pit, but no subsurface debris was found outside the Can Pit. Surface soil (0 to 6 inches bgs), shallow subsurface soil (6 to 24 inches bgs), deep subsurface soil (10 feet bgs) from two test pits, and shallow aquifer groundwater samples were collected within the Drum Disposal Area. One surface soil sample (0 to 6 inches bgs) and one deep subsurface soil sample from the native soil underneath the debris (~14 to 16 feet bgs) were collected within the Can Pit, while one deep subsurface soil sample (10 feet bgs) from a test pit and one shallow aquifer groundwater sample were collected immediately adjacent to the Can Pit. All of these samples were collected in order to evaluate the nature and extent of contamination associated with the debris disposal areas. Additionally, surface soil, subsurface soil, and groundwater samples were collected from the assumed upgradient and downgradient directions from the AOC in order to evaluate potential migration pathways. The sample locations are shown on **Figure 2-3**. The samples were analyzed for volatile organic compounds, semivolatile organic compounds, pesticides, polychlorinated biphenyls, inorganic constituents (inorganics), and explosives. The analytical data were used to perform human health and ecological risk screenings. A detailed summary of the SI activities is provided in the Final Site Inspection Report (CH2M HILL, 2012).

### 2.2.2 Nature and Extent of Contamination

No surface debris remains at the AOC. The results of the test pitting activities indicate that subsurface debris is present within, and is limited to, the Can Pit, and no subsurface debris was identified in the test pits outside of the Can Pit or in the Drum Disposal Area. Debris, consisting of rusted, flakey, metal shards and cans, amber glass Clorox bottles, and clear glass bottles, was identified in the subsurface from the surface of the open pit to an approximate depth of 14 feet bgs (or 10 feet below the surface of the open pit) at test pit location CAA07-TPSO02, located within the Can Pit (**Figure 2-3**).

The results of the soil sampling indicate that elevated concentrations of inorganics are present in surface soil within the Can Pit and at a localized hot spot, sample location CAA07-SS03 (**Figure 2-3**), within the Drum Disposal Area. The horizontal extent of the elevated inorganics in the surface soil at the hot spot in the Drum Disposal Area has not been fully delineated. The samples collected south-southeast of the hot spot sample location did not exceed screening criteria, and therefore, the extent of contamination has been delineated in that direction. However, no soil samples have been collected to the north, east, or west of the hot spot sample location.

Groundwater data exceeded preliminary screening criteria; however, an Expanded SI is being conducted to further evaluate groundwater. Therefore, groundwater is not addressed in this EE/CA.

### 2.2.3 Risk Summary

The human health and ecological risk screenings conducted as part of the SI concluded that there is potential risk to human and ecological receptors from exposure to inorganics in surface soil at both the Drum Disposal Area and the Can Pit. In addition, the CAX Tier I Partnering Team assumes that the subsurface debris within the Can Pit presents the potential for future impacts to site media, and is, therefore, assumed to pose a potential future risk to human health.

Potential unacceptable human health risks were identified from exposure to arsenic, chromium, and iron in surface soil within the Can Pit and at a localized hot spot (surface soil sample location CAA07-SS03) in the Drum Disposal Area. An unacceptable carcinogenic risk is associated with arsenic and chromium, primarily chromium, the only constituent of potential concern (COPC) that alone contributes a risk above the screening benchmark level. The unacceptable carcinogenic risk is based on the assumption that all of the chromium detected in the surface soil is hexavalent chromium. However, chromium is generally found in soil in the trivalent form, unless

activities at the site have resulted in the release or formation of hexavalent chromium. Any hexavalent chromium in soil is expected to be reduced over time to trivalent chromium by organic matter (USEPA, 1998). If chromium is present in the trivalent form, chromium would not be considered a COPC and arsenic would not contribute enough risk to be considered a COPC. The potential noncarcinogenic hazard is associated with iron. However, iron is considered an essential human nutrient, and although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present onsite would not result in any adverse health effects. Ingestion of soil at the exposure concentration of iron in soil, which would result in ingestion of 16.5 milligrams per day (mg/day) of iron for an adult ( $164,516 \text{ milligrams per kilogram [mg/kg]}^2 \times \text{ingestion rate of } 100 \text{ mg/day} \times \text{conversion factor of kilogram [kg]/106 \text{ milligrams [mg]})$ , is below the tolerable upper intake level, the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 32.9 mg/day of iron ( $164,516 \text{ mg/kg} \times \text{ingestion rate of } 200 \text{ mg/day} \times \text{conversion factor of kg/106 mg}$ ), which is below the tolerable upper intake level of 40 mg/day for children. Therefore, iron has not been carried forward as a COPC.

Potentially unacceptable ecological risks were identified from exposure to lead and manganese in surface soil within the Can Pit and lead, manganese, and zinc in surface soil at a localized hot spot (surface soil sample location CAA07-SS03) in the Drum Disposal Area.

If chromium is present in the trivalent form and iron is not retained as a COPC, there would be no potential human health risk in the surface soil at either the Can Pit or Drum Disposal Area. However, the potential risk to ecological receptors in surface soil would remain and need to be addressed. In addition, the subsurface debris within the Can Pit would still be removed, because, as previously stated, the CAX Tier I Partnering Team assumes it may pose a potential future risk to human health.

A Conceptual Site Model is presented as **Figure 2-4** and the locations of the subsurface debris and surface soil impacted by COPCs are identified on **Figure 2-5**.

## 2.3 Determination of Removal Action Areas

The following two areas have been identified for this removal action:

### Drum Disposal Area Hot Spot

The COPC concentrations at soil sample location CAA07-SS03 pose potential human health and ecological risks from exposure to surface soil at the Drum Disposal Area. The horizontal extent of the removal action in this area has been partially delineated by existing sample locations not posing unacceptable risk, CAA07-SS06 and -SS07 (**Figure 2-3**). Because surface soil samples have not been collected to the north, east, and west of CAA07-SS03, the actual limits of this hot spot will be determined by the collection of pre-excavation confirmation samples for comparison to cleanup goals to ensure that the soil remaining following the removal action does not pose risk to human health and the environment<sup>3</sup>. The approach for delineation of the horizontal extent of the hot spot will be presented in a separate work plan for review by the CAX Tier I Partnering Team. A 25-foot-radius removal action area around CAA07-SS03 has been assumed for cost-estimating purposes. The vertical extent of the removal for this area is 6 inches based on subsurface soil data collected during the SI, which did not pose potential human health or ecological risk.

### Can Pit

The Can Pit is approximately 600 square feet (ft<sup>2</sup>) (30 feet x 20 feet) in area. The horizontal limits of this removal action area have been defined by test pitting during the SI, which indicated that subsurface debris was limited to

<sup>2</sup> 164,516 mg/kg is the 95 percent upper confidence limit.

<sup>3</sup> This potential human health risk is based on the presence of chromium in the hexavalent form. If pre-excavation confirmation sampling determines that chromium is present in the trivalent form and not the hexavalent form, there is no potential unacceptable human health risk. However, the potential risk to ecological receptors would remain and need to be addressed.

the area within the Can Pit. The unacceptable human health and ecological risks identified in the surface soil within the Can Pit (0 to 6 inches bgs of the open pit) are limited to the extent of the pit since the debris has been identified as the source of the potential unacceptable risks. The internal depth of subsurface debris within the Can Pit was from the ground surface within the Can Pit (4 feet bgs) to approximately 14 feet bgs, based on the test pit excavated within the Can Pit. As previously stated, the CAX Tier I Partnering Team assumes that the subsurface debris within the Can Pit presents the potential for future impacts to site media and is, therefore, assumed to pose a potential future risk to human health.

## 2.4 Development of Cleanup Goals

Preliminary remediation goals (PRGs) were developed for pre-excavation confirmation samples needed to delineate the horizontal extent of the surface soil removal needed around SI soil sample location CAA07-SS03, which defines the Drum Disposal Area Hot Spot. The PRGs for the human health COPCs (arsenic and chromium, assuming chromium is in the hexavalent form) were established based on the higher of USEPA residential soil regional screening levels (RSLs) and CAX background data. Since there are only two human health COPCs and both pose potential carcinogenic risks, the residential soil RSLs for these two COPCs (arsenic and hexavalent chromium) were multiplied by 10 to adjust to a target cancer risk of  $10^{-5}$  for each individual COPC, instead of the target cancer risk of  $10^{-6}$  used in the RSL table, resulting in a cumulative risk of  $2 \times 10^{-5}$ , which is within USEPA-acceptable risk levels. The PRGs established for chromium and arsenic will only be applicable if chromium is detected in the hexavalent form during the pre-excavation confirmation sampling at concentrations that drive human health risk. The PRGs for the ecological COPCs (lead, manganese, and zinc) were established based on the higher of ecological literature-based toxicity screening values and CAX background data. The PRGs are provided in **Table 2-1**.

TABLE 2-1  
Surface Soil Preliminary Remediation Goals for the Drum Disposal Area Hot Spot

COPC	PRG	Reference
Arsenic	6 mg/kg	Maximum Background Soil Concentration (CH2M HILL, 2011)
Chromium (hexavalent)	18.3 mg/kg	Maximum Background Soil Concentration (CH2M HILL, 2011)
Lead	120 mg/kg	Ecological Soil Screening Concentration (USEPA, 2005)
Manganese	340 mg/kg	Maximum Background Soil Concentration (CH2M HILL, 2011)
Zinc	120 mg/kg	Ecological Soil Screening Concentration (USEPA, 2007)

No post-removal cleanup goals were developed, as there will be no post-removal sampling. For the Drum Disposal Area, the vertical extent of the removal area is 6 inches, based on subsurface soil data collected during the SI, which did not pose potential human health or ecological risk. For the Can Pit, the removal will extend vertically from the surface of the open pit until native soil is reached, a depth of approximately 14 feet bgs. Encountering native soil will be the determining factor for ending the Can Pit removal and no post-removal soil samples will be collected because:

1. The surface soil posing potential risk to human health and ecological receptors will be removed, along with the several feet (~10) of debris that is underneath it.
2. There are no human health receptors at the native soil depth underneath the debris (or ~14 feet bgs).
3. The results for the soil sample collected underneath the debris show no unacceptable human health risk for direct contact, and the soil is deeper than is typically evaluated for direct contact with soil.
4. The SI did not evaluate the leaching to groundwater pathway or compare the soil data to USEPA Regional Soil Screening Levels for protection of groundwater. However, the groundwater will be evaluated further in a separate study (Expanded SI), which will include the installation of permanent monitoring wells and

collection of groundwater samples. It is anticipated that the excavation within the Can Pit will extend to 14 feet bgs, which is likely close to the depth of groundwater (~18-20 feet bgs). In addition, a qualitative review of the SI groundwater data collected immediately adjacent to the Can Pit does not indicate a release of contaminants to groundwater from the Can Pit area (e.g., no organic compound detections and limited low-level inorganic compound detections).



- Legend**
- Site Boundary
  - Activity Boundaries
  - City/County Boundaries

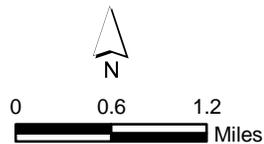
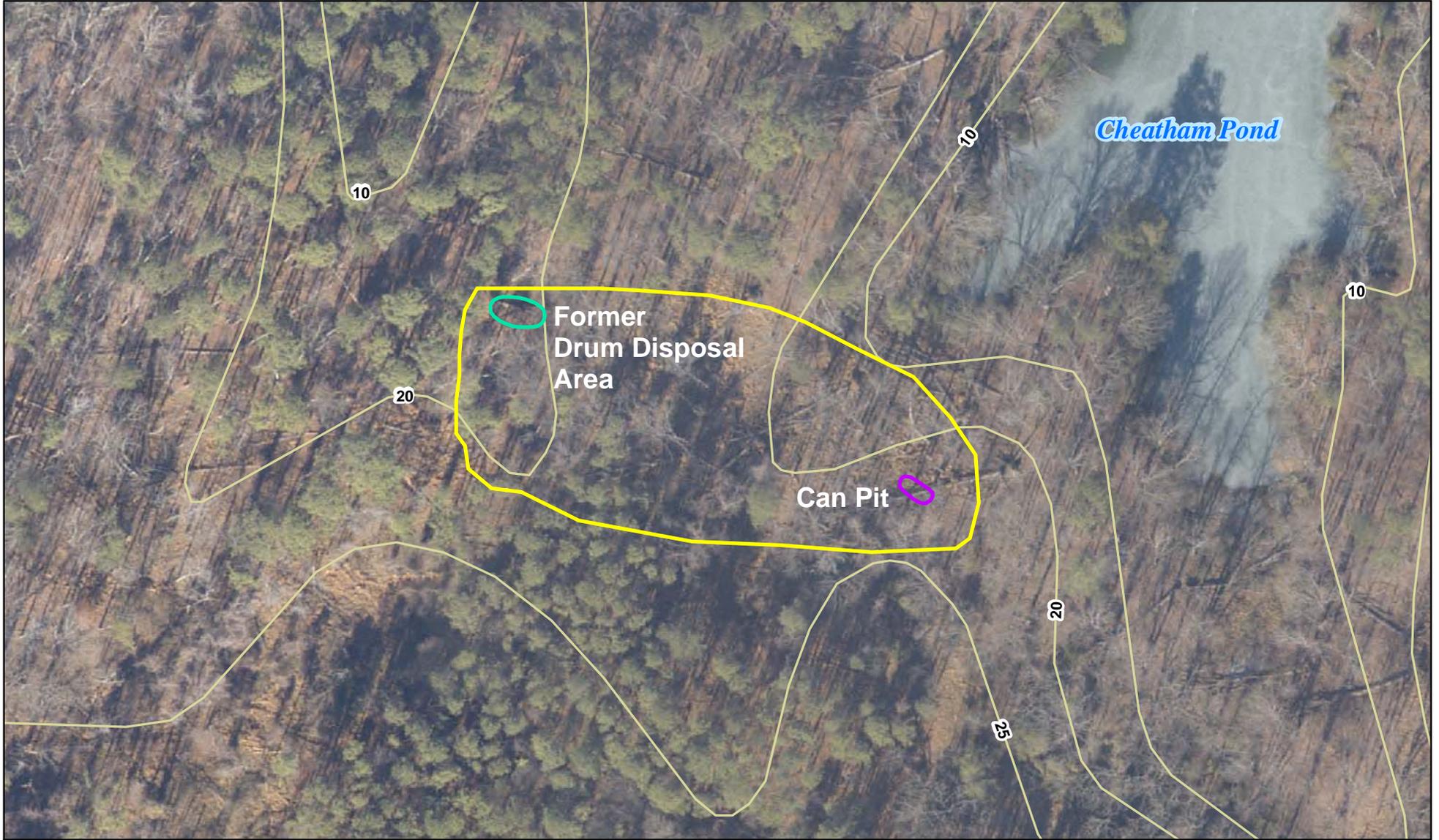


Figure 2-1  
Location of CAX and AOC 7  
Engineering Evaluation and Cost Estimate for AOC 7  
Cheatham Annex  
Williamsburg, Virginia



**Legend**

-  Approximate AOC 7 Study Area
-  Approximate Area of the Former Drum Disposal Area
-  Approximate Area of the Can Pit
-  Topographic Surface Contour (feet above mean sea level)

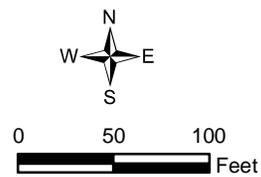
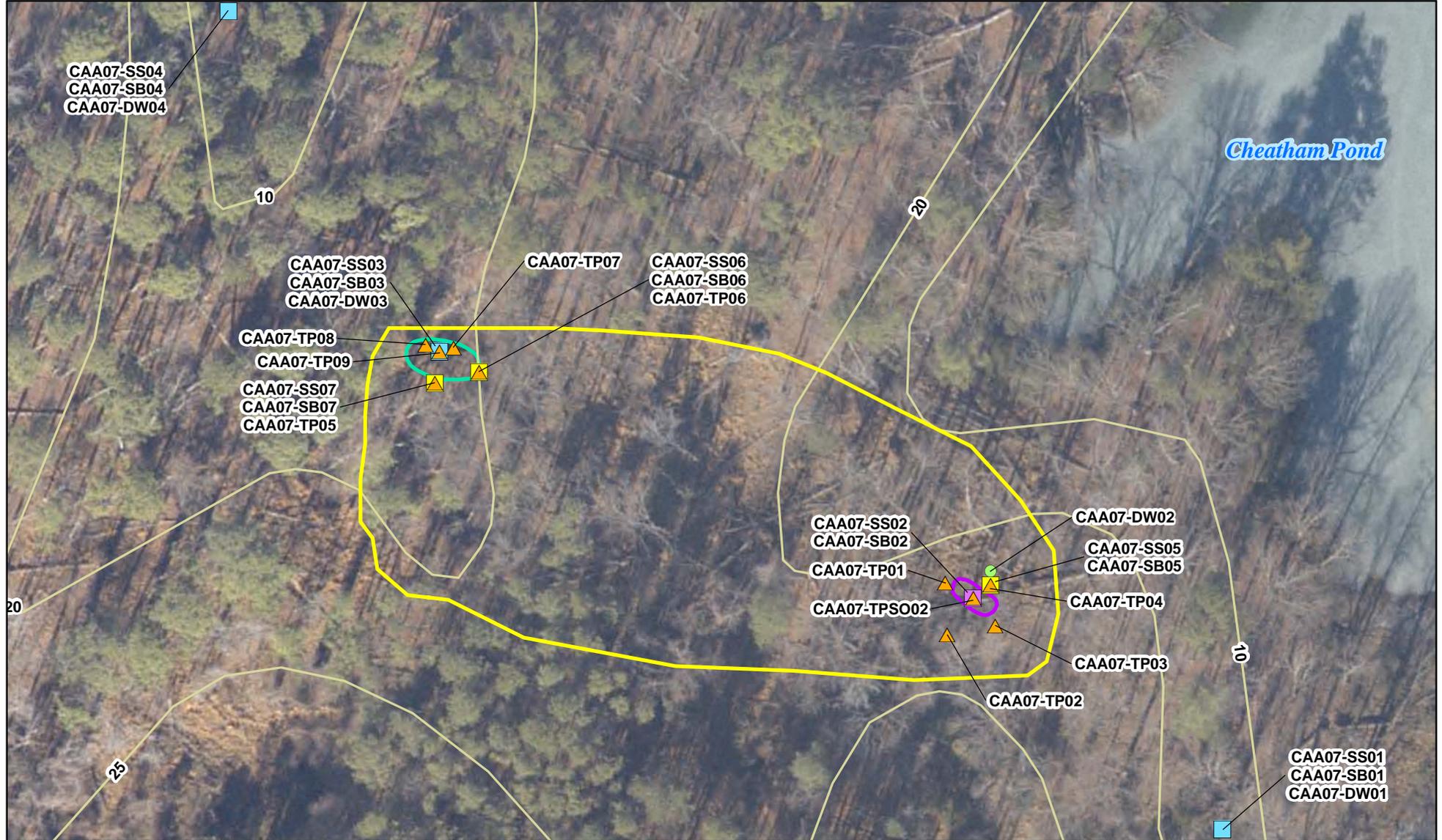


Figure 2-2  
AOC 7 Layout  
Engineering Evaluation and Cost Estimate for AOC 7  
Cheatham Annex  
Williamsburg, Virginia

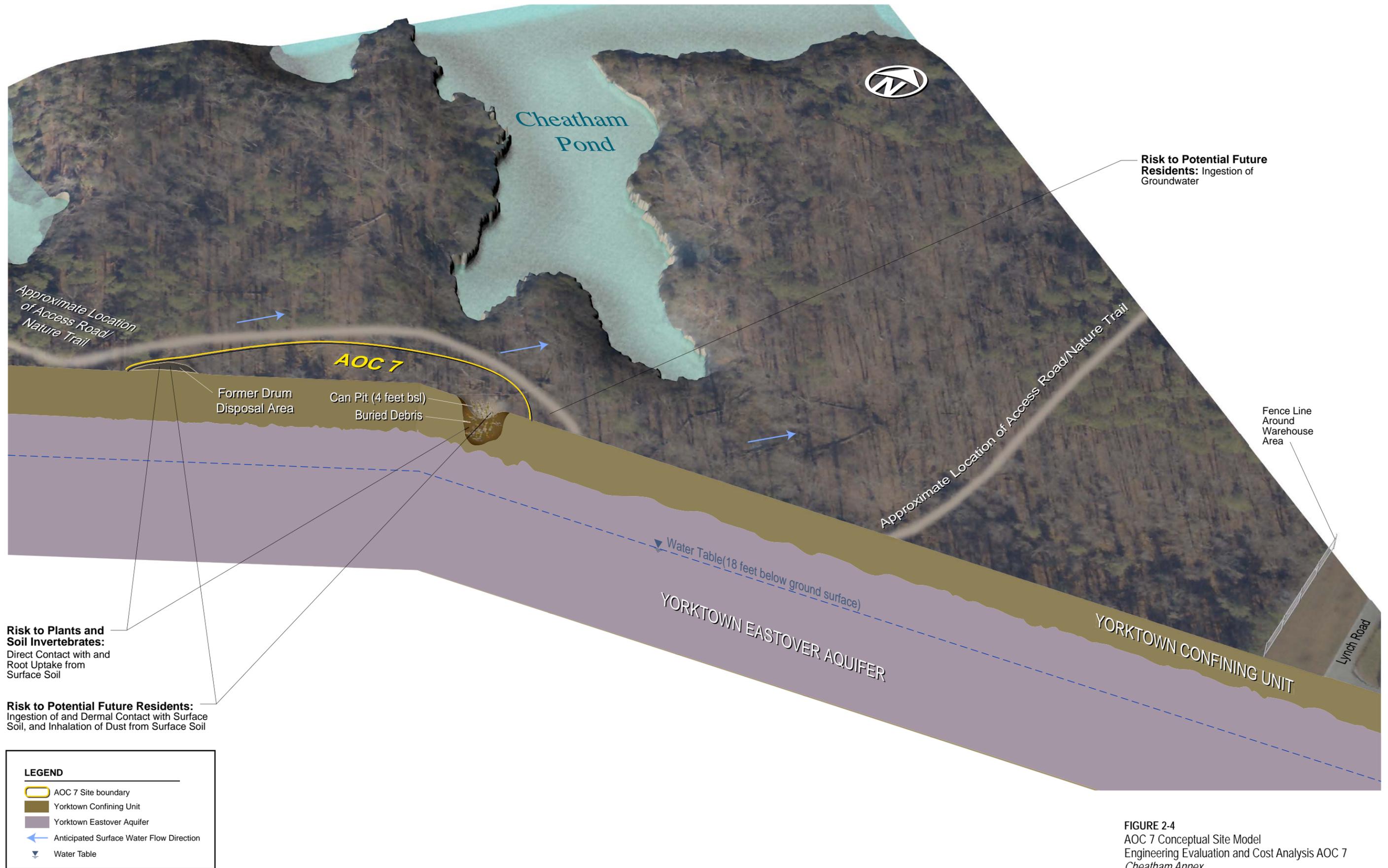


**Legend**

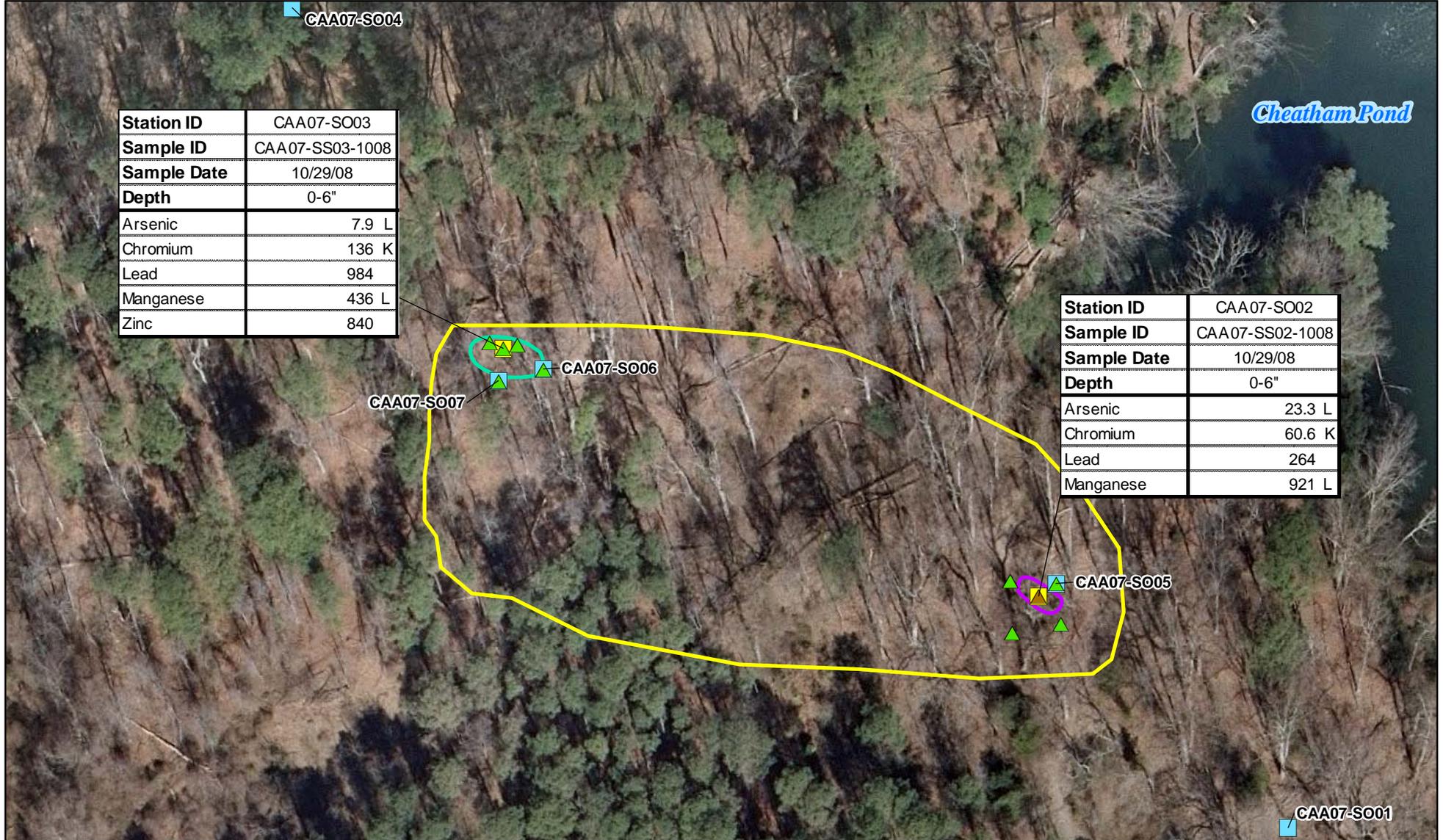
- Groundwater Only Sample Location
- Groundwater, Surface Soil (0-6"), and Shallow Subsurface Soil (6-24") Sample Location
- Surface Soil (0-6"), and Deep Subsurface Soil (14-16') Sample Location
- Surface Soil (0-6"), Shallow Subsurface Soil (6-24"), and Deep Subsurface Soil (10') Sample Location
- ▲ Test Pit Location
- Topographic Surface Contour (feet above mean sea level)
- Approximate area of the Former Drum Disposal Area
- Approximate Extent of Buried Debris within the Can Pit (4-16 feet below ground surface)
- Approximate AOC 7 Study Area



Figure 2-3  
AOC 7 Comprehensive Investigation Locations  
Engineering Evaluation and Cost Estimate for AOC 7  
Cheatham Annex  
Williamsburg, Virginia



**FIGURE 2-4**  
 AOC 7 Conceptual Site Model  
 Engineering Evaluation and Cost Analysis AOC 7  
 Cheatham Annex,  
 Williamsburg, Virginia



<b>Station ID</b>	CAA07-SO03
<b>Sample ID</b>	CAA07-SS03-1008
<b>Sample Date</b>	10/29/08
<b>Depth</b>	0-6"
Arsenic	7.9 L
Chromium	136 K
Lead	984
Manganese	436 L
Zinc	840

<b>Station ID</b>	CAA07-SO02
<b>Sample ID</b>	CAA07-SS02-1008
<b>Sample Date</b>	10/29/08
<b>Depth</b>	0-6"
Arsenic	23.3 L
Chromium	60.6 K
Lead	264
Manganese	921 L

**Legend**

- ▲ Test Pit Location Without Debris
- ▲ Test Pit Location With Debris
- Soil Sample Location Posing No Potential Risk
- Soil Sample Location with Surface Soil Posing Potential Risk

- Approximate AOC 7 Study Area
- Approximate area of the Former Drum Disposal Area
- Approximate Extent of Buried Debris within the Can Pit (4-16 feet below ground surface)

Note: K – Analyte present, value may be biased high      L – Analyte present, value may be biased low

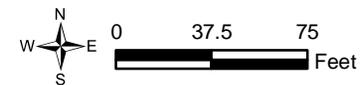


Figure 2-5  
Locations with COPCs and Subsurface Debris  
Engineering Evaluation and Cost Estimate for AOC 7  
Cheatham Annex  
Williamsburg, Virginia

## Identification of Removal Action Objectives

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### 3.1 Statutory Limits on Removal Action

The NCP, 40 CFR Part 300.415, dictates statutory limits of \$2 million and a 12 month duration for USEPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the remedial action to be taken. However, this removal action will not be USEPA fund-financed. The Navy and Marine Corps installation restoration manual does not limit the cost or duration of removal actions; nonetheless, cost-effectiveness is a recommended criterion for the evaluation of removal action alternatives and is considered in Sections 4 and 5.

### 3.2 Removal Action Objectives and Scope

The RAOs are as follows:

- Prevent exposure to contaminants in subsurface debris and surface soil at concentrations potentially posing unacceptable risks to human health and the environment.<sup>4</sup>
- Minimize the potential for the migration of contaminants from the surface soil and subsurface debris to groundwater.

### 3.3 Determination of Removal Action Schedule

This EE/CA will be made available for a 30-day public comment period. Notice of its availability for public review, along with a brief summary of the EE/CA, will be published in two local newspapers – *Daily Press* and *The Virginia Gazette*. The public comment period is scheduled to be from February 15, 2014 to March 18, 2014. A public information session will be held during or immediately following the public comment period, if requested. If public comments are received during the public comment period, a Responsiveness Summary documenting responses to significant comments will be prepared and included in an Action Memorandum, which will be placed in the AR for CAX. The AR file can be found on the CAX Public Environmental Restoration Program web site at <http://go.usa.gov/DynP>. The AR is also available for public review by appointment through the NAVFAC Mid-Atlantic Public Affairs Office<sup>5</sup>.

Because this removal action has been designated non-time-critical, the start date of the removal action will be determined by factors other than the urgency of the threat. Possible factors include weather, the availability of resources, and site constraints. The total project period is anticipated to last 16 months from the beginning of the public comment period to completion of the associated construction completion documentation. Critical milestone periods for the removal action are as follows:

- EE/CA public comment period—30 days
- Pre-excavation confirmation sampling, subcontracting, work plan, and mobilization—10 months

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<sup>4</sup> This RAO assumes there is a potential human health risk in surface soil due to the presence of chromium in the hexavalent form. If pre-removal action confirmation sampling determines that chromium is present in the trivalent form and not the hexavalent form, there is no potential unacceptable human health risk in surface soil and the RAO will be revised. However, the potential risk to ecological receptors in surface soil, as well as the subsurface debris, would remain and need to be addressed.

<sup>5</sup> NAVFAC Mid-Atlantic  
Public Affairs Office  
9742 Maryland Avenue  
Norfolk, VA 23511-3095  
(757) 445-8732, ext. 3096  
wpnsta.pao@navy.mil

- Removal action—1 month
- CERCLA documentation—4 months

### 3.4 Applicable or Relevant and Appropriate Requirements

The removal action will, to the extent practicable, comply with applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws, as described in 40 CFR 300.415. Other federal and state advisories, criteria, and/or guidance will be considered as appropriate in formulating the removal action. Applicable requirements are those requirements specific to AOC 7 that satisfy all jurisdiction prerequisites of the law or requirements. Relevant and appropriate requirements are those that do not have jurisdiction authority over the particular circumstances at AOC 7, but are meant to address similar situations, and therefore are suitable for use at the AOC. Federal ARARs are determined by the lead agency, which in this case is the Navy. As outlined by 40 CFR 300.415(j), the lead agency may consider the urgency of the situation and the scope of the removal action to be conducted in determining whether compliance with ARARs is practicable. The NCP, 40 CFR 300.400(g)(2), specifies factors to consider in determining which requirements of other environmental laws are relevant and appropriate:

- The purpose of the requirement in relation to the purpose of CERCLA
- The media regulated by the requirement
- The substance(s) regulated by the requirement
- The actions or activities regulated by the requirement
- Variations, waivers, or exemptions of the requirement
- The type of place regulated and the type of place affected by the release or CERCLA action
- The type and size of the facility or structure regulated by the requirement or affected by the release
- Consideration of the use or potential use of affected resources in the requirement

In some circumstances, a requirement may be relevant to the particular site-specific situation, but may not be appropriate because of differences in the purpose of the requirement, the duration of the regulated activity, or the physical size or characteristic of the situation it is intended to address. There is more discretion in the judgment of relevant and appropriate requirements than in the determination of applicable requirements.

Three classifications of requirements are defined by USEPA in the ARAR determination process: chemical-specific, location-specific, and action-specific.

**Chemical-specific ARARs** are health- or risk-management-based numbers or methodologies that result in the establishment of numerical values for a given medium that would meet the NCP threshold criterion of overall protection of human health and the environment. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated medium. The federal chemical-specific ARARs for AOC 7 are summarized in **Appendix A, Table A-1**. No Virginia chemical-specific ARARs have been identified for AOC 7 (**Appendix A, Table A-2**).

**Location-specific ARARs** restrict remedial activities and media concentrations based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on remedial actions within wetlands or coastal areas, near locations of known endangered species, or on protected waterways. The federal and Virginia location-specific ARARs for AOC 7 are summarized in **Appendix A, Tables A-3 and A-4**.

**Action-specific ARARs** are requirements that define acceptable treatment and disposal procedures for hazardous substances. No federal action-specific ARARs have been identified for AOC 7 (**Appendix A, Table A-5**). The Virginia action-specific ARARs for AOC 7 are summarized in **Appendix A, Table A-6**.

### 3.5 General Disposal Requirements

Waste disposal procedures implemented for the removal action will be in accordance with applicable laws and regulations. For the purposes of this EE/CA, the cost estimates were based on the assumption that excavated soil and miscellaneous debris will be non-hazardous. Waste characterization testing will be conducted in accordance

with the requirements of the disposal facility. Any materials classified as hazardous will be appropriately transported and disposed of in accordance with applicable requirements. All materials will be disposed in a state-permitted disposal facility that is approved by the Navy and is permitted to accept CERCLA waste.

# Description and Evaluation of Removal Action Alternatives

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The alternatives for this removal action were considered using professional judgment and information from previous environmental activities. Alternatives were evaluated based on effectiveness, implementability, and cost. The no action alternative was evaluated for comparative purposes.

## 4.1 Description of Removal Action Alternatives

### 4.1.1 Alternative 1: No Action

With this alternative, no action would be conducted and no controls would be implemented. The area would be left as it currently exists, leaving the surface soil and subsurface debris posing potential human health and ecological risks in place. Therefore, in accordance with CERCLA (Section 121(c)), as amended by SARA, the site would be reviewed every five years. It is assumed that the current level of maintenance would be sustained.

### 4.1.2 Alternative 2: Excavation and Backfill (Drum Disposal Area Hot Spot) and Soil Cover and Land Use Controls (Can Pit)

This alternative consists of excavation of the Drum Disposal Area Hot Spot, backfilling the Drum Disposal Area Hot Spot, and construction of a soil cover over the Can Pit (**Figure 4-1**). Because subsurface debris within the Can Pit would remain onsite, LUCs, operation and maintenance (O&M), and Five-Year Reviews would be required to assure that the soil cover remains in place and continues to be protective of human health and the environment.

#### 4.1.2.1 Drum Disposal Area Hot Spot

##### Pre-Excavation Confirmation Sampling

Because surface soil samples have not been collected to the north, east, and west of the Drum Disposal Area Hot spot (SI sample location CAA07-SS03), pre-excavation confirmation samples would be collected to delineate the horizontal extent of the Drum Disposal Area Hot Spot removal action area. The discrete surface soil samples would be collected from 0 to 6 inches bgs and analyzed for arsenic, chromium<sup>6</sup>, lead, manganese, and zinc. The sample results would be compared to the PRGs in **Table 2-1**. If the results exceed the cleanup goals, additional sampling will be conducted until the results are below the cleanup goals and the extent of the removal action area has been defined. The sampling details would be established in a Sampling and Analysis Plan.

##### Site Preparation and Clearing

Site preparation activities would include setup of a staging area and facilities, installation of erosion and sediment (E&S) controls, clearing of vegetation in the work areas, installation of access roads, and installation of appropriate drainage controls to the degree necessary to support construction.

Typical E&S controls would be implemented (such as a silt fence and hay bales installed around areas to be disturbed at topographic lows). Additional details would be determined in the E&S Control Plan to be included with the Removal Action Work Plan. Temporary E&S controls might include silt fencing, temporary diversion dikes, and sediment traps. Permanent E&S controls after construction would include appropriate grading and site vegetation.

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<sup>6</sup> Chromium speciation will be performed to determine whether chromium is present in the trivalent form or the hexavalent form. If chromium is in the trivalent form, as discussed in Subsection 2.2.3, there are no unacceptable human health risks to address at the AOC and arsenic and chromium will be eliminated as COPCs. However, the potential risk to ecological receptors would remain and need to be addressed.

The existing access road and nature trail would be used to access the work area. It is assumed that the access road and nature trail will require vegetation clearance along each of its sides to widen the path for heavy equipment access, as well as installation of a temporary culvert to cross the drainage ditch that intersects the access road and nature trail.

### **Excavation and Backfill**

The surface soil within the Drum Disposal Area Hot Spot would be excavated to a depth of 6 inches bgs. For estimating purposes, the size of the excavation area is estimated to be 2,000 ft<sup>2</sup> (approximately a 25-foot radius around sample location CAA07-SO03), which would result in removal of approximately 40 cubic yards (yd<sup>3</sup>) of soil; however, the actual limits and volume will be determined based on the pre-excavation sampling. Post-excavation confirmation samples would not be required because the extent of contamination would be delineated prior to excavation (pre-excavation sampling). Excavated soil, assumed to be non-hazardous for cost-estimating purposes, would be transported and disposed offsite.

An estimated total of approximately 50 loose yd<sup>3</sup> of clean topsoil would be used to backfill the excavation area to pre-existing conditions to support vegetation growth. The excavation and backfilling would be performed using mechanical earthwork equipment (such as excavators, bulldozers, and dump trucks).

#### **4.1.2.2 Can Pit**

##### **Soil Cover**

The surface of the Can Pit area is currently 4 feet bgs. Therefore, a soil cover would be installed over the 600 ft<sup>2</sup> Can Pit area by backfilling the pit with an estimated total of approximately 120 loose yd<sup>3</sup> of clean fill material from offsite. The offsite clean fill will consist of approximately 20 yd<sup>3</sup> of topsoil and approximately 100 yd<sup>3</sup> of general fill. The final desired as-built slope of the soil cover would be up to 2 percent to promote positive drainage away from the soil cover. General fill would be used to bring the grade to within 6 inches of the final grade, followed by the placement of a 6-inch topsoil layer to support vegetation growth. Hauling and backfilling would be performed using mechanical earthwork equipment (such as bulldozers and dump trucks). Additional details would be determined during the development of the Removal Action Work Plan.

##### **Land Use Controls and Operation and Maintenance**

Because the surface soil potentially posing a risk to human health and the environment and the subsurface debris (assumed to present a potential for future impacts to site media, thus pose a potential future human health risk) would remain in the Can Pit, LUCs would be implemented on the extent of the soil cover, and O&M of the soil cover would be conducted in order to prevent exposure. The O&M would include quarterly inspections of the cover for the first two years, followed by annual inspections, and soil cover and vegetative maintenance as required (assumed every five years). The LUCs and O&M would be implemented indefinitely; however, a period of 30 years was used for cost-estimating purposes.

#### **4.1.2.3 Site Restoration**

All equipment, materials, and temporary E&S and drainage controls would be removed from the site. Areas disturbed during the removal action would be stabilized by seeding with native species of grasses. The access road and nature trail would be restored to pre-existing conditions. Given the site setting (densely wooded with ground cover consisting mainly of leaf litter) and the relatively small area that will be disturbed, tree plants would not be required since it is expected that pioneer species would slowly move back into these areas over time. These areas would be monitored after initial restoration activities to determine recovery success and to identify if any additional restoration activities would be necessary. More specific details would be provided in the Removal Action Work Plan.

### 4.1.3 Alternative 3: Excavation and Backfill (Drum Disposal Area Hot Spot and Can Pit)

This alternative consists of excavation and backfilling of the Drum Disposal Area Hot Spot and Can Pit (**Figure 4-1**). No LUCs and O&M are required for this alternative since the surface soil and debris would be removed from the Can Pit.

#### 4.1.3.1 Drum Disposal Area Hot Spot

The same pre-removal confirmation sampling and excavation and backfill described under Alternative 2 (Section 4.1.2.1) would occur for the Drum Disposal Area Hot Spot with Alternative 3. Therefore, they are not repeated here.

#### 4.1.3.2 Can Pit

Instead of installing a soil cover over the Can Pit, the Can Pit would be excavated to remove the surface soil and the subsurface debris, then backfilled to bring the excavation to surface grade. Thus, no LUCs or O&M would be required for the Can Pit for Alternative 3. The components of excavation and backfill for the Can Pit under this alternative are discussed below.

##### Excavation

The soil and subsurface debris within the 600-ft<sup>2</sup> Can Pit would be excavated to the visible extent of the debris, estimated to be present to a maximum depth of 14 feet bgs (which is 10 feet below the surface of the open pit). An estimated total of 220 yd<sup>3</sup> of material would be excavated. Because of the depth of the excavation, sloping or shoring would be required to ensure safety. For cost estimating purposes, it is assumed that the excavation will be at a 1:1 slope, and that material excavated outside of the Can Pit for sloping will be set aside for reuse on site. The water table in that area of the AOC is deep enough (approximately 20 feet bgs) that it should not be encountered; therefore, no dewatering is anticipated. Post-removal confirmation samples would not be required for the reasons presented in Section 2.4. The excavated soil and the subsurface debris from the Can Pit, both assumed to be non-hazardous for cost-estimating purposes, would be transported and disposed offsite. The excavation (and backfilling) would be performed using mechanical earthwork equipment (such as excavators, bulldozers, and dump trucks; a long-reach excavator is recommended to minimize the side sloping required).

##### Backfill

Some soil from outside of the Can Pit (moved away from the Can Pit to slope the excavation) would be returned to the Can Pit excavation, to the extent practicable. An estimated total of approximately 390 loose yd<sup>3</sup> of clean fill material will be brought in (approximately 20 yd<sup>3</sup> of topsoil and approximately 370 yd<sup>3</sup> of general fill) to be used to backfill the excavation area to match the surrounding grade. General fill would be used to bring the grade to within 6 inches of the final grade, followed by the placement of a 6-inch topsoil layer to support vegetation growth.

#### 4.1.3.3 Activities Common to Both Removal Areas

##### Site Preparation and Clearing

Site preparation activities would include setup of a staging area and facilities, installation of erosion and sediment (E&S) controls, clearing of vegetation in the work areas, installation of access roads, and installation of appropriate drainage controls to the degree necessary to support construction.

Typical E&S controls would be implemented (such as a silt fence and hay bales installed around areas to be disturbed at topographic lows). Additional details would be determined in the E&S Control Plan to be included with the Removal Action Work Plan. Temporary E&S controls might include silt fencing, temporary diversion dikes, and sediment traps. Permanent E&S controls after construction would include appropriate grading and site vegetation.

The existing access road and nature trail would be used to access the work area. It is assumed that the access road and nature trail will require vegetation clearance along each of its sides to widen the path for heavy

equipment access, as well as installation of a temporary culvert to cross the drainage ditch that intersects the access road and nature trail.

### Site Restoration

All equipment, materials, and temporary E&S and drainage controls would be removed from the site. Areas disturbed during the removal action would be stabilized by seeding with native species of grasses. Given the site setting (densely wooded with ground cover consisting mainly of leaf litter) and the relatively small area that will be disturbed, tree plants would not be required since it is expected that pioneer species would slowly move back into these areas over time. These areas would be monitored after initial restoration activities to determine recovery success and to identify whether any additional restoration activities would be necessary. More specific details would be detailed in the Removal Action Work Plan.

## 4.2 Evaluation of Alternatives

### 4.2.1 Evaluation Criteria

The criteria used to evaluate the removal action alternatives are based on *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, PB93-963402 (USEPA, 1993).

### 4.2.2 Effectiveness

The *effectiveness* criterion addresses the expected results of the removal action alternatives. It includes two major subcategories: protectiveness and ability to achieve the RAOs.

- Protectiveness
  - Protective of public health and community
  - Protective of workers during implementation
  - Protective of the environment
  - Compliant with ARARs
- Ability to achieve RAOs
  - Ability to meet the expected level of treatment or containment
  - Has no residual effect concerns
  - Maintain long-term control

In addition to the protectiveness and ability to achieve the RAO subcategories, sustainability should be considered. Therefore, a sustainability assessment was conducted using SiteWise, a stand-alone tool that assesses the environmental footprint of a remedial alternative to compare the overall life-cycle environmental impacts of each remedy (Battelle, 2011). The sustainability assessment provides an additional comparison criterion that may allow options with smaller environmental impacts to be selected when all other criteria are met. The sustainability assessment is included in **Appendix B**.

### 4.2.3 Implementability

The *implementability* criterion encompasses the technical and administrative feasibility of the removal action. It includes three subcategories: technical feasibility, availability of resources, and administrative feasibility.

- Technical feasibility
  - Construction and operational consideration
  - Demonstrated performance and useful life
  - Adaptability to environmental conditions
  - Contribution to performance of long-term removal actions
  - Implementation within the allotted time
- Availability of resources
  - Availability of equipment

- Availability of personnel and services
- Laboratory testing capacity
- Offsite treatment and disposal capacity
- Post-removal action site control
- Administrative feasibility
  - Required permits and/or easement or rights-of-way
  - Impacts on adjoining property
  - Ability to impose institutional controls
  - Likelihood of obtaining exemptions from statutory limits (if needed)

#### 4.2.4 Cost

The *cost* criterion encompasses the life-cycle costs of a project, including the projected implementation costs and the long-term O&M costs of the remedial action. For the detailed cost analysis, the expenditures required to complete each alternative were estimated in terms of capital costs, including direct and indirect costs, to complete initial construction activities. Direct costs include the cost of construction, equipment, land and site development, treatment, transportation, and disposal. Indirect costs include engineering expenses and contingency allowances.

Future post-construction costs (that is, periodic inspections and maintenance) would be required to ensure the continued effectiveness of Alternative 2 (Excavation and Backfill [Drum Disposal Area Hot Spot] and Soil Cover and LUCs [Can Pit]). The future costs were calculated using an assumed inflation rate of 3.8 percent for a 30-year time-frame. After inflating the future costs, they were analyzed using present worth, which discounts all future costs to a common base year (2008). Present-worth analysis allows the cost of the removal action to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the life of the removal action. The present-worth calculations included an assumed discount rate of 3 percent (White House OMB, 2012). Although a Five-Year Review would be required for Alternative 1, the future costs associated with the review are assumed to be covered by another CAX site since the Five-Year Reviews are conducted per facility; therefore, there is no cost calculated for Alternative 1.

The estimated costs are provided to an expected accuracy of +50 percent and -30 percent. The alternative cost estimates are in 2013 dollars and the unit pricing is based on costs from similar projects, vendor quotes, or engineering estimates. The enclosed Engineer's Estimate (**Appendix C**) is only an estimate of possible construction costs for budgeting purposes.

#### 4.2.5 Evaluation of Alternatives

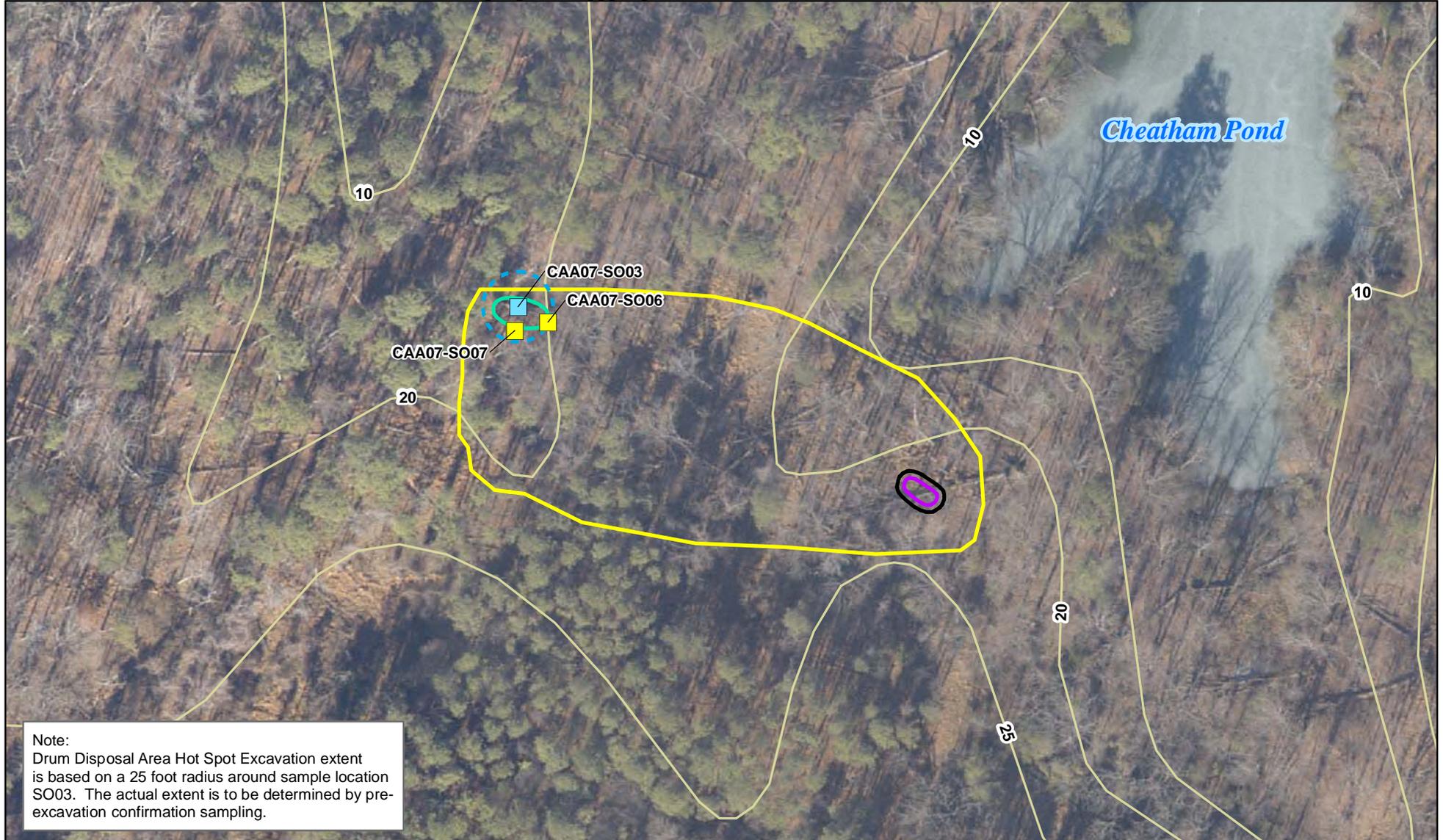
**Table 4-1** summarizes the results of the alternative evaluation with respect to effectiveness, ease of implementation, and cost.

TABLE 4-1  
Evaluation of Removal Action Alternatives

Alternative	Description	Effectiveness	Implementability	Cost
<b>Alternative 1 - No Action</b>	No removal action work performed; site left "as is."	Will not meet RAOs, comply with ARARs, reduce volume or mobility of contamination, or provide any short- or long-term protectiveness	No action to implement	<b>\$0</b>
<b>Alternative 2 - Excavation, Backfill, Soil Cover, and LUCs</b>	Excavate the Drum Disposal Area Hot Spot to 6 inches bgs with the horizontal extent defined by pre-excavation confirmation samples; backfill the Drum Disposal Area Hot Spot; construct a soil cover over the Can Pit by backfilling the pit. Future actions include LUCs and O&M to prevent unauthorized disturbance of the cover.	<p>Protective of human health and the environment because it prevents direct exposure to the surface soil and subsurface debris posing potential risks; potential short-term risks to site workers exposed to contaminated materials during construction would be managed through training and use of personal protective equipment; potential short-term risks to the community as a result of the excavated surface soil and subsurface debris being transported offsite will be managed by ensuring that trucks are not overloaded and are covered prior to leaving the site.</p> <p>Complies with the ARARs.</p> <p>Achieves the RAOs. Long-term protectiveness achieved provided the soil cover is maintained and LUCs are in place.</p> <ul style="list-style-type: none"> <li>Poses a potential environmental impact primarily associated with the transportation and operation of the mechanical earthwork equipment.</li> </ul>	<p>Components are well established and can be completed with conventional equipment in a relatively short time-frame. LUCs and O&amp;M required.</p> <p>Because subsurface debris remains onsite, LUCs, O&amp;M, and Five-Year Reviews will be required.</p>	<p>Capital Cost: \$218,000</p> <p>Present Value of LUCs and O&amp;M: \$75,000</p> <p><b>Total Present Value of Alternative: \$293,000</b></p>

TABLE 4-1  
Evaluation of Removal Action Alternatives

Alternative	Description	Effectiveness	Implementability	Cost
<b>Alternative 3 - Excavation and Backfill</b>	Excavate the Drum Disposal Area Hot Spot to 6 inches bgs with the horizontal extent defined by pre-excavation confirmation samples; excavate the Can Pit to the visible extent of subsurface debris; backfill the excavation areas.	<p>Protective of human health and the environment because it prevents direct exposure to the surface soil and subsurface debris posing potential risks; potential short-term risks to site workers exposed to contaminated material would be managed through training and use of personal protective equipment; potential short-term risks to the community as a result of the excavated surface soil and subsurface debris being transported offsite would be managed by ensuring that trucks are not overloaded and are covered prior to leaving the site.</p> <p>Complies with the ARARs.</p> <p>Achieves the RAOs. Long-term protectiveness would be achieved because no surface soil or subsurface debris posing potential risk would remain onsite.</p> <p>Poses a potential environmental impact primarily associated with the transportation and disposal of the excavated soil and subsurface debris.</p>	Components are well established and can be completed with conventional equipment in a relatively short time-frame.	<b>\$282,000</b>



Note:  
 Drum Disposal Area Hot Spot Excavation extent is based on a 25 foot radius around sample location SO03. The actual extent is to be determined by pre-excavation confirmation sampling.

**Legend**

- Groundwater, Surface Soil (0-6"), and Shallow Subsurface Soil (6-24") Sample Location
- Surface Soil (0-6"), Shallow Subsurface Soil (6-24"), and Deep Subsurface Soil (10') Sample Location
- Topographic Surface Contour (feet above mean sea level)
- Approximate AOC 7 Study Area
- Approximate area of the Former Drum Disposal Area
- Approximate area of the Can Pit
- Approximate Extent of Can Pit Soil Cover (Alternative 1) or Excavation (Alternative 2)
- Approximate Extent of Drum Disposal Area Hot Spot Excavation (Alternative 1 and 2)

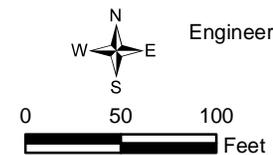


Figure 4-1  
 Removal Action Alternatives Layout  
 Engineering Evaluation and Cost Estimate for AOC 7  
 Cheatham Annex  
 Williamsburg, Virginia

SECTION 5

# Comparative Analysis of Removal Action Alternatives

Section 5 expands on the evaluation of the alternatives by providing a comparative analysis to assist the decision-making process by which a removal action will be selected. In Section 4, these alternatives were described according to their effectiveness, ease of implementation, and cost. In this section, the alternatives are compared to one another for each of the three criteria.

**Table 5-1** summarizes the results of the alternatives comparison. Comparative terms used in **Table 5-1** are defined relative to the other alternatives.

TABLE 5-1  
Removal Action Alternative Comparison

Alternative	Effectiveness	Implementation	Cost
Alternative 1 – No Action	Least Effective	Easiest	Least Expensive
Alternative 2 – Excavation and Backfill (Drum Disposal Area) and Soil Cover and LUCs (Can Pit)	Effective	Moderately Easy	Moderately Expensive and Most Expensive of the Three Alternatives
Alternative 3 – Excavation and Backfill (Drum Disposal Area and Can Pit)	Most Effective	Moderately Easy, but Most Difficult of the Three Alternatives	Moderately Expensive

## 5.1 Effectiveness

Alternative 1 would not be effective because it would not be protective of human health and the environment, would not comply with ARARs, and would not achieve the RAOs of this EE/CA. Alternatives 2 and 3 would be effective because they would both be protective of human health and the environment, comply with ARARs, and be able to achieve the RAOs. However, because subsurface debris posing a potential risk to human health is left in place as part of Alternative 2, that alternative results in a greater magnitude of risk remaining after the removal action than Alternative 3. Additionally, LUCs and O&M would be required as part of Alternative 2 to ensure protectiveness is maintained. Therefore, Alternative 3 is considered more effective than Alternative 2.

## 5.2 Implementability

Alternative 1 requires no implementation and is, therefore, the easiest to implement. Alternatives 2 and 3 would both be moderately easy to implement because they are technically and administratively feasible and the resources needed to implement the alternatives are readily available. Both alternatives would be completed using common construction practices and in a short time-frame. However, because Alternative 3 includes excavation of the Can Pit to an assumed depth of 14 feet bgs, resulting in sloping of the excavation, that alternative would be more difficult to implement than Alternative 2.

## 5.3 Cost

Alternative 1 is the cheapest alternative and Alternative 2 is the most expensive alternative. Alternative 3 is slightly less expensive than Alternative 2. The cost estimates for the alternatives are provided in **Appendix C**.

## SECTION 6

# Recommended Removal Action Alternative

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Alternatives 2 and 3 are comparable in their ability to protect human health and the environment, ability to achieve the RAOs, ease of implementability, compliance with ARARs, and cost. However, because subsurface debris posing a potential risk to human health is left in place under Alternative 2, the alternative results in a greater magnitude of risk remaining after the removal action and requires LUCs and O&M to ensure the removal action remains protective over time. It is also the most expensive of the three alternatives. Therefore, the recommended removal alternative is Alternative 3, Excavation and Backfill (Drum Disposal Area Hot Spot and Can Pit). Alternative 3 consists of excavating the Drum Disposal Area Hot Spot to a depth of 6 inches bgs and to the horizontal extent defined by pre-excavation confirmation samples, excavating the subsurface debris within the Can Pit, and backfilling the excavations.

Navy, USEPA, and VDEQ representatives were involved with the development of this alternative through the Tier I Partnering Team process and will have the opportunity to comment on the recommendation during the regulatory review period for this EE/CA. Following the regulatory review period, a 30-day public comment period will be held to determine public acceptance of the recommended alternative. If public comments are received, a Responsive Summary addressing significant comments will be prepared as part of the Action Memorandum and included in the AR, along with the final EE/CA.

## SECTION 7

# References

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[http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html).

**Appendix A**  
**Applicable or Relevant and Appropriate**  
**Requirements Tables**

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## Acronyms and Abbreviations

ARAR	Applicable or relevant and appropriate requirement	POTW	Publicly Owned Treatment Works
BTAG	Biological Technical Assistance Group	ppm	Parts per Million
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act	RBC	Risk-Based Concentrations
CFC	Chlorofluorocarbon	RCRA	Resource Conservation and Recovery Act
CFR	Code of Federal Regulations	SDWA	Safe Drinking Water Act
DCR	Virginia Department of Conservation and Recreation	SMCL	Secondary Maximum Contaminant Level
DNH	Division of Natural Heritage	TBC	To Be considered
MCL	Maximum Contaminant Level	TCLP	Toxicity Characteristic Leaching Procedure
MCLG	Maximum Contaminant Level Goal	TSCA	Toxic Substance Control Act
NAAQS	National Ambient Air Quality Standards	USACE	US Army Corps of Engineers
NESHAPs	National Emission Standards for Hazardous Air Pollutants	USC	United States Code
NPDES	National Pollutant Discharge Elimination System	USEPA	United States Environmental Protection Agency
NSDWRs	National Secondary Drinking Water Regulations	VA	Virginia
NSPS	New Source Performance Standards	VAC	Virginia Administrative Code
PCB	Polychlorinated biphenyls	VMRC	Virginia Marine Resource Commission
PMCL	Primary Maximum Contaminant Level	VPA	Virginia Pollutant Abatement
		VPDES	Virginia Pollutant Discharge Elimination System

## References

- Commonwealth of Virginia, 2004. Preliminary Identification, Applicable or Relevant and Appropriate Requirements.
- USEPA, 1998. *CERCLA Compliance with Other Laws Manual: Interim Final*. Office of Emergency and Remedial Response. EPA/540/G-89/006.
- USEPA, 1998. *CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes*. Office of Emergency and Remedial Response. EPA/540/G-89/009.
- USEPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

**Table A-1**  
**Federal Chemical-Specific ARARs**  
**Engineering Evaluation and Cost Estimate for Area of Concern 7**  
**Cheatham Annex, Williamsburg, Virginia**

Media	Requirement	Prerequisite	Citation	Alternative	ARAR/TBC Determination	Comment
<b>Preliminary Remediation Goals</b>						
Surface Soil	Chemical concentrations corresponding to fixed levels of human health risk (i.e., a hazard quotient of 1, or lifetime cancer risk of $10^{-6}$ , whichever occurs at a lower concentration).	Assessment of potential human health risks.	USEPA Region III RSL Tables only as they apply to Arsenic [CAS #7440-38-2] and Chromium (hexavalent) [CAS # 18540-29-9]	2, 3	TBC	The following PRGs were established based on this guidance: Arsenic [CAS #7440-38-2]: 6.4 mg/kg Chromium (hexavalent)[CAS # 18540-29-9]: 18.2 mg/kg
Surface Soil	Chemical concentrations corresponding to fixed levels of risks to ecological receptors (flora and/or fauna).	Assessment of potential ecological risks.	Ecological Risk Assessment Guidance for Superfund (ERAGS) only as it applies to Lead [CAS #7439-92-1], Manganese [CAS # 7439-96-5], and Zinc [CAS #7440-66-6]	2, 3	TBC	The following PRGs were established based on this guidance: Lead [CAS #7439-92-1]: 120 mg/kg Manganese [CAS # 7439-96-5]: 324 mg/kg Zinc [CAS #7440-66-6]: 120 mg/kg

**Table A-2**  
**Virginia Chemical-Specific ARARs**  
**Engineering Evaluation and Cost Estimate for Area of Concern 7**  
**Ceatham Annex, Williamsburg, Virginia**

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Virginia Chemical-Specific ARARs apply.						

**Table A-3**  
**Federal Location-Specific ARARs**  
**Engineering Evaluation and Cost Estimate for Area of Concern 7**  
**Cheatham Annex, Williamsburg, Virginia**

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
<b><i>Migratory Flyway</i></b>						
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking.	Presence of migratory birds.	16 USC 703	2, 3	Applicable	The site is located in the Atlantic Migratory Flyway. If migratory birds, or their nests or eggs, are identified at the site, operations will not destroy the birds, nests, or eggs.
<b><i>Coastal Zone</i></b>						
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the area that will affect maximum extent practicable, State coastal zone management programs. Federal agencies must supply the State with a consistency determination.	Wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal zone.	15 CFR 930.33(a)(1), (c); .36(a); .39(b), (c)	2, 3	Applicable	Activities at AOC 7 that will affect Virginia's coastal zone will be consistent to the maximum extent practicable with Virginia's enforceable policies. Activities performed on-site and in compliance with CERCLA are not subject to administrative review; however the substantive requirements of making a consistency determination will be met.

**Table A-4**  
**Virginia Location-Specific ARARs**  
**Engineering Evaluation and Cost Estimate for Area of Concern 7**  
**Cheatham Annex, Williamsburg, Virginia**

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
<b>Wetlands</b>						
Dredging, filling, and/or discharging pollutants into, or adjacent to, surface waters (including wetlands)	Regulations for activities undertaken in State surface waters	Activities such as dredging, filling, or discharging any pollutant into or adjacent to surface waters, or otherwise altering the physical, chemical, or biological properties of surface waters; excavating in wetlands; or conducting the following activities in a wetland: 1. New activities to cause draining that significantly alters or degrades existing wetland acreage or functions. 2. Filling or dumping. 3. Permanent flooding or impounding. 4. New activities that cause significant alteration or degradation of existing wetland acreage or functions.	9 VAC 25-210-90(F)(3), 115(C)(1); 116(A), (B), (C), (F);	2, 3	Relevant and Appropriate	Remediation activities will not be conducted within the onsite wetland; however, site activities have the potential to impact the onsite wetland. Erosion control measures will be in place during construction to prevent impacts.

Table A-5  
Federal Action-Specific ARARs  
Engineering Evaluation and Cost Estimate for Area of Concern 7  
Cheatham Annex, Williamsburg, Virginia

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Federal Action-Specific ARARs apply.						

**Table A-6**  
**Virginia Action-Specific ARARs**  
**Engineering Evaluation and Cost Estimate for Area of Concern 7**  
**Cheatham Annex, Williamsburg, Virginia**

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
<b>Erosion and Sediment Control</b>						
Erosion and deposits of soil/sediment caused by land disturbing activities	Regulations for the effective control of soil erosion, sediment deposition and nonagricultural runoff which must be met in any control program to prevent the unreasonable degradation of properties, stream channels, waters and other natural resources.	Construction activities that will disturb more than 10,000 square feet of land.	9 VAC 25-840-40 (1); (2); (3); (4); (17); (18); (19)(h), (i)	2, 3	Relevant and Appropriate	Erosion control measures will be implemented for the construction activities. The regulations are relevant and appropriate because less than 10,000 square feet of land will be disturbed during remediation activities.
<b>Fugitive Dust Control</b>						
Generation of fugitive dust	Regulations regarding reasonable precautions to prevent particulate matter from becoming airborne.	Conducting any activity which may cause particulate matter to become airborne.	9 VAC 5-50-90	2, 3	Applicable	Dust control measures will be implemented during activities at the site.
<b>Waste Management</b>						
Management of non-hazardous solid waste in containers	Establishes standards and procedures pertaining to the management of non-hazardous solid wastes in containers. Nonputrescible wastes must be stored in appropriate containers and not staged for more than 90 days.	Generation of non-hazardous solid waste that is managed onsite in containers.	9 VAC 20-81-95(D)(10)(b)	2, 3	Applicable	It is anticipated that some wastes (such as decontamination fluids) may be generated and managed onsite in containers. Based on the analytical results from previous investigations, it is expected that these wastes will be non-hazardous solid waste. Wastes will be characterized prior to offsite disposal.
Accumulation of hazardous waste in containers onsite for less than 90 days	Hazardous waste may be accumulated on site in containers for up to 90 days so long as the containers are in good condition, compatible with the waste being stored, and labeled with the words "Hazardous Waste" and the date that accumulation began. The containers must also be kept closed unless adding or removing waste and inspected weekly.	Accumulation of hazardous waste in containers onsite.	9 VAC 20-60-262 only as it incorporates 40 CFR 262.34 (a) (1)(i), (2), (3)	2,3	Applicable	This requirement is only applicable if hazardous waste is generated and managed onsite in containers. Containers will be managed in accordance with these requirements.

**Table A-6**  
**Virginia Action-Specific ARARs**  
**Engineering Evaluation and Cost Estimate for Area of Concern 7**  
**Cheatham Annex, Williamsburg, Virginia**

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Accumulation and/or treatment of hazardous waste in staging piles onsite	A staging pile must be designed, constructed, and maintained to prevent the migration of hazardous constituents other media. The design must consider location, hydrogeology, and any other factors that may reasonably influence the migration of hazardous constituents. Closure requirements are also included.	Accumulation or treatment of hazardous wastes in staging piles onsite	9 VAC 20-60-264 only as it incorporates 40 CFR 264.554(d)(1)(ii), (d)(2), (j)(1), (j)(2)	2, 3	Relevant and Appropriate	These requirements are applicable to operating a staging pile associated with a corrective action management unit and therefore relevant and appropriate for treatment or staging of hazardous wastes in piles during this action. Staging piles will be designed and operated in accordance with these standards; however, since this is a CERCLA action no permit will be required.
<b><i>Final Cover Design Standards</i></b>						
Construction of a landfill cap	Establishes design criteria for capping sites with waste in place	Construction of a cap with waste in place	9 VAC 20-81-160(D)(f)	2	Relevant and Appropriate	These requirements are relevant and appropriate because the disposal area was never permitted. The substantive requirements of alternative cap design will be met, however administrative reviews are not required for CERCLA actions.

**Appendix B**  
**Sustainability Assessment**

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# Sustainability Analysis for AOC 7

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## Introduction

This appendix presents the approach taken and results obtained from a sustainability analysis performed for Area of Concern (AOC) 7, Cheatham Annex (CAX), Williamsburg, Virginia. A site description and history of AOC 7 is provided in the Engineering Evaluation/Cost Analysis (EE/CA). The following removal actions were developed to address potential risks to human health and the environment from exposure to impacted surface soil and subsurface debris. A detailed summary of the removal actions is provided in the EE/CA.

- Alternative 1 – No Action
- Alternative 2 – Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)
- Alternative 3 – Excavation and Backfill (Drum Disposal Hot Spot and Can Pit)

The purpose of this analysis is to provide a quantitative assessment of the potential environmental and social impact of each removal action. The sustainability analysis was performed using SiteWise Version 2.0 (Battelle, 2011) for Alternatives 2 and 3. Although the No Action alternative (Alternative 1) has no actions that would impact sustainability, it is not considered a viable alternative and will not be further discussed in this analysis.

## Method and Assumptions

The SiteWise tool consists of a series of Excel-based spreadsheets used to conduct a baseline assessment of sustainability metrics. The assessment is carried out using a spreadsheet-based building block approach, where every remedial alternative is first broken down into modules that mirror the phases of remedial action work, specifically: remedial investigation (RI), remedial action construction (RAC), remedial action operation, and long-term monitoring (LTM). For this analysis only the RAC phase is applicable.

SiteWise uses various emission factors from governmental or non-governmental research sources to determine the environmental impact of each activity. The quantitative metrics calculated by the tool include:

- 1) Greenhouse gases (GHGs) reported as metric tons of carbon dioxide equivalents (CO<sub>2</sub>e), consisting of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O)
- 2) Energy usage (expressed as millions of British Thermal Units [MMBTU])
- 3) Water usage (gallons of water)
- 4) Air emissions of criteria pollutants consisting of metric tons of nitrogen (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), and particulate matter (PM<sub>10</sub>)
- 5) Accident risk (risk of injury and risk of fatality)

For the purpose of this discussion the term footprint will be used to describe the quantified emissions or quantities for each metric. To estimate the sustainability footprint for each removal action alternative, only those elements possessing important sustainability impacts were included in the assessment. A lower footprint indicates lower deleterious impacts to environmental and social metrics, which collectively make up the SiteWise sustainability metrics. Conversely, a higher footprint indicates higher deleterious impacts associated with the SiteWise metrics. The major conclusions of this sustainability analysis are incorporated into the effectiveness criteria evaluation of the EE/CA.

The following is a description of the major activities for each alternative under the RAC.

- Alternative 2 –Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)

- Production of soil for cover and backfilling (industry averages for heavy equipment operation to extract soil from the ground)
- Transportation of personnel and equipment for capping, excavation, and backfilling activities
- Equipment use to place soil cover, excavate impacted soil, and backfill excavated area
- Transportation and disposal of residuals to non-hazardous landfill
- Onsite labor hours for estimate of accident risks
- Alternative 3 – Excavation and Backfill (Drum Disposal Hot Spot and Can Pit)
  - Production of soil for backfilling (industry averages for heavy equipment operation to extract soil from the ground)
  - Transportation of personnel and equipment for excavation and backfilling activities
  - Equipment use to excavate debris and impacted soil, and backfill excavated area
  - Transportation and disposal of residuals to non-hazardous landfill
  - Onsite labor hours for estimate of accident risks

## General Assumptions

The specific assumptions made for the individual remedies are presented in **Tables B-1** and **B-2**. The following general assumptions are used for the SiteWise tool evaluation:

- The complete environmental footprint for production of equipment used, or production of the vehicles used for transportation, is not considered in this analysis.
- Daily local transportation is assumed to consist of 25 miles of driving a light duty truck per day.
- Landfill is located 100 miles away from the site.
- The following weights and distance for delivery are used for equipment:
  - Bulldozer, Loader, off-road dump truck – 20 tons, 50 miles round trip
  - Excavator – 30 tons, 50 miles round trip

## Results and Conclusions

A comparative analysis for Alternatives 2 and 3 is summarized in **Figure B-1**. **Table B-3** presents a comparison of the quantitative environmental footprint metrics evaluated for each of the removal action alternatives.

Alternative 2 had lower footprints for all of the sustainability metrics compared with Alternative 3 because it involves less transportation of materials and waste and less heavy equipment to implement.

A qualitative relative impact summary is also provided in **Table B-3**. The relative impact is a qualitative assessment of the relative footprint of each alternative, a rating of high, medium, or low is assigned to each alternative based on its performance against the other alternatives. The tool assigns a ranking of high to the highest footprint in each category and assigns the rankings of other alternatives based on the difference in the data between alternatives. The ranking is based on a 30 percent difference, for example, if the footprints of two alternatives are within 30 percent of each other they will be given the same rating. This allows for some uncertainty inherent in the assumptions used in the model.

It should be noted that while this analysis compares the environmental footprints of each of the alternatives, the alternatives provide different end-uses. Therefore, a comparison of the results of the alternatives needs to be made in the context of the benefits (e.g., ARAR compliance, contaminant reduction, cost effectiveness, and etc.) of each of the alternatives.

The following is a summary of the individual alternatives:

### **Alternative 2— Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)**

**GHG and Energy Use** – Approximately 50 percent of the potential GHG and energy use footprints are from material production (impacts from heavy equipment used to extract soil from the ground). Material and equipment transportation, equipment use, and transportation and disposal of residuals each contributed approximately 10 to 15 percent of the GHG and energy footprints. Less than 5 percent of the GHG and energy footprints are from personnel transportation.

**Criteria Air Pollutants (NO<sub>x</sub>, SO<sub>x</sub>, PM<sub>10</sub>)** – Approximately 70 percent of the NO<sub>x</sub> footprint is from equipment use during the removal action. Residual handling contributes approximately 25 percent and transportation of personnel and equipment each contribute approximately 2 percent of the NO<sub>x</sub> footprint. More than 85 percent of the potential SO<sub>x</sub> and 90 percent of the potential PM<sub>10</sub> footprints are attributed to residual handling with equipment use contributing the majority of the remaining footprints. It is important to note that criteria air pollutants from material production are not included in the SiteWise inventory, thus these footprints are likely underestimated.

**Accident Risks** – The majority of each accident risk footprint (risk of injury and risk of fatality) are from onsite labor hours during the removal action which contributes approximately 70 and 87 percent of the injury and fatality footprints, respectively. Transportation of personnel contributes approximately 14 and 6 percent of the injury and accident risk footprints and transportation of equipment/materials contributes approximately 10 and 4 percent. Transportation of residuals contributes approximately 7 and 3 percent.

Results are provided in **Table B-4** and **Figure B-2**.

### **Alternative 3 – Excavation and Backfill (Drum Disposal Hot Spot and Can Pit)**

**GHG and Energy Use** – Approximately 40 to 45 percent of the potential GHG and energy use footprints are from material production and residual handling. Material and equipment transportation, equipment use, and transportation and disposal of residuals each contributed approximately 5 to 10 percent of the remaining GHG and energy footprints. Less than 2 percent of each footprint is from personnel transportation.

**Criteria Air Pollutants (NO<sub>x</sub>, SO<sub>x</sub>, PM<sub>10</sub>)** – Approximately 70 percent of the NO<sub>x</sub> footprint and more than 95 percent of the SO<sub>x</sub> and PM<sub>10</sub> footprints are from residual transportation and disposal. Equipment use contributes slightly more than 25 percent of the NO<sub>x</sub> footprints and less than 5 percent of the SO<sub>x</sub> and PM<sub>10</sub> footprints. Personnel transportation and material and equipment transportation each contribute less than 1 percent of the criteria air pollutant footprints. It is important to note that criteria air pollutants from material production are not included in the SiteWise inventory, thus these footprints are likely underestimated.

**Accident Risks** – Approximately 40 percent of the fatality risk is from onsite labor hours, with another 40 percent from residual transportation and disposal. Personnel transportation and material and equipment transportation contributed approximately 10 percent of the fatality risk footprint. Approximately 70 percent of the injury risk footprint is from onsite labor hours. Residual transportation and disposal contributes approximately 20 percent and personnel and material and equipment transportation each contribute approximately 5 percent of the injury risk footprints.

Results are provided in **Table B-5** and **Figure B-3**.

## **Uncertainty Assessment**

The SiteWise tool calculates environmental and risk footprints based on industry averages, published emissions factors, and generalized data sources. The footprint results are not representative of actual emissions and should be used for comparative purposes only.

Only GHG and total energy use data is available in the SiteWise inventory for material production. Other footprints such as water use and criteria air pollutants are likely underrepresented in the SiteWise analysis.

## Recommendations

The estimates from the SiteWise tool were used to estimate the environmental footprint of the alternatives. Once the alternative is selected, it is recommended that the footprint of the selected alternative be further evaluated in the design phase of the projects to explore opportunities to optimize the environmental footprint of the project and integrate sustainable remediation best practices in the design, construction, and operation of the removal action.

If Alternative 2 is selected, potential best practices may include using equipment with emissions control devices or managing work such that engine idle time is minimized. If Alternative 3 is selected, a potential best practice may be sourcing a landfill or waste receptor that is closer to the site.

## References

Battelle. 2011. *SiteWise Version 2 User Guide*. NAVFAC Engineering Service Center, UG-2092-ENV. June.

Table B-1

**Alternative 2 - Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)**

AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis

Cheatham Annex, Williamsburg, Virginia

Sitewise Tab	Assumptions
<b>Removal Action Construction</b>	<b>Cover installation, hot spot excavation, backfill, LUCs</b>
Material Production - Fill/Backfill/Topsoil/Access Road	Access Road (gravel) - 360 square yard (3,240 square ft), 0.5 feet deep. 60 cy x 1.4 ton/cy = 84 tons
	Fill material (soil) - Can Pit Area - 66 cy x 1.5 ton/cy = 99 tons = 198,000 lbs
	Fill material (soil) - Drum Disposal Area - 15 cy x 1.5 ton/cy = 23 tons = 46,000 lbs
	Topsoil - Can Pit Area - 14 cy x 1.5 ton/cy = 21 tons = 42,000 lbs
	Topsoil - Drum Disposal Area - 15 cy x 1.5 ton/cy = 23 tons = 46,000 lbs
Personnel Transportation - Road	Daily local travel: Light truck, gasoline powered 5 people, 25 miles round trip, 10 days, 1 person per vehicle (50 total trips)
Equipment/Material Transportation - Road	General assumption: 25 miles one way, ~20-25 ton loads, diesel powered
	Fill Material - 122 tons total, 6 trips, 20 tons each, 25 miles x 6 trips = 150 miles full, 150 miles empty
	Topsoil - 44 tons, 2 trips, 22 tons each, 25 miles x 2 trips = 50 miles full, 50 miles empty
	Gravel - 84 tons, 4 trips, 21 tons each, 25 miles x 4 trips = 100 miles full, 100 miles empty
	Heavy Equipment to site - Excavator (30 tons), Dozer (20 tons), Front End Loader (20 tons), Offroad Dump Truck (20 tons) each transported 25 miles to site, 25 miles from site at end of work
Equipment Use	Dozer - Can Pit Area - backfill 112 cy soil, Drum Disposal Area - backfill 30 cy soil
	Excavator - remove 48 cy material (Drum Disposal Area)
	Front-end loader - assume moves all soil/gravel once - 97+14+15+15+60 = 201 cy material
	Off-road dump truck - proxy internal combustion engine w/fuel efficiency of 5 gallons/hr runtime, running average of 3 hrs per day (30 hrs)
IDW transportation/disposal	71 tons of nonhazardous soil to landfill located 100 miles away, 3 trips, ~24 tons each, 3 empty trips
Labor Hours Onsite	520 hours (assumes 10 x 10 hr days to complete - 1 site superintendent, 1 heavy equipment operator, 2 laborers, 1 health and safety manager, 20 hrs confirmation sampling) - all construction laborers

Notes:

R/T = round trip

Table B-2

**Alternative 3 - Excavation and Backfill (Drum Disposal Hot Spot and Can Pit)**  
*AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis*  
*Cheatham Annex, Williamsburg, Virginia*

Sitewise Tab	Assumptions
<b>Removal Action Construction</b>	<b>Debris and soil excavation, backfill</b>
Material Production - Fill/Backfill/Topsoil/Access Road	Access Road (gravel) - 360 square yard, 6 inches deep. 60 cy x 1.4 ton/cy = 84 tons Fill material (soil) - Both areas - 212 cy x 1.5 ton/cy = 318 tons = 636,000 lbs Topsoil - Both areas - 69 cy x 1.5 ton/cy = 103.5 tons = 207,000 lbs
Personnel Transportation - Road	Daily local travel: 5 people, 25 miles round trip, 15 days, 1 person per vehicle (75 total trips)
Equipment/Material Transportation - Road	General assumption: 25 miles one way, ~20-25 ton loads, diesel powered Fill Material - 318 tons total, 16 trips, 20 tons each, 25 miles x 16 trips = 400 miles full, 400 miles empty Topsoil - 104 tons, 5 trips, 21 tons each, 25 miles x 5 trips = 250 miles full, 250 miles empty Gravel - 84 tons, 4 trips, 21 tons each, 25 miles x 4 trips = 100 miles full, 100 miles empty Heavy Equipment to site - Excavator (30 tons), Dozer (20 tons), Front End Loader (20 tons), Offroad Dump Truck (20 tons) each transported 25 miles to site, 25 miles from site at end of work
Equipment Use	Excavator - remove 608 cy material Dozer - backfill 629 cy fill, 29 cy topsoil = 658 cy Front-end loader - assume moves all soil/gravel once - 629+29+60 = 718 cy material Off-road dump truck - proxy internal combustion engine w/fuel efficiency of 5 gallons/hr runtime, running average of 3 hrs per day (45 hrs)
IDW transportation/disposal	912 tons of nonhazardous soil to landfill located 100 miles away, 45 trips, 20.3 tons each, 45 empty trips
Labor Hours Onsite	770 hours (assumes 15 x 10 hr days to complete - 1 site superintendent, 1 heavy equipment operator, 2 laborers, 1 health and safety manager, 20 hrs confirmation sampling) - all construction laborers

Notes:

TABLE B-3

**Relative Impact of Alternatives**

*AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis  
Cheatham Annex, Williamsburg, Virginia*

Remedial Alternatives	GHG Emissions	Total energy Used	Water Used	NO <sub>x</sub> emissions	SO <sub>x</sub> Emissions	PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
	metric ton	MMBTU	gallons	metric ton	metric ton	metric ton		
Alternative 2 - Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)	12	191	0	2.12E-02	3.52E-03	1.80E-02	7.14E-05	1.40E-02
Alternative 2 - Excavation and Backfill (Drum Disposal Hot Spot)	23	375	0	3.94E-02	8.27E-03	3.96E-02	1.17E-04	2.19E-02

Relative Impact

Remedial Alternatives	GHG Emissions	Total energy Used	Water Used	NO <sub>x</sub> emissions	SO <sub>x</sub> Emissions	PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
Alternative 2 - Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)	Medium	Medium	Low	Medium	Medium	Medium	Medium	Medium
Alternative 2 - Excavation and Backfill (Drum Disposal Hot Spot)	High	High	Low	High	High	High	High	High

The relative impact is a qualitative assessment of the relative footprint of each alternative, a rating of High for an alternative is assigned if it is at least 70 percent of the maximum

Notes:

MMBTU - million British Thermal Unit  
NO<sub>x</sub> - Nitrogen Oxides  
SO<sub>x</sub> - Sulfur Oxides  
LUCs - land use controls

PM10 - Particulate Matter  
GHG - Greenhouse Gases  
NA - Not applicable

Table B-4

**Alternative 2 - Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit) Results**

AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis

Cheatham Annex, Williamsburg, Virginia

Phase	Activities	GHG Emissions	Total Energy Used	Water Used	NO <sub>x</sub> Emissions	SO <sub>x</sub> Emissions	PM <sub>10</sub> Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	metric ton	metric ton	metric ton		
Remedial Action Construction	Consumables	5	98	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	1	9	NA	2.9E-04	9.0E-06	4.1E-05	9.8E-06	7.8E-04
	Transportation-Equipment	2	21	NA	5.1E-04	9.0E-06	4.5E-05	7.0E-06	5.7E-04
	Equipment Use and Misc	2	24	0	1.4E-02	4.0E-04	1.4E-03	4.8E-05	1.2E-02
	Residual Handling	2	40	NA	6.2E-03	3.1E-03	1.7E-02	6.2E-06	5.0E-04
	<b>Total</b>	<b>12</b>	<b>191</b>	<b>0</b>	<b>2.12E-02</b>	<b>3.52E-03</b>	<b>1.80E-02</b>	<b>7.14E-05</b>	<b>1.40E-02</b>

Notes:

MMBTU - million British Thermal Unit

NO<sub>x</sub> - Nitrogen Oxides

SO<sub>x</sub> - Sulfur Oxides

PM10 - Particulate Matter

NA - Not Applicable

GHG - Greenhouse Gases

Table B-5

**Alternative 3 - Excavation and Backfill (Drum Disposal Hot Spot and Can Pit) Results**

*AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis*

*Cheatham Annex, Williamsburg, Virginia*

Phase	Activities	GHG Emissions	Total Energy Used	Water Used	NO <sub>x</sub> Emissions	SO <sub>x</sub> Emissions	PM <sub>10</sub> Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	metric ton	metric ton	metric ton		
Remedial Action Construction	Consumables	10	185	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	1	13	NA	4.3E-04	1.4E-05	6.1E-05	1.5E-05	1.2E-03
	Transportation-Equipment	3	38	NA	9.2E-04	1.6E-05	8.2E-05	1.3E-05	1.1E-03
	Equipment Use and Misc	4	45	0	2.4E-02	1.3E-03	2.4E-03	7.3E-05	1.8E-02
	Residual Handling	6	93	NA	1.4E-02	7.0E-03	3.7E-02	1.6E-05	1.3E-03
	<b>Total</b>	<b>23</b>	<b>375</b>	<b>0</b>	<b>3.94E-02</b>	<b>8.27E-03</b>	<b>3.96E-02</b>	<b>1.17E-04</b>	<b>2.19E-02</b>

Notes:

MMBTU - million British Thermal Unit

NA - not applicable

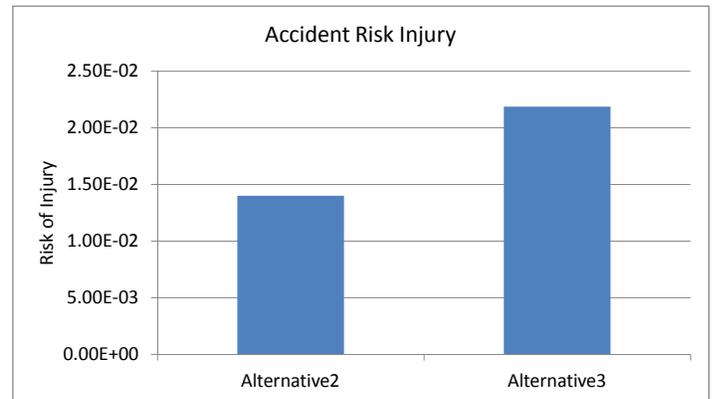
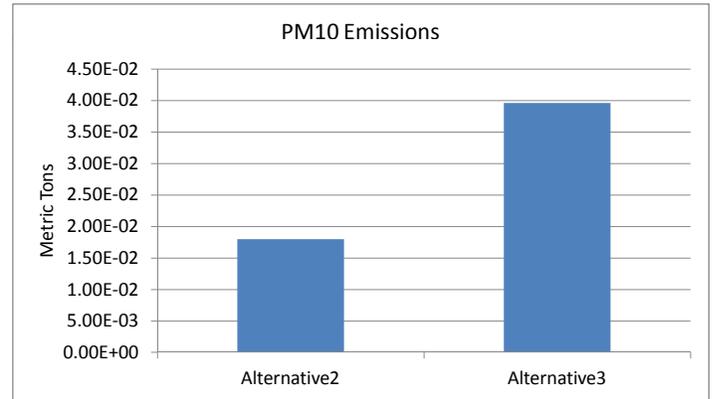
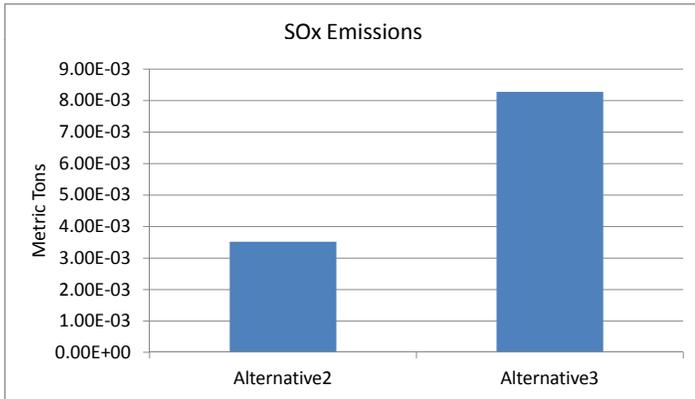
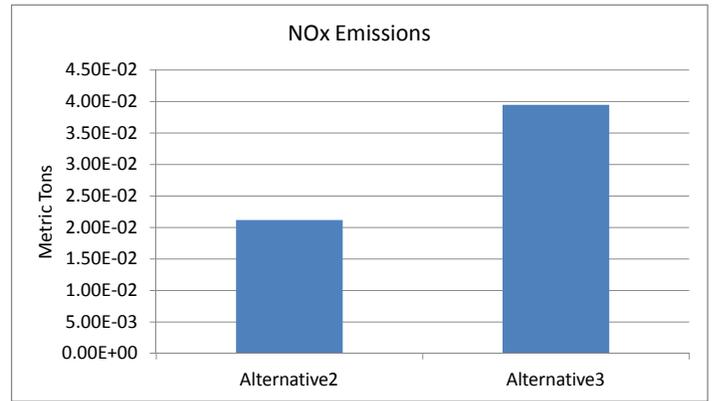
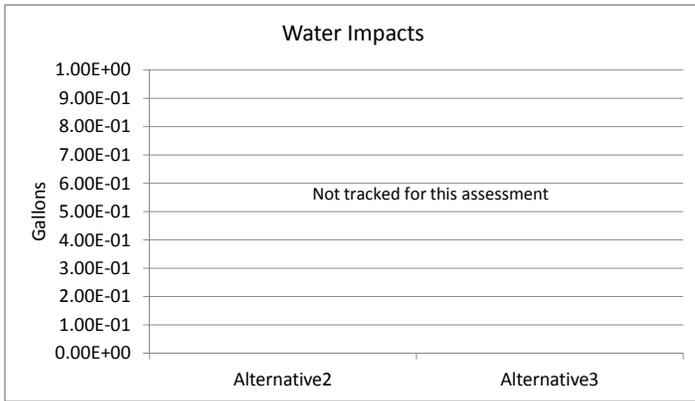
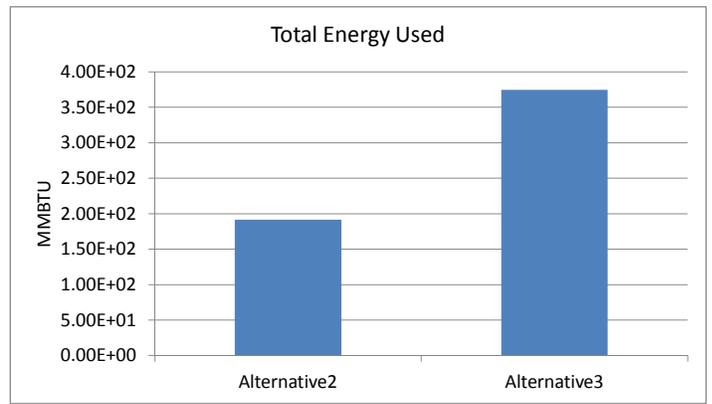
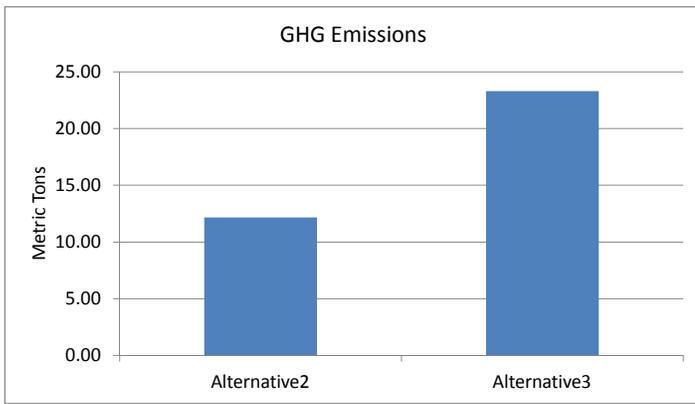
NO<sub>x</sub> - Nitrogen Oxides

SO<sub>x</sub> - Sulfur Oxides

PM10 - Particulate Matter

NA - Not Applicable

GHG - Greenhouse Gases



Notes:  
 Alternative 2 - Soil cover, excavation, backfill, and land use controls  
 Alternative 3 - Excavation and backfill

Figure B-1  
 Overall Results  
 AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis  
 Cheatham Annex, Williamsburg, Virginia

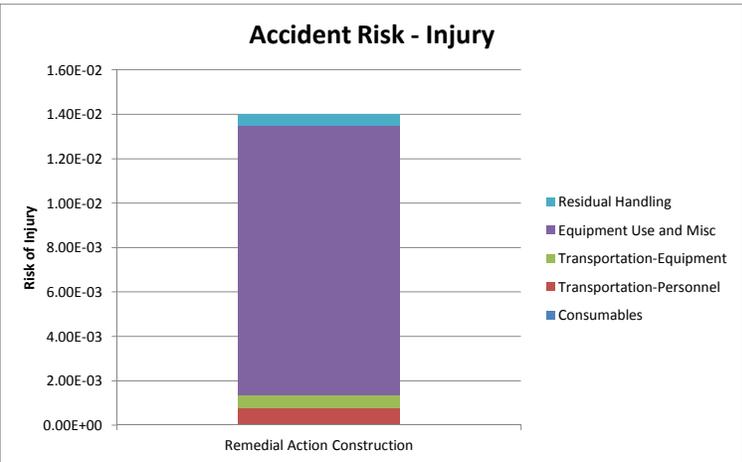
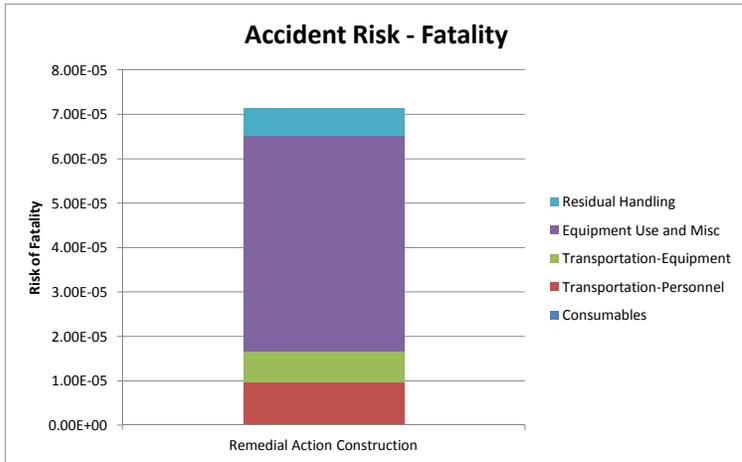
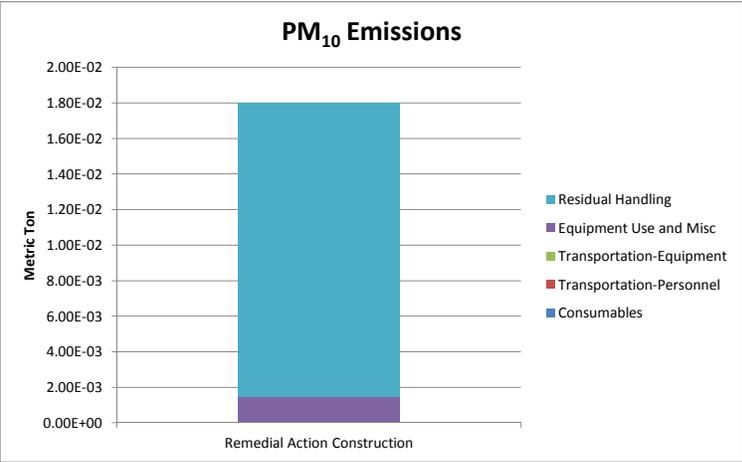
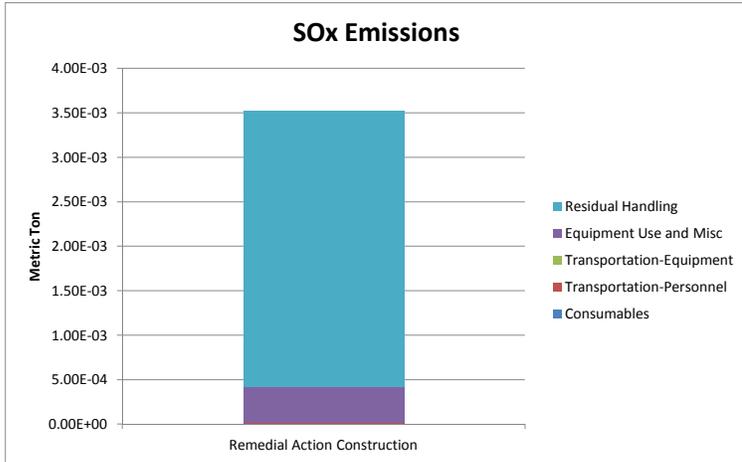
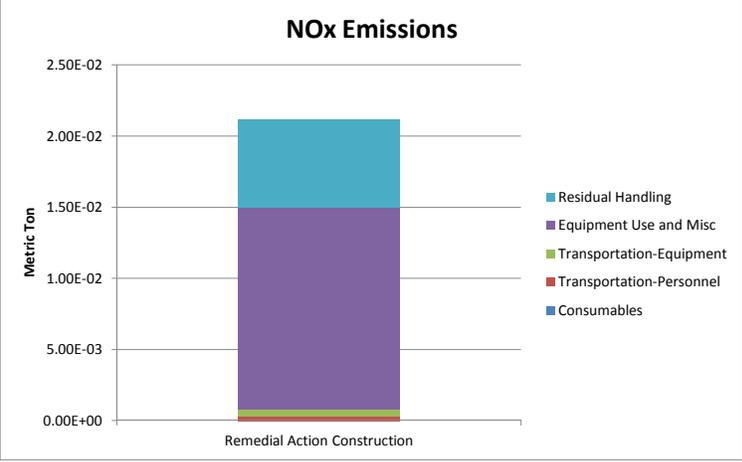
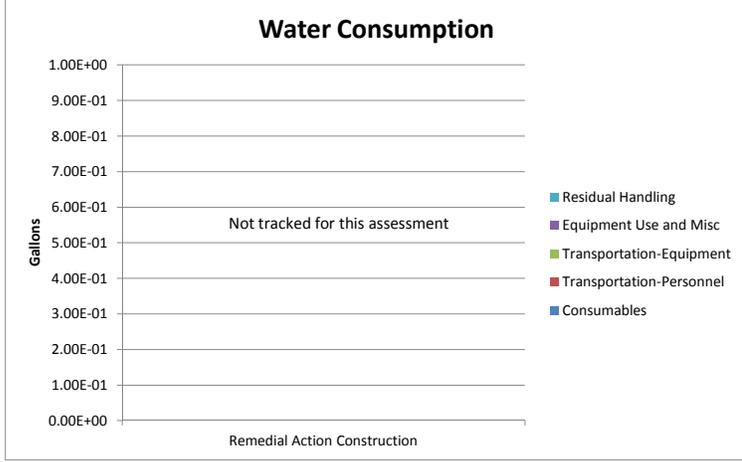
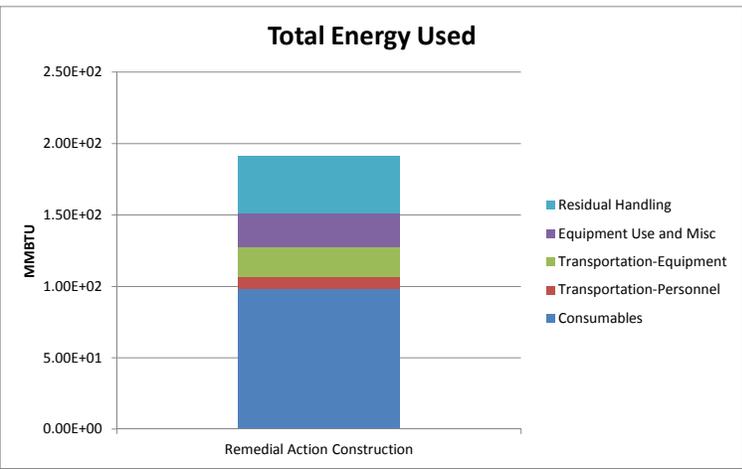
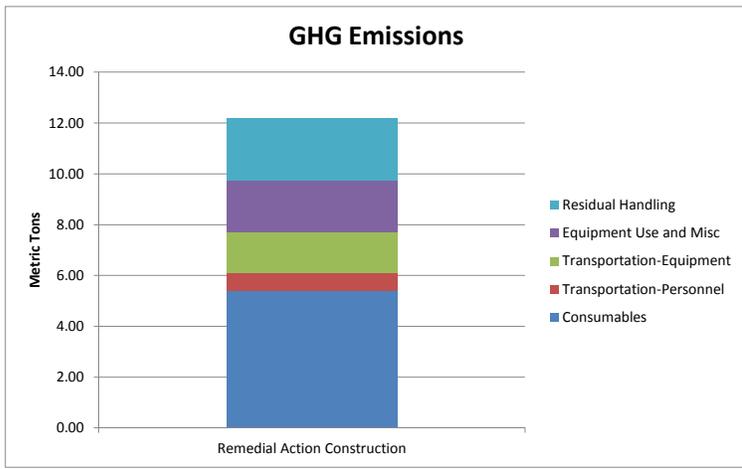


Figure B-2  
 Alternative 2 - Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and LUCs (Can Pit)  
 AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis  
 Cheatham Annex, Williamsburg, Virginia

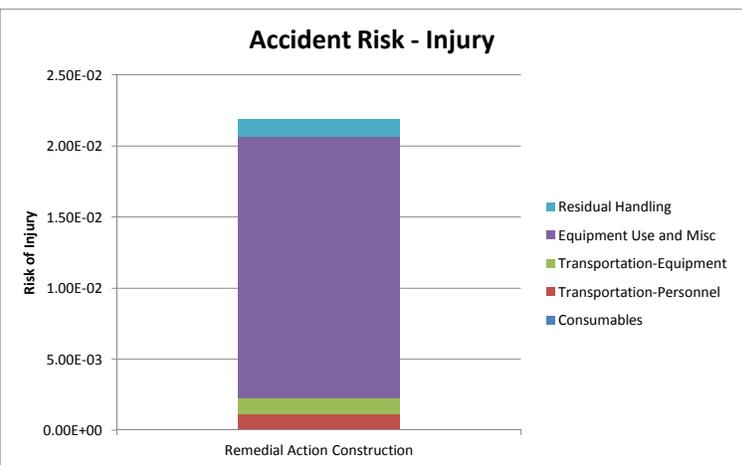
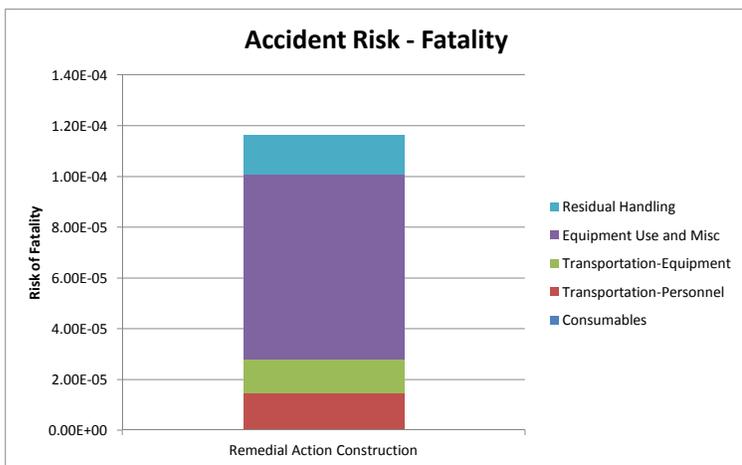
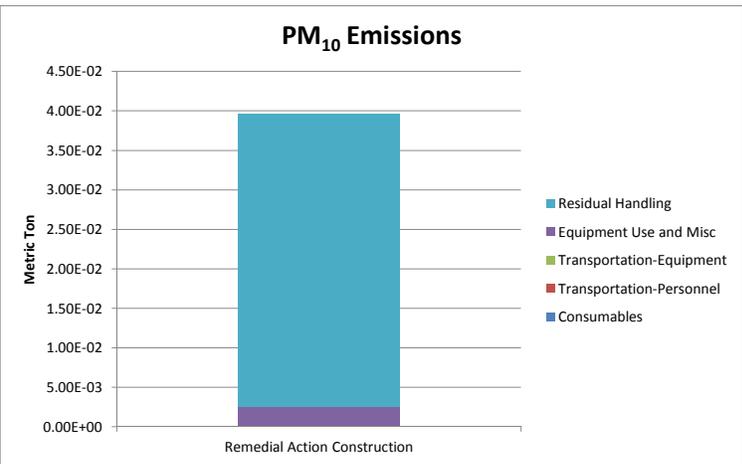
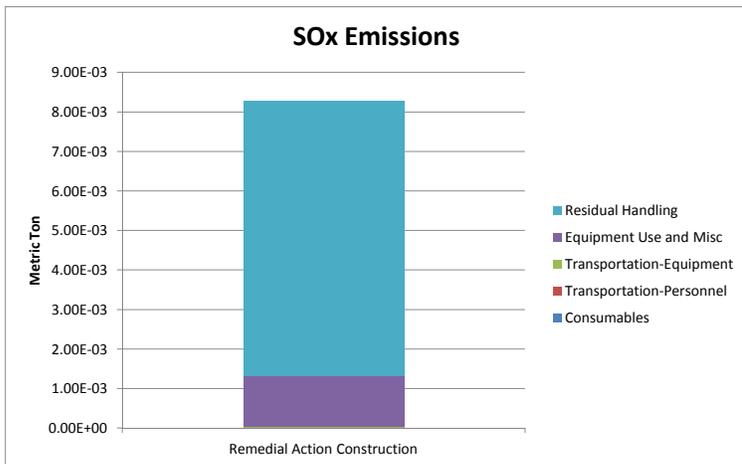
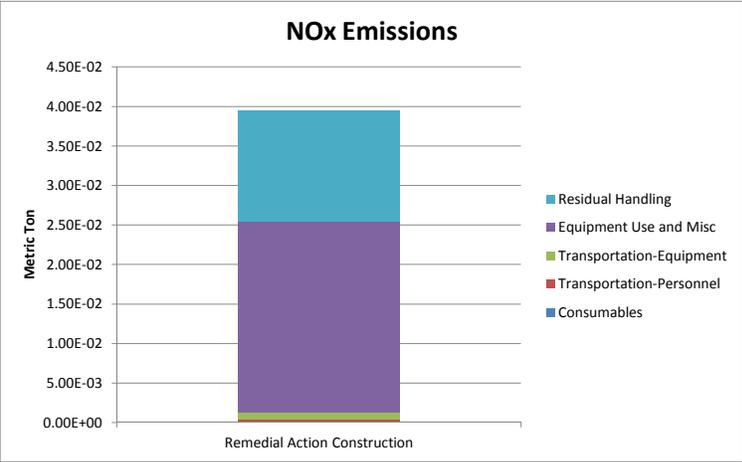
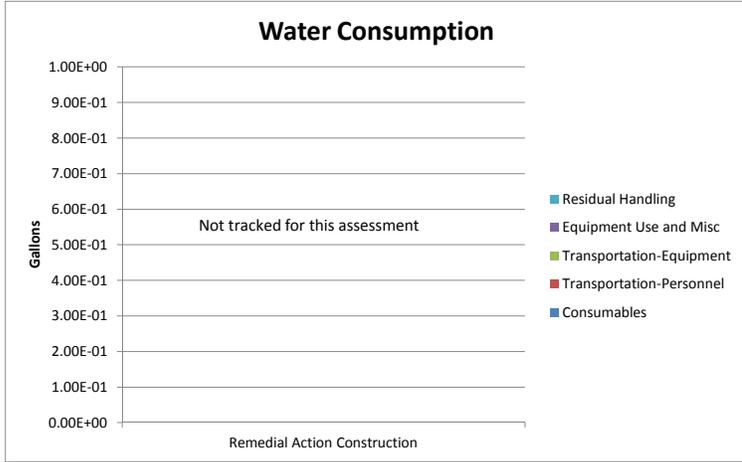
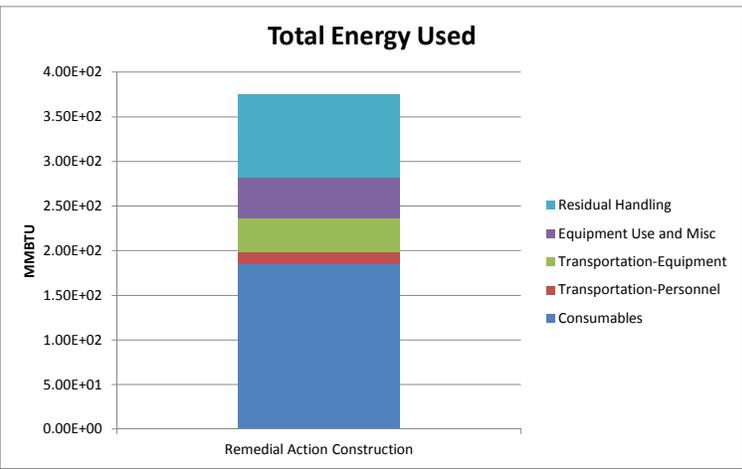
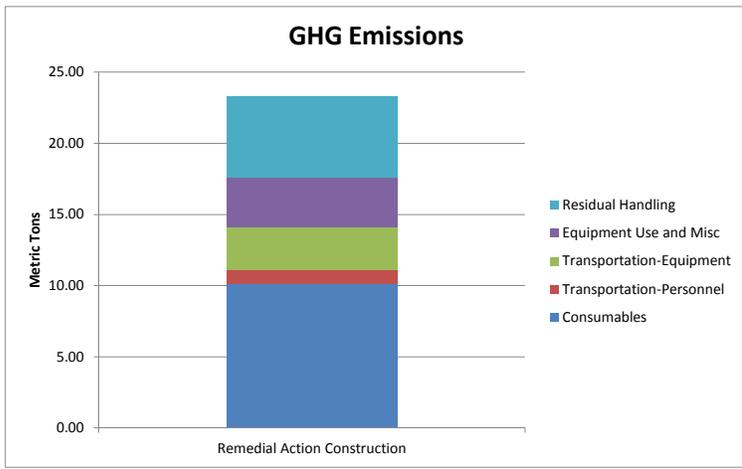


Figure B-3  
Alternative 3 - Excavation and Backfill (Drum Disposal Hot Spot and Can Pit)  
AOC 7 Can Pit and Drum Disposal Removal Engineering Evaluation/Cost Analysis  
Cheatham Annex, Williamsburg, Virginia

**Appendix C**  
**Cost Estimates**

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TABLE C-1

## Engineer's Cost Estimate for Alternative 2: Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)

## Engineering Evaluation and Cost Analysis for AOC 7

## Cheatham Annex

## Williamsburg, Virginia

Description: Alternative 2 consists of excavating the Drum Disposal Area Hot Spot and installing a soil cover over the Can Pit. The Drum Disposal Area, assumed to be a 25 foot radius that will be excavated to 0.5 ft bgs and backfilled. A soil cover will be installed over the 600 ft<sup>2</sup> Can Pit, currently open to 4 ft bgs, by backfilling the pit to bring it up to the surrounding grade. LUCs, consisting of fencing and signage, will be implemented for the Can Pit cover.

Description of Service/Items	Unit	Quantity	Unit Price	Total	Assumptions
<b>Common to Both Removal Areas</b>					
<b>Work Planning Documents</b>					
Construction Work Plan	Lump Sum	1	\$20,000.00	\$20,000.00	Includes draft and final submission and Erosion and Sediment Control Plan
EM385 Health and Safety Plan	Lump Sum	1	\$12,000.00	\$12,000.00	Includes draft and final submission and AHAs
Construction Completion Report	Lump Sum	1	\$15,000.00	\$15,000.00	Includes draft and final submission
<b>Work Planning Documents Total</b>				<b>\$47,000</b>	
<b>Mobilization/Demobilization and Site Setup</b>					
Mobilization/Demobilization	Each	2	\$5,715.00	\$11,430.00	Includes mobilization and demobilization of all equipment and materials necessary to perform the work. (RSMMeans Crew #B-1, #B-10L, #B-10T, and #B-12A)
Construction Entrance Temporary Road	square yard	360	\$15.05	\$5,418.00	One at 200' x 12' and 6" thick with #1 VDOT Stone to access the site from the access road and one 70'x12' and 6" thick with #1 VDOT stone to access the access road from Chase Road. [RSMMeans #01-55-23.50 (0100)].
Silt Fence	Linear Feet	280	\$4.25	\$1,190.00	Includes silt fence for the Can Pit and Drum Disposal Areas (approximately 25' x 25' for the can pit area and 45' x 45' for the drum disposal area). Includes labor and equipment. (Based on recent similar project).
Material Handling Area for Excavated Material	Lump Sum	1	\$1,500.00	\$1,500.00	Assumes 50' x 50' area. Includes impermeable liner, berm, silt fence, sandbags, and 3" layer of sand over the impermeable liner to protect the liner; setup and removal included (based on project similar in nature).
Material Staging Area for Fill Material	Lump Sum	1	\$650.00	\$650.00	Assumes 50' x 50' area. Includes 3 rolls of poly sheeting and silt fence; removal included
Vegetation Clearance	Acre	0.193	\$6,850.00	\$1,322.05	Assumes clearing 3' on each side of the 1,400' access road. [RSMMeans #31-11-10.10 (0200)].
Temporary Culvert	Lump Sum	1	\$4,414.50	\$4,414.50	Assumes 12" diameter piping and stone for a 3' deep by 5' wide by 18' long drainage ditch (RSMMeans Crew #B-1 & #B-12A plus #31-37-13.10, and #33-41-13.40).
Portable Toilet and Handwash Station	Week	2	\$100.00	\$200.00	Based on recent quote from project similar in nature. RS Means is similar in price at 72.38 per week. Recommend \$100 based on recent project.
Trimble GPS	Week	2	\$900.00	\$1,800.00	For identifying removal areas and pre-excavation horizontal delineation sample locations
<b>Site Restoration</b>					
Grading	square yard	2800	\$2.86	\$8,008.00	Includes re-grading the nature trail/access road. Assumes 1,400' x 18' road [RSMMeans #31-22-16.10 (1050)].
Seeding	Lump Sum	1	\$3,179.88	\$3,179.88	Includes seed and straw for Can Pit Area, Drum Disposal Area, and all other disturbed areas. Assumes the area to be restored is less than 1 acre [RSMMeans #32-92-19.14 (0800)].
<b>Mobilization/Demobilization, Site Setup, and Site Restoration Total</b>				<b>\$39,112</b>	
<b>Construction Crew</b>					
Site Superintendent	Hour	100	\$58.50	\$5,850.00	Assumes 10 10-hour days to complete work.
Heavy Equipment Operator	Hour	100	\$45.50	\$4,550.00	Assumes 10 10-hour days to complete work and 1 operator for dozer for Can Pit cover installation and the same operator using the excavator and dozer for the drum disposal area.
Laborer	Hour	200	\$28.60	\$5,720.00	Assumes 10 10-hour days to complete work and 2 laborers. One to spot excavator and one to watch trucks unloading topsoil and general fill.
H&S/QC Manager	Hour	100	\$52.00	\$5,200.00	Assumes 10 10-hour days to complete work
<b>Heavy Equipment</b>					
Excavator	Week	2	\$3,690.00	\$7,380.00	Includes fuel [Hertz Equipment Rental = \$2,440/week plus \$1,250/week (250 gal. @ \$5/gal) for diesel fuel].
Dozer	Week	2	\$2,575.00	\$5,150.00	Includes fuel [Hertz Equipment Rental = \$1,575/week plus \$1,000/week (200 gal. @ \$5/gal) for diesel fuel].
Front End Loader	Week	2	\$2,945.00	\$5,890.00	Includes fuel [Hertz Equipment Rental = \$1,945/week plus \$1,000/week (200 gal. @ \$5/gal) for diesel fuel].
Off-Road Dump Truck	Week	2	\$4,665.00	\$9,330.00	Includes fuel [Hertz Equipment Rental = \$3,415/week plus \$1,250/week (250 gal. @ \$5/gal) for diesel fuel].
Project Vehicle (Pickup Truck)	Week	2	\$1,780.00	\$3,560.00	Includes fuel and rental vehicle. Assumes 1 truck for Site Superintendent and 1 for Construction crew [Hertz Equipment Rental = 2 each @ \$750/week plus 2 each @ \$140/week (35 gallons @ \$4/gallon for fuel)].
<b>Construction Crew and Heavy Equipment Total</b>				<b>\$52,630</b>	
<b>Drum Disposal Area Excavation and Backfill</b>					
<b>Pre-Excavation Confirmation Sampling</b>					
Confirmation Sampling	each	20	\$95.00	\$1,900.00	Assumes 7 day TAT and tier approach consisting of 4 surface soil samples per tier with 10 ft spacing between tiers. Assume 50 ft radius from hotspot (5 tiers). Samples analyzed for arsenic, chromium, lead, manganese, zinc. BOA rates used.
Confirmation Sampling Field Crew	Hour	20	\$53.50	\$1,070.00	Assumes 1 10-hour day to complete the confirmation sampling with a 2-man crew. Includes collecting one sample from the Drum Disposal Area for waste characterization.
<b>Material Delivery</b>					
Topsoil material and delivery	cubic yard	47	\$22.00	\$1,034.00	Includes 6" of topsoil over a 2000 ft <sup>2</sup> area; assume 1.25 cy loose/in-place

TABLE C-1

**Engineer's Cost Estimate for Alternative 2: Excavation and Backfill (Drum Disposal Hot Spot) and Soil Cover and Land Use Controls (Can Pit)**  
**Engineering Evaluation and Cost Analysis for AOC 7**  
**Cheatham Annex**  
**Williamsburg, Virginia**

Description: Alternative 2 consists of excavating the Drum Disposal Area Hot Spot and installing a soil cover over the Can Pit. The Drum Disposal Area, assumed to be a 25 foot radius that will be excavated to 0.5 ft bgs and backfilled. A soil cover will be installed over the 600 ft<sup>2</sup> Can Pit, currently open to 4 ft bgs, by backfilling the pit to bring it up to the surrounding grade. LUCs, consisting of fencing and signage, will be implemented for the Can Pit cover.

Description of Service/Items	Unit	Quantity	Unit Price	Total	Assumptions
<b>Waste Disposal Preparation</b>					
T&D of Excavated Soil	Ton	91	\$75.00	\$6,825.00	Assumes 1.5 tons/cy, non-hazardous. Includes 3" sand layer in 50' by 50' material handling area. (Based on recent pricing from Subtitle D Disposal Facility).
Waste Characterization Sampling	Each	1	\$1,035.00	\$1,035.00	Assumes 1 sample per 750 cy for full TCLP (VOCs, SVOCs, metals, herbicides, and pesticides), reactivity, ignitability, and corrosivity with 7 day TAT. BOA rates.
<b>Drum Disposal Area Total</b>				<b>\$11,864</b>	
<b>Can Pit Area Cover Installation and LUCs</b>					
<b>Material Delivery</b>					
Topsoil material and delivery	cubic yard	18	\$22.00	\$396.00	Includes 6" of topsoil over a 600 ft <sup>2</sup> area sloped at 2% from the center to the edges to promote positive drainage; assume 1.25 cy loose/in-place [RSMMeans # 31-23-23.15 (7000)]
General fill material and delivery	cubic yard	98	\$15.00	\$1,470.00	Includes 3.5' of general fill over 600 ft <sup>2</sup> area; assume 1.25 cy loose/in-place.
<b>LUCs</b>					
Fence Installation (chain link)	Linear Feet	100	\$52.00	\$5,200.00	Assumes 25' x 25' area surrounding the Can Pit. (Industrial Chain Link Fence - 8' high) [RSMMeans #32-31-13.20 (0940)]
Gate	Opening	1	\$2,850.00	\$2,850.00	Double swing gate, includes posts & hardware, in concrete - 8' high, 20' opening. [RSMMeans #32-31-13.20 (5090)]
Sign (small)	Each	1	\$86.40	\$86.40	Assumes 24" x 24" white sign with black lettering.
<b>Can Pit Area Cover Installation and LUCs Total</b>				<b>\$10,002</b>	
<b>Subtotal</b>				<b>\$160,609</b>	
Contingency (15%)			15.0%	\$24,091	
Construction Management (10%)			10.0%	\$16,061	
Project Management (8%)			8.0%	\$12,849	
<b>Subtotal</b>				<b>\$213,610</b>	
Performance Bond (2%)			2.0%	\$4,272	Industry Average
<b>TOTAL CAPITAL COST</b>				<b>\$218,000</b>	
<b>Operations and Maintenance (O&amp;M) for Can Pit Area Soil Cover (1 to 30 Years)</b>					
LUC and Cover Quarterly Inspections	Each	8	\$1,200.00	\$9,600.00	Assumes 2 years of quarterly inspections. Includes reporting. Engineer's estimate based on recent similar projects.
Annual LUC and Cover Inspections	Each	28	\$1,200.00	\$33,600.00	Engineer's estimate based on recent similar projects.
5-Year Review and Report	Each	6	\$9,500.00	\$57,000.00	Engineer's estimate based on recent similar projects.
<b>Subtotal</b>				<b>\$100,200</b>	
Contingency (15%)			15.0%	\$15,030	
<b>TOTAL O&amp;M COST</b>				<b>\$115,000</b>	
Total O&M Cost Per Year				\$3,833	
Total Years of O&M				30	
Discount Rate				3.00%	
Discount Factor				19.60	
<b>Total Present Value of O&amp;M Cost</b>				<b>\$75,000</b>	
<b>TOTAL PRESENT VALUE of ALTERNATIVE</b>				<b>\$293,000</b>	
				+50%	<b>\$440,000</b>
				-30%	<b>\$205,000</b>

**References and Source Notes**

- Base costs used are 2013 dollars.
- RS Means: Facilities Construction Cost Data, 2013.
- Recent similar projects include construction projects in JEB Little Creek in Virginia Beach, VA; NAS Oceana in Virginia Beach, VA; SJCA in Chesapeake, VA; and NSN in Norfolk, VA.
- Discount factor established per "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis", OSWER Directive No. 9355.3-20, December 6, 2012.

**Assumptions and Exclusions**

1. Mobilization includes utility clearance.
2. The enclosed Engineer's Estimate is only an estimate of possible construction costs for budgeting purposes. This estimate is limited to the conditions existing at its issuance and is not a guarantee of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained. This is an order-of-magnitude cost estimate that is expected to be within +50 to -30 percent of the anticipated costs in the EE/CA.

TABLE C-2

**Engineer's Cost Estimate for Alternative 3: Excavation and Backfill (Drum Disposal Hot Spot and Can Pit)**  
**Engineering Evaluation and Cost Analysis for AOC 7**  
**Cheatham Annex**  
**Williamsburg, Virginia**

Description: Alternative 3 consists of excavating the Drum Disposal Hot Spot and Can Pit. The Drum Disposal Area, assumed to be 2,000 ft<sup>2</sup>, wa 25 foot radius that will be excavated to 0.5 ft bgs and backfilled. The 600 ft<sup>2</sup> Can Pit, currently open to 4 ft bgs, will be excavated to visible limits of debris (assumed to be 14 ft bgs) and backfilled to match the surrounding grade.

Description of Service/Items	Unit	Quantity	Unit Price	Total	Assumptions
<b>Common to Both Removal Areas</b>					
<b>Work Planning Documents</b>					
Construction Work Plan	Lump Sum	1	\$20,000.00	\$20,000.00	Includes draft and final submission and Erosion and Sediment Control Plan
EM385 Health and Safety Plan	Lump Sum	1	\$12,000.00	\$12,000.00	Includes draft and final submission and AHAs
Construction Completion Report	Lump Sum	1	\$15,000.00	\$15,000.00	Includes draft and final submission
<b>Work Planning Documents Total</b>				<b>\$47,000</b>	
<b>Mobilization/Demobilization and Site Setup</b>					
Mobilization/Demobilization	Each	2	\$5,715.00	\$11,430.00	Includes mobilization and demobilization of all equipment and materials necessary to perform the work. (RSMMeans Crew #B-1, #B-10L, #B-10T, and #B-12A)
Construction Entrance Temporary Road	square yard	360	\$15.05	\$5,418.00	One at 200' x 12' and 6" thick with #1 VDOT Stone to access the site from the access road and one 70'x12' and 6" thick with #1 VDOT stone to access the access road from Chase Road. [RSMMeans #01-55-23.50 (0100)].
Silt Fence	Linear Feet	280	\$4.25	\$1,190.00	Includes silt fence for the Can Pit and Drum Disposal Areas (approximately 25' x 25' for the can pit area and 45' x 45' for the drum disposal area). Includes labor and equipment. (Based on recent similar project).
Material Handling Area	Lump Sum	1	\$1,500.00	\$1,500.00	Assumes 50' x 50' area. Includes impermeable liner, berm, silt fence, sandbags, and 3" layer of sand over the impermeable liner to protect the liner; setup and removal included (based on project similar in nature).
Material Staging Area for Fill Material	Lump Sum	1	\$650.00	\$650.00	Assumes 50' x 50' area. Includes 3 rolls of poly sheeting and silt fence; removal included
Vegetation Clearance	Acre	0.193	\$6,850.00	\$1,322.05	Assumes clearing 3' on each side of the 1,400' access road. [RSMMeans #31-11-10.10 (0200)].
Temporary Culvert	Lump Sum	1	\$4,414.50	\$4,414.50	Assumes 12" diameter piping and stone for a 3' deep by 5' wide by 18' long drainage ditch (RSMMeans Crew #B-1 & #B-12A plus #31-37-13.10, and #33-41-13.40).
Portable Toilet and Handwash Station	Week	3	\$100.00	\$300.00	Based on recent quote from project similar in nature. RS Means is similar in price at 72.38 per week. Recommend \$100 based on recent project.
Trimble GPS	Week	3	\$900.00	\$2,700.00	For identifying removal areas and pre-excavation horizontal delineation sample locations
<b>Site Restoration</b>					
Road Re-Grading	square yard	2800	\$2.64	\$7,392.00	Includes re-grading the nature trail/access road. Assumes 1,400' x 18' road. RSMMeans #31-22-16.10 (1050)
Seeding	Lump Sum	1	\$2,918.50	\$2,918.50	Includes seed and straw for Can Pit Area, Drum Disposal Area, and all other disturbed areas. Assumes the area to be restored is less than 1 acre [RSMMeans #32-92-19.14 (0800)].
<b>Mobilization/Demobilization, Site Setup, and Site Restoration Total</b>				<b>\$39,235</b>	
<b>Construction Crew</b>					
Site Superintendent	Hour	150	\$58.50	\$8,775.00	Assumes 15 10-hour days to complete work.
Heavy Equipment Operator	Hour	150	\$45.50	\$6,825.00	Assumes 15 10-hour days to complete work and 1 operator for dozer for Can Pit cover installation and the same operator using the excavator and dozer for the drum disposal area.
Laborer	Hour	300	\$28.60	\$8,580.00	Assumes 15 10-hour days to complete work and 2 laborers. One to spot excavator and one to watch trucks unloading topsoil and general fill.
H&S/QC Manager	Hour	150	\$52.00	\$7,800.00	Assumes 15 10-hour days to complete work
<b>Heavy Equipment</b>					
Excavator	Week	3	\$3,690.00	\$11,070.00	Includes fuel [Hertz Equipment Rental = \$2,440/week plus \$1,250/week (250 gal. @ \$5/gal)for diesel fuel].
Dozer	Week	3	\$2,575.00	\$7,725.00	Includes fuel [Hertz Equipment Rental = \$1,575/week plus \$1,000/week (200 gal. @ \$5/gal)for diesel fuel].
Front End Loader	Week	3	\$2,945.00	\$8,835.00	Includes fuel [Hertz Equipment Rental = \$1,945/week plus \$1,000/week (200 gal. @ \$5/gal)for diesel fuel].
Off-Road Dump Truck	Week	3	\$4,665.00	\$13,995.00	Includes fuel [Hertz Equipment Rental = \$3,415/week plus \$1,250/week (250 gal. @ \$5/gal)for diesel fuel].
Project Vehicle (Pickup Truck)	Week	3	\$1,780.00	\$5,340.00	Includes fuel and rental vehicle. Assumes 1 truck for Site Superintendent and 1 for Construction crew [Hertz Equipment Rental = 2 each @ \$750/week plus 2 each @ \$140/week (35 gallons @ \$4/gallon for fuel).
<b>Construction Crew and Heavy Equipment Total</b>				<b>\$78,945</b>	
<b>Drum Disposal Area</b>					
<b>Pre-Excavation Confirmation Sampling</b>					
Confirmation Sampling	each	20	\$95.00	\$1,900.00	Assumes 7 day TAT and tier approach consisting of 4 surface soil samples per tier with 10 ft spacing between tiers. Assume 50 ft radius from hotspot (5 tiers). Samples analyzed for arsenic, chromium, lead, manganese, zinc. BOA rates used.
Confirmation Sampling Field Crew	Hour	20	\$53.50	\$1,070.00	Assumes 1 10-hour day to complete the confirmation sampling with a 2-man crew.
<b>Confirmation Sampling Total</b>				<b>\$2,970</b>	

TABLE C-2

**Engineer's Cost Estimate for Alternative 3: Excavation and Backfill (Drum Disposal Hot Spot and Can Pit)**  
**Engineering Evaluation and Cost Analysis for AOC 7**  
**Cheatham Annex**  
**Williamsburg, Virginia**

Description: Alternative 3 consists of excavating the Drum Disposal Hot Spot and Can Pit. The Drum Disposal Area, assumed to be 2,000 ft<sup>2</sup>, wa 25 foot radius that will be excavated to 0.5 ft bgs and backfilled. The 600 ft<sup>2</sup> Can Pit, currently open to 4 ft bgs, will be excavated to visible limits of debris (assumed to be 14 ft bgs) and backfilled to match the surrounding grade.

Description of Service/Items	Unit	Quantity	Unit Price	Total	Assumptions
<b>Material Delivery</b>					
Topsoil material and delivery	cubic yard	47	\$22.00	\$1,034.00	Includes 6" of topsoil over a 2,000 ft <sup>2</sup> (drum disposal area); assume 1.25 cy loose/in-place.
<b>Material Delivery Total</b>				<b>\$1,034</b>	
<b>Waste Disposal Preparation</b>					
T&D of Excavated Soil	Ton	91	\$75.00	\$6,825.00	Assumes 1.5 tons/cy, non-hazardous. Includes 3" sand layer in about 50' by 50' material handling area. (Based on recent pricing from Subtitle D Disposal Facility).
Waste Characterization Sampling	Each	1	\$1,035.00	\$1,035.00	Assumes 1 sample per 750 cy for full TCLP (VOCs, SVOCs, metals, herbicides, and pesticides), reactivity, ignitability, and corrosivity with 7 day TAT. BOA rates.
<b>Waste Disposal Preparation Total</b>				<b>\$7,860</b>	
<b>Drum Disposal Area Total</b>				<b>\$11,864</b>	
<b>Can Pit Area</b>					
<b>Material Delivery</b>					
Topsoil material and delivery	cubic yard	14	\$22.00	\$308.00	Includes 6" of topsoil over a 600 ft <sup>2</sup> (can pit area); assume 1.25 cy loose/in-place.
General fill material and delivery	cubic yard	375	\$15.00	\$5,625.00	Includes 13.5' of general fill over a 600 ft <sup>2</sup> (can pit area) and; assume 1.25 cy loose/in-place. Assumes excavated soil from Can Pit Area below the top 6" (50% by volume of 9.5' of general fill) will be separated from debris and reused as backfill. Assumes 104 cy of the subsurface soil from the excavation (that was separated from the debris) would be used as general fill.
<b>Material Delivery Total</b>				<b>\$5,933</b>	
<b>Waste Disposal Preparation</b>					
T&D of Excavated Soil and Debris	Ton	323	\$75.00	\$24,192.71	Assumes only top 6" of soil in the Can Pit Area will be disposed offsite. Assumes 1.5 tons/cy for 6" top soil layer and 3" sand layer in about 85' by 85' material handling area. Assumes 50% of Can Pit volume is debris at 0.5 tons/cy. Does not include disposal of side slopes or subsurface soil.
Waste Characterization Sampling	Each	1	\$1,035.00	\$1,035.00	Assumes 1 sample per 750 cy for full TCLP (VOCs, SVOCs, metals, herbicides, and pesticides), reactivity, ignitability, and corrosivity with 7 day TAT. BOA rates.
<b>Waste Disposal Preparation Total</b>				<b>\$25,228</b>	
<b>Can Pit Area Total</b>				<b>\$31,161</b>	
<b>Subtotal</b>				<b>\$208,205</b>	
Contingency (15%)			15.0%	\$31,231	
Construction Management (10%)			10.0%	\$20,820	
Project Management (8%)			8.0%	\$16,656	
<b>Subtotal</b>				<b>\$276,912</b>	
Performance Bond (2%)			2.0%	\$5,538	Industry Average
<b>TOTAL CAPITAL COST</b>				<b>\$282,000</b>	
			+50%	<b>\$423,000</b>	
			-30%	<b>\$197,000</b>	

**References and Source Notes**

- Base costs used are 2013 dollars.
- RS Means: Facilities Construction Cost Data, 2013.
- Recent similar projects include construction projects in JEB Little Creek in Virginia Beach, VA; NAS Oceana in Virginia Beach, VA; SJCA in Chesapeake, VA; and NSN in Norfolk, VA.

**Assumptions and Exclusions**

1. Mobilization includes utility clearance.
2. The enclosed Engineer's Estimate is only an estimate of possible construction costs for budgeting purposes. This estimate is limited to the conditions existing at its issuance and is not a guarantee of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained. This is an order-of-magnitude cost estimate that is expected to be within +50 to -30 percent of the anticipated costs in the EE/CA.

## **Responses to Comments**

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029**

December 3, 2013

Mr. Scott Park  
NAVFAC MIDLANT, Building N-26, Room 3208  
Attention: Code OPHE3, Mr. Scott Park  
9742 Maryland Avenue  
Norfolk, VA 23511-3095

Subject: Draft Engineering Evaluation and Cost Analysis for Area of Concern 7 – Drum Disposal Area and Can Pit, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia, August 2013

Mr. Park:

Thank you for the opportunity to review the subject document. EPA has one comment on the subject document as follows:

1. Page 4-2, Section 4.1.2.1 Drum Disposal Area Hot Spot: The text indicates "...clean topsoil..." would be used to backfill this area. EPA requests, that prior to implementation of the Removal Action, the Navy provide EPA with information on the fill material to be used, including sampling data. EPA recommends the use of the Region 3 BTAG Backfill Values as a tool for screening backfill material.

Please submit a final copy of the subject document for our records. If you have any questions, please contact me at 215-814-2077.

Sincerely,

A handwritten signature in blue ink that reads "Gerald F. Hoover".

Gerald F. Hoover, RPM  
NPL/BRAC Federal Facilities Branch

cc: Wade Smith, VDEQ

# Response to Comments

## Draft AOC 7 Engineering Evaluation/Cost Analysis for Soil Hotspot Removal

Naval Weapons Station Yorktown Cheatham Annex  
Williamsburg, VA  
December 24, 2013

The comment below was received via a letter dated December 3, 2013 from Gerald Hoover, USEPA, Region III. The Navy's response follows the comment.

**EPA Comment:** Page 4-2, Section 4.1.2.1 Drum Disposal Area Hot Spot: The text indicates "...clean topsoil..." would be used to backfill this area. EPA requests that prior to implementation of the Removal Action, the Navy provide EPA with information on the fill material to be used, including sampling data. EPA recommends the use of the Region 3 BTAG Backfill Values as a tool for screening backfill material.

**Navy Response:** Based on recent EPA and Navy discussions regarding fill material, the CAX Partnering Team will develop and agree on a plan for certifying fill materials are clean prior to their use at a site. This approach will apply for the AOC 7 soil removal, as well as, any future CAX removals where imported backfill materials are necessary. The removal contractor will incorporate this approach into their workplan, which will be subject to Team review and approval. No change to the EE/CA text is necessary. The Navy recommends continuation with preparation of the draft final AOC 7 EE/CA in anticipation of the upcoming 30-day public review period.

## Ivester, Marlene/VBO

---

**From:** Smith, Wade (DEQ) [Wade.Smith@deq.virginia.gov]  
**Sent:** Wednesday, December 18, 2013 1:55 PM  
**To:** scott.park@navy.mil  
**Cc:** Ivester, Marlene/VBO; Sawyer, Stephanie/VBO; Hoover, Gerald  
**Subject:** CAX: AOC 7 Draft EE/CA - DEQ Comments  
**Attachments:** Draft CAX AOC 7 EECA AUG13(DEQ).docx

Thank you for giving the DEQ the opportunity to comment on the *Draft EE/CA* for AOC 7 at CAX.

DEQ's comments are attached (Track Changes via Word).

Upon your acceptance of the proposed changes and upon your submittal of the requested revisions, the DEQ will issue an official letter for your files.

Please let me know if you have any questions.

Sincerely,

Wade M. Smith  
Remediation Project Manager  
Virginia Department of Environmental Quality  
Office of Remediation Programs  
Phone: (804) 698-4125  
[wade.smith@deq.virginia.gov](mailto:wade.smith@deq.virginia.gov)

# Response to Comments

## Draft AOC 7 Engineering Evaluation/Cost Analysis for Soil Hotspot Removal

Naval Weapons Station Yorktown Cheatham Annex  
Williamsburg, VA  
February 5, 2014

The comments below were embedded in the draft document's Word text file and received via an email dated December 18, 2013 from Wade Smith, Virginia Department of Environmental Quality. The Navy's response follows each comment.

**Editorial.** Editorial comments were accepted with the exception of change 'an' to 'a' before NTCRA in Section 1.1, Regulatory Background.

1. *VDEQ Comment (regarding Section 2.3, Determination of Removal Action Areas, 1st Paragraph, 4<sup>th</sup> Sentence): The DEQ concurs with this approach. [i.e., the horizontal extent of the hot spot will be presented in a separate work plan for review by the CAX Tier I Partnering Team]*

Navy Response: Comment noted.

2. *VDEQ Comment (regarding Section 3.3, Determination of Removal Action Schedule, 1<sup>st</sup> paragraph, 2<sup>nd</sup> to last sentence): Hyperlink not valid.*

Navy Response: The public website hyperlink has been revised to "<http://go.usa.gov/DynP>," to reflect the recent URL change.

3. *VDEQ Comment (regarding Section 4.1.2.2, Can Pit, 1<sup>st</sup> paragraph, 2<sup>nd</sup> sentence): Please indicate if a sample of this fill material will be collected prior to backfilling.*

Navy Response: Per the response to an EPA comment that said the soil pile would need to be tested to ensure it meets the definition of clean fill and does not present potential risk to ecological receptors, the Navy will leave the soil pile in place and not use it as backfill. All language stating such will be removed from the EE/CA. (Note: The soil pile is not the site. The Can Pit is.)

4. *VDEQ Comment (regarding Section 7, References): Please include reference in text [for USEPA, 1999] or remove.*

Navy Response: The reference "(USEPA, 1999)" has been deleted.

5. *VDEQ Comment (regarding Appendix A):*

1. *Please note as of July 1, 2013 the State Water Control Law §62.1-44.2 et seq. incorporates the Erosion and Sediment Control Law under the jurisdiction of the State Water Control Board. This has resulted in changes to the numbering system of the regulation 4 VAC 50-30-40 has been renumbered as 9 VAC 25-840-40. The substantive subsections of this citation are the same.*
2. *Consider adding the following additional substantive sections to the Virginia Solid Waste regulation: 9 VAC 20-81-95 (D)(13), (d)(2)(4) and (e); section 45(B)(2)(f).*

Navy Response: Table A-6, where the above mentioned citations are referenced, has been revised as follows:

1. In the first row, the citation “4 VAC 50-30-40” has been changed to “9 VAC 25-840-40.” The substantive subsections listed in the citation have remained the same, per the VDEQ’s comment that these have not changed despite the citation renumbering.
2. Sections 9 VAC 20-81-95(D)(13)(d)(2),(4), and 9 VAC 20-81-95(D)(13)(e) refer to the management of piles of land-clearing debris. These activities are not anticipated during the work; therefore, they were not added to the table. Section 9 VAC 20-81-45(b)(2)(f) is a noted exemption in the regulations; however, it is not an ARAR and has not been added to the table.

**Regulatory Acceptance**

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**From:** Hoover, Gerald <Hoover.Gerald@epa.gov>  
**Sent:** Tuesday, December 24, 2013 11:31 AM  
**To:** Ivester, Marlene/VBO  
**Cc:** scott.park@navy.mil; Sawyer, Stephanie/VBO; Wade.Smith@deq.virginia.gov; Schripsema, Catherine/DET  
**Subject:** RE: EPA Comment letter on draft EE/CA for AOC 7 attached

EPA has reviewed the Navy's response to our comment on the draft EE/CA for AOC7. This email provides EPA's acceptance of that response and our concurrence for the preparation and submittal of the EE/CA for public review.

~~~~~  
**Jerry Hoover**  
**Remedial Project Manager**  
**Environmental Protection Agency, Region III**  
**Mail Code (3HS11)**  
**1650 Arch Str.**  
**Philadelphia, PA 19103**  
**(215) 814-2077**

---

**From:** Marlene.Ivester@CH2M.com [mailto:Marlene.Ivester@CH2M.com]  
**Sent:** Tuesday, December 24, 2013 11:15 AM  
**To:** Hoover, Gerald  
**Cc:** scott.park@navy.mil; Stephanie.Sawyer@CH2M.com; Wade.Smith@deq.virginia.gov; Catherine.Schripsema@CH2M.com  
**Subject:** RE: EPA Comment letter on draft EE/CA for AOC 7 attached

Jerry,

Attached is the response to your comment on the draft AOC 7 EE/CA. If you are fine with this response, please provide your acceptance and go-ahead for preparation of the draft final document for the public review period.

FYI – after we have addressed VDEQ's comments on the draft EE/CA, the draft final will be available for 30-day public review. Following the public review period, the document will be revised as needed to incorporate any public comments received, and then the final EE/CA will be issued. At this time, the Action Memorandum for base Commanding Officer signature will also be prepared. (We are looking at February for an AM instead of the previously anticipated January. It's still 2QFY14, but about a month later b/c of the time needed to discuss the backfill requirements.)

Regards,

Marlene

---

**From:** Hoover, Gerald [mailto:Hoover.Gerald@epa.gov]  
**Sent:** Tuesday, December 03, 2013 3:13 PM  
**To:** Ivester, Marlene/VBO; [scott.park@navy.mil](mailto:scott.park@navy.mil); Sawyer, Stephanie/VBO; [Wade.Smith@deq.virginia.gov](mailto:Wade.Smith@deq.virginia.gov)  
**Subject:** EPA Comment letter on draft EE/CA for AOC 7 attached

---

**From:** Hoover, Gerald <Hoover.Gerald@epa.gov>  
**Sent:** Monday, February 10, 2014 9:59 AM  
**To:** Ivester, Marlene/VBO; Wade.Smith@deq.virginia.gov  
**Cc:** scott.park@navy.mil; Schripsema, Catherine/DET  
**Subject:** RE: CAX AOC 7 Draft Final EE/CA-EPA Approval

EPA has reviewed the red-lined version of the subject document and has no comments.

~~~~~  
**Jerry Hoover**  
**Remedial Project Manager**  
**Environmental Protection Agency, Region III**  
**Mail Code (3HS11)**  
**1650 Arch Str.**  
**Philadelphia, PA 19103**  
**(215) 814-2077**

---

**From:** Marlene.Ivester@CH2M.com [mailto:Marlene.Ivester@CH2M.com]  
**Sent:** Friday, February 07, 2014 12:46 PM  
**To:** Wade.Smith@deq.virginia.gov; Hoover, Gerald  
**Cc:** scott.park@navy.mil; Catherine.Schripsema@CH2M.com  
**Subject:** CAX AOC 7 Draft Final EE/CA

Wade,

Attached are the responses to your comments on the draft AOC 7 EE/CA, plus the red-line. Based on one of your comments, there was a change to the Table A-6 in Appendix A (red text in table signifies change), so a copy of Appendix A is attached, too. Also, because we will not be using the soil pile adjacent to the Can Pit as backfill (per response to an EPA comment), we needed to revise the cost estimate and a copy of it (Appendix C) is attached as well.

Jerry,

We responded to and resolved your comments back in December. However, we still needed to provide you with a red-line for your review and approval.

If you both could review the attached files and let us know if you approve of the revisions, we'll be ready to get a copy of the draft final into the library for the public comment period. Following the public review period, if there are no public comments, the document will go final and the AM prepared.

If you have any questions, let me know.

Regards,

Marlene

**Jerry Hoover**  
**Environmental Protection Agency, Region III**  
**Mail Code (3HS11)**  
**1650 Arch Str.**  
**Philadelphia, PA 19103**  
**(215) 814-2077**



# COMMONWEALTH of VIRGINIA

## DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219

Mailing address: P.O. Box 1105, Richmond, Virginia 23218

TDD (804) 698-4021

[www.deq.virginia.gov](http://www.deq.virginia.gov)

Molly Joseph Ward  
Secretary of Natural Resources

David K. Paylor  
Director

(804) 698-4000  
1-800-592-5482

February 11, 2014

Mr. Scott Park  
NAVFAC MIDLANT, Building N-26  
Hampton Roads Restoration Product Line, Code OPHREV4  
9742 Maryland Avenue  
Norfolk, VA 23511-3095

**RE: Final Red-Line Engineering Evaluation and Cost Analysis for  
AOC 7 – Drum Disposal Area and Can Pit  
Naval Weapons Station Yorktown  
Cheatham Annex  
Williamsburg, Virginia**

Dear Mr. Park:

The Virginia Department of Environmental Quality (DEQ) has received the *Final Red-Line Engineering Evaluation and Cost Analysis* (EE/CA) for AOC 7 – Drum Disposal Area and Can Pit at Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The February 2014 EE/CA, prepared by CH2M HILL, was received by the DEQ (electronically) on February 7, 2014.

Thank you for providing the DEQ's Office of Remediation Programs the opportunity to review the above-referenced EE/CA. Subsequent to DEQ's internal review, this office concurs with the proposed text revisions and recommends submittal of the *Final Engineering Evaluation and Cost Analysis*.

Please contact me at (804) 698-4125 or [wade.smith@deq.virginia.gov](mailto:wade.smith@deq.virginia.gov) with any additional questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'Wade M. Smith'.

Wade M. Smith  
Remediation Project Manager  
Office of Remediation Programs

cc: Jerry Hoover, EPA

**Attachment B**  
**Public Notices and Responsiveness Summary**



SUBMITTED PHOTO

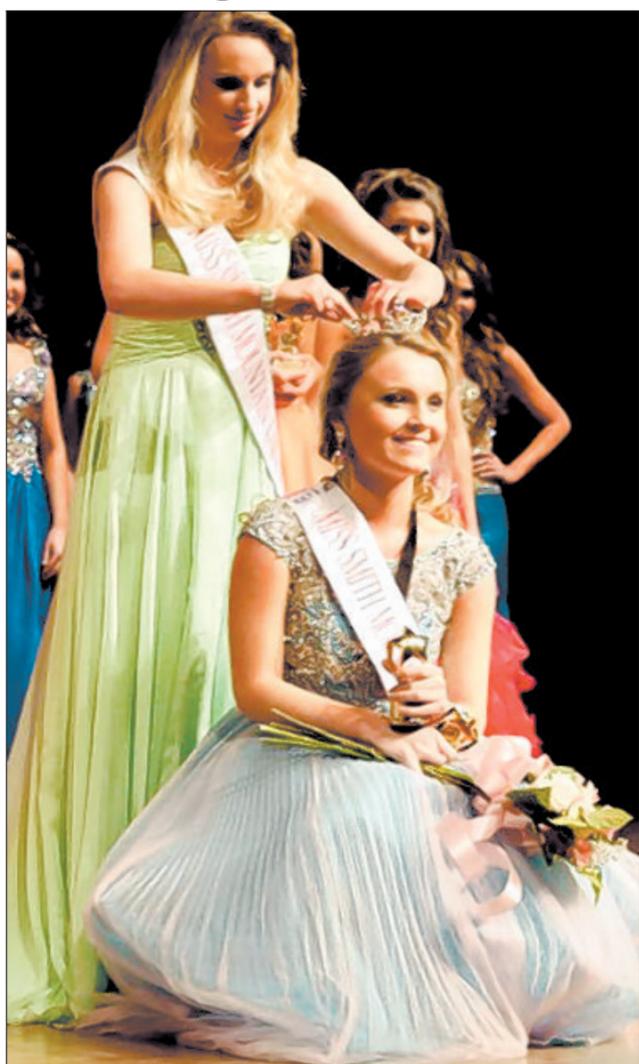
## Networking event to meet at Pitchers Sports Bar Feb. 19

At 5:30 p.m. on Wednesday, Feb. 19, the Williamsburg Business Alliance's After 5 Networking Event will be hosted by Pitchers Sports Bar at the Doubletree Hotel (formerly the Williamsburg Marriott), 50 Kingsmill Road. Businesses and nonprofit organizations are welcome. Reconnect with old friends and meet new contacts to grow your business. Bring a friend, \$10 and a business card. To RSVP or for more information, email WilliamsburgBusinessAlliance@yahoo.com or visit mywba.net.

# Lizzy Mothershead is crowned pageant queen

Lizzy Mothershead, a junior at Williamsburg Christian Academy, recently was crowned Miss Smith Mountain Lake Outstanding Teen and won an \$18,000 scholarship. The pageant consisted of an interview in front of a panel of five judges, a talent performance, and modeling an evening gown.

Young women must also have great academics and be physically fit. Mothershead won in the interview category and tied in the talent and evening gown categories. For the talent segment, she sang "Mein Herr Marquis" from the opera "Die Fledermaus." She will go on to compete for the title of Miss Virginia's Outstanding Teen in June, where she will be competing with teens from all over the state.



RICK MYERS

Lizzy Mothershead, a junior at Williamsburg Christian Academy, has been crowned Miss Smith Mountain Lake Outstanding Teen. She is pictured here, as McKenna Luzynski, the outgoing Miss Smith Mountain Lake Outstanding Teen, fixes her crown.



SUBMITTED PHOTO

## Nature Camp students meet Garden club

Ford's Colony Garden Club has been an active supporter in the participation of local students in Nature Camp each summer. Tina Taverna, right, who coordinates these efforts, recently introduced two of last summer's participants to Garden Club members. Brienna Gillen, an eighth-grader at Hornsby Middle School, majored in limnology, and Nicholas Gosselin, a ninth-grader at Jamestown High School, studied entomology at last year's Nature Camp. Students interested in learning more about sponsorships for Nature Camp are encouraged to call 345-2870.



### Notice of Navy's Invitation for Public Comment on the Engineering Evaluation/Cost Analysis Report for

### AOC 7 - Drum Disposal Area and Can Pit Naval Weapons Station Yorktown, Cheatham Annex

The Department of the Navy invites public comment on Area of Concern (AOC) 7 (Drum Disposal Area and Can Pit) Draft Final Engineering Evaluation/Cost Analysis (EE/CA) Report that presents information pertaining to a proposed soil removal action at Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia. AOC 7 is located within a wooded area of Cheatham Annex (CAX), along a hiking and nature trail immediately south of one of the southern fingers of Cheatham Pond. This removal action is being considered to address potential unacceptable risk to human health and the environment posed by exposure to contaminants in surface soil and subsurface debris and is not considered time critical. The purpose of the proposed non-time-critical removal action is to mitigate potential risks to human health and the environment by reducing exposures to soil contaminated with metals (i.e., arsenic, chromium, lead, manganese and zinc) at the site. The removal action will involve the excavation and off-site disposal at an appropriate disposal facility of contaminated soil from the two areas.

AOC 7 was identified in April 2004 when the Navy discovered two debris disposal areas in the woods behind the CAX warehouse area, referred to as the Drum Disposal Area and the Can Pit. Empty rusted pails, cans and/or rusted, 55-gallon drums were identified in the Drum Disposal Area. The other debris disposal area, referred to as the Can Pit, is an approximately 30-by-20-foot pit open to a depth of 4 feet below ground surface (bgs). The Can Pit contained numerous empty, 5 gallon, rusted cans labeled "tetrachloroethane" on the ground surface within the pit. Surface debris was removed from both areas in 2006 as a housekeeping measure.

The EE/CA examined three alternatives based on effectiveness, implementability, and cost. Alternative 1 for AOC 7, no action, assumes no action will be taken and the site would be left as it currently exists. Alternative 1 is only considered in order to provide a baseline from which to compare the other alternatives. Alternative 2 includes excavation and backfill in the Drum Disposal Area Hot Spot. A soil cover would be installed in the Can Pit and land use controls would be implemented to assure that the soil cover remains in place. Alternative 3 includes excavation and backfill in both the Drum Disposal Area Hot Spot and Can Pit. Alternative 3 is the recommended removal action alternative because it results in the complete removal of debris and impacted surface soil and will achieve unlimited use/unrestricted exposure for soils by removing those soils that pose a potential unacceptable risk to the environment.

The Draft Final EE/CA Report for AOC 7 is available for public review at the following location during normal business hours:

York County Public Library - Yorktown  
8500 George Washington Memorial Highway  
Yorktown, Virginia  
(757) 890-5207

The public is invited to provide written comments on the Draft Final EE/CA Report for AOC 7. Written comments will be accepted until Tuesday, March 18, 2014 at the following address:

Naval Weapons Station Yorktown  
Attn: Public Affairs Officer  
160 Main Road  
Yorktown, Virginia 23691-0160  
Phone: (757) 887-4939  
E-mail: mark.piggott@navy.mil

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**Notice of Navy's Invitation for  
 Public Comment on the  
 Engineering Evaluation/Cost Analysis Report  
 for  
 AOC 7 – Drum Disposal Area and Can Pit  
 Naval Weapons Station Yorktown, Cheatham Annex**

The Department of the Navy invites public comment on the Area of Concern (AOC) 7 (Drum Disposal Area and Can Pit) Draft Final Engineering Evaluation/Cost Analysis (EE/CA) Report that presents information pertaining to a proposed soil removal action at Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia. AOC 7 is located within a wooded area of Cheatham Annex (CAX), along a hiking and nature trail immediately south of one of the southern fingers of Cheatham Pond. This removal action is being considered to address potential unacceptable risk to human health and the environment posed by exposure to contaminants in surface soil and subsurface debris and is not considered time critical. The purpose of the proposed non-time-critical removal action is to mitigate potential risks to human health and the environment by reducing exposures to soil contaminated with metals (i.e., arsenic, chromium, lead, manganese and zinc) at the site. The removal action will involve the excavation and off-site disposal at an appropriate disposal facility of contaminated soil from the two areas.

AOC 7 was identified in April 2004 when the Navy discovered two debris disposal areas in the woods behind the CAX warehouse area, referred to as the Drum Disposal Area and the Can Pit. Empty rusted pails, cans and/or rusted, 55-gallon drums were identified in the Drum Disposal Area. The other debris disposal area, the Can Pit, is an approximately 30-by-20-foot pit open to a depth of 4 feet below ground surface (bgs). The Can Pit contained numerous empty, 5-gallon, rusted cans labeled “tetrachloroethane” on the ground surface within the pit. Surface debris was removed from both areas in 2006 as a housekeeping measure.

The EE/CA examined three alternatives based on effectiveness, implementability, and cost. Alternative 1 for AOC 7, no action, assumes no action will be taken and the site would be left as it currently exists. Alternative 1 is only considered in order to provide a baseline from which to compare the other alternatives. Alternative 2 includes excavation and backfill in the Drum Disposal Area Hot Spot. A soil cover would be installed in the Can Pit and land use controls would be implemented to assure that the soil cover remains in place. Alternative 3 includes excavation and backfill in both the Drum Disposal Area Hot Spot and Can Pit. Alternative 3 is the recommended removal action alternative because it results in the complete removal of debris and impacted surface soil and will achieve unlimited use/unrestricted exposure for soils by removing those soils that pose a potential unacceptable risk to the environment.

The Draft Final EE/CA Report for AOC 7 is available for public review at the following location during normal business hours:

York County Public Library – Yorktown  
 8500 George Washington Memorial Highway  
 Yorktown, Virginia  
 (757) 890-5207

The public is invited to provide written comments on the Draft Final EE/CA Report for AOC 7. Written comments will be accepted until Tuesday, March 18, 2014 at the following address:

Naval Weapons Station Yorktown  
 Attn: Public Affairs Officer  
 160 Main Road  
 Yorktown, Virginia 23691-0160  
 Phone: (757) 887-4939  
 E-mail: mark.piggott@navy.mil



BOB MACK/ FLORIDA TIMES-UNION PHOTO

A jury found Michael Dunn guilty of four counts but couldn't reach a decision on a murder charge. Dunn was accused of killing Jordan Davis, 17, during a dispute over music.

## Fla. man guilty, but not of murder, in loud music trial

BY MICHAEL MUSKAL  
 Tribune Newspapers

A jury Saturday found Michael Dunn, the Florida man accused of fatally shooting an unarmed teenager during a dispute over loud music, guilty of four charges, but it was unable to reach a decision on the fifth count of first-degree murder.

Dunn, who is white, fired 10 shots into an SUV, killing Jordan Davis, 17, who was black. Three of Davis' friends were also in the SUV. The Nov. 23, 2012, shooting outside a convenience store in Jacksonville, Fla., erupted after Dunn asked the teens in the SUV to turn down their music.

Dunn was charged with first-degree murder, three counts of attempted second-degree murder and one count of firing into a vehicle in the shooting.

The jury couldn't reach a decision on the first-degree murder charge but convicted Dunn on the other four counts after several days of deliberations. Sen-

tencing, which could mean as much as 75 years in prison, will be next month.

Dunn contended he acted in self-defense. Prosecutors suggested that Dunn, 47, was angry because a young black man was disrespecting him.

That Dunn had fired into the SUV and killed Davis was never in question. What jurors had to determine was whether Dunn had acted in self-defense.

The proceedings are the latest in a series of murder cases with claims of self-defense that have roiled Florida and garnered national attention.

“This defendant was disrespected by a 17-year-old teenager, and he lost it. He wasn't happy with Jordan Davis' attitude. What was his response? You're not going to talk to me like that,” Assistant State Attorney Erin Wolfson said. “He took these actions because it was premeditated. It was not self-defense.”

But Dunn's attorney, Cory Strolla, pressed the self-defense claim and argued

that Dunn had a right to shoot if he reasonably thought he was in danger.

“We understand Jordan Davis was human, and this was a tragedy,” Strolla said.

The attorney added later, “Deadly force is justifiable if Dunn reasonably believed he faced an attempted murder of himself or another.”

Florida's “stand your ground” law allows the defense to seek a special hearing to help the defendant gain immunity from prosecution before a trial. Dunn and his lawyers did not choose to take that route but argued that he had acted in self-defense because he thought there was a weapon in the car and he feared for his life.

Dunn has argued that the case was all about self-defense and that he was fearful for himself and his fiancée, Rhonda Rouer. In his testimony, Dunn told jurors he was in Jacksonville with Rouer to attend his son's wedding.

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## Zimmerman: I'm homeless and suffering from PTSD

ORLANDO, Fla. — George Zimmerman, the neighborhood watch volunteer who was acquitted in the 2012 killing of teenager Trayvon Martin, told the Spanish-language television network Univision that he is homeless and suffering from post-traumatic stress disorder.

An English translation of the interview that airs Sunday was released to the media Saturday.

Special correspondent Ilija Calderon spoke at length to Zimmerman, who shot Martin, 17, nearly two years ago in Zimmerman's gated community in Sanford, Fla.

In the interview, Zimmerman repeatedly declined to answer questions about the shooting, citing a pending federal civil-rights

investigation.

However, he told Calderon that his first reaction after firing the shot was concern that he had missed.

“I was afraid it had gone through his clothes and that it was going to go...into a house and — because the young man was still talking to me, as I have said. So I thought that it hadn't ... affected him, and I got worried, and I said, ‘I hope that it hasn't — that the bullet hasn't hit a neighbor,’” Zimmerman said. “But I only knew that the attack stopped.”

Zimmerman described receiving death threats, which he attributed to the portrayal of the shooting in the media.

Later in the interview, Zimmerman told Calderon that he was “100 percent”

sure of his actions on the night of the shooting. Martin would have killed him if he hadn't opened fire, Zimmerman said.

He also said he can't have a “normal life,” wears a bulletproof vest when in public and doesn't have a permanent home.

He said his family helps him “a lot.”

“I'm totally homeless,” Zimmerman said. Later, Calderon asked how he has changed since the shooting: “I suffer from PTSD,” he replied.

Zimmerman was charged with second-degree murder in Martin's death by a special prosecutor but was acquitted last year.

— Jeff Weiner,  
 Tribune Newspapers

## Sheriff 'cancels' Valentine's Day to keep would-be Cupids off roads

A northern Georgia sheriff took to the department's Facebook page and canceled Valentine's Day because of dangerous, icy roads — possibly succeeding in eliminating car crashes but drawing some heat from lovers.

Here's Sheriff Scott Berry's Cupid-killer message: “The Oconee County Sheriffs Office announces that Valentines Day has been CANCELED from a line North of I-16 to the Georgia/Tennessee border.

“Men who live in the designated ‘NO VALENTINES DAY ZONE’ are exempt from having to run out and buy lottery scratchers and Hershey bars from the corner stores until February 18, 2014, due to ice, snow, freezing rain,” he wrote on Facebook.

It apparently worked. “We had extremely low traffic volumes,” Berry said Friday. “We had just two traffic incidents, and those were people getting stuck.”

In anticipation of the storm, Berry had posted a video early in the week on Facebook and YouTube in which he made dire warnings about the storm.

“The roads are going to be sheets of ice,” he warned.

By Wednesday, he worried that people would be keen to get out when some stores reopened. So he capitalized on Valentine's Day to get a message to the department's 10,000 followers.

On Friday, the Georgia Department of Transportation declared victory in the bid to keep people off roads.

“With your help, a forecasted ‘catastrophic’ weather event became better than expected on our road network,” district engineer Bayne Smith said of Georgia residents.

However, not everyone was in love with Berry's Valentine scheme. In addition to some mean Facebook comments, Berry said they received two disparag-

ing emails and an angry call.

“Once again a public official makes a ridiculous statement and makes Georgians look (like) totally backwards red necks,” one email read.

Others blew a virtual kiss. “Good call, Sheriff,” wrote one woman. “If my husband of 36 years wanted to go out for roses in these conditions, I would seriously hide his keys.”

And some just chuckled. “Men's shelter soon to open in Oconee County,” one man wrote.

It's not the first time Berry has had some fun on the department's official page. During a previous storm, he said he warned people not to lick flagpoles.

“We try to make it a little funny when we can,” Berry said of the social media strategy.

— Paresch Dave,  
 Tribune Newspapers