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ENGINEERING EVALUATION/COST ANALYSIS FORMER SIGSBEE ANNEX WATER
TOWERS NAS KEY WEST FL
05/01/2010
AGVIQ ENVIRONMENTAL SERVICES

Engineering Evaluation/Cost Analysis Former Sigsbee Annex Water Towers

Sigsbee Annex Naval Air Station Key West Key West, Florida

Revision No. 01

Contract No. N62470-08-D-1006
Task Order No. JM27

Submitted to:



U.S. Naval Facilities
Engineering Command
Southeast

Prepared by:



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May 2010

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Submitted to:

Department of the Navy
U.S. Naval Facilities Engineering Southeast

Prepared by:



May 2010

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May 17, 2010

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17 MAY 2010

Date

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Acronyms and Abbreviations

AGVIQ-CH2M HILL	AGVIQ-CH2M HILL Joint Venture III Small Business Response Action Contract
ARAR	applicable or relevant and appropriate requirement
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FKAA	Florida Keys Aqueduct Authority
GCTL	groundwater cleanup target level
LUC	land use control
mg/kg	milligram per kilogram
mg/L	milligram per liter
NAS	Naval Air Station
NAVFACSE	Naval Facilities Engineering Command, Southeast Division
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NFA	no further action
NTCRA	non-time-critical removal action
O&M	operation and maintenance
PCB	polychlorinated biphenyl
PPE	personal protective equipment
ppm	parts per million
SARA	Superfund Amendments and Reauthorization Act
SAWT	Sigsbee Annex Water Tower
SCTL	soil cleanup target level
SPLP	synthetic precipitation leaching procedure
SVOC	semivolatile organic compound
TBC	to-be-considered
TCLP	Toxicity Characteristic Leaching Procedure
TtNUS	Tetra Tech NUS
VOC	volatile organic compound
XRF	x-ray fluorescence
yd ³	cubic yards

Executive Summary

This report presents an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at the two Sigsbee Annex Water Tower (SAWT) sites at Naval Air Station (NAS), Key West, Key West, Florida. Previous site investigations identified potential unacceptable risk to human health and the environment posed by exposure to lead-impacted surface soil.

The goals of the EE/CA are to identify the objectives of the removal action, and to scope and analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. The removal action objectives for the SAWT sites are to:

- Mitigate potential unacceptable risk to human health and the environment posed by exposure to lead in surface soil by removing the contaminated soil to below the Florida Department of Environmental Protection (FDEP) direct exposure residential soil cleanup target level (SCTL) for lead (400 milligrams per kilogram [mg/kg]).
- Remove the potential source of contamination to the shallow groundwater, by meeting the FDEP groundwater cleanup target level (GCTL) for lead (0.015 milligrams per liter [mg/L]).
- Close the SAWT sites with a no further action (NFA) decision.

The following removal action alternatives were evaluated:

- Alternative 1: No action
- Alternative 2: Engineering controls and institutional controls
- Alternative 3: Excavation and backfill

Alternative 1, no action, does not meet the objectives of the NTCRA to mitigate risk to human health and the environment and does not comply with applicable or relevant requirements (ARARs). As such, this alternative is not recommended.

Alternative 2, engineering controls and institutional controls, is effective in meeting the first removal action objective, which is to mitigate risk to human health and the environment. However, since the surface soil will remain in place, this alternative does not meet the second and third objectives, which are to remove the potential source of contamination to shallow groundwater and to prepare the sites for closure with NFA. In addition, Alternative 2 requires land use controls (LUCs) and long-term operation and maintenance (O&M) to control future land use and to provide for fencing maintenance and inspections. Finally, Alternative 2 does not meet ARARs. Because Alternative 2 does not achieve all of the removal action objectives, the alternative is not recommended.

Alternative 3, excavation and backfill with imported topsoil, is highly effective because it eliminates the onsite risks to human health and the environment and meets ARARs. It is also straightforward to implement, utilizing conventional construction methods and resources. Because this alternative results in the removal of impacted surface soil to meet

Residential SCTLs, it meets the removal action objectives of the EE/CA to mitigate risk to human health and the environment, removes the source of potential contamination to shallow groundwater, and prepares the sites for closeout with NFA. Therefore, Alternative 3 is the recommended alternative.

1.0 Introduction

AGVIQ-CH2M HILL Joint Venture III (AGVIQ-CH2M HILL) has been contracted by the Naval Facilities Engineering Command, Southeast (NAVFAC SE), to prepare this Engineering Evaluation/Cost Analysis (EE/CA) for impacted surface soils at the two Sigsbee Annex Water Tower (SAWT) sites at Naval Air Station (NAS) Key West, Key West, Florida (Figure 1-1). This work is being performed under the terms and conditions of Contract Number N62470-08-D-1006, Task Order No. JM27.

1.1 Regulatory Background

This document is issued by the United States Department of the Navy, the lead agency responsible for remediation of the two SAWT sites, 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 take any appropriate removal action to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release relating to 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, 40 Code of Federal Regulations (CFR) 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.” Removal actions for the SAWT sites are not time-critical. Non-time-critical removal actions (NTCRAs) are defined in 40 CFR Section 300.415(b)(4) as actions pertaining to an imminent threat to human health or the environment and that have planning periods of 6 months or more.

The lead agency is required by 40 CFR Section 300.415 to conduct an EE/CA when a 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, NTCRAs also allow for the expedited cleanup of sites in comparison to the remedial action process under CERCLA.

Community involvement requirements for NTCRAs include preparing an EE/CA and making it available for public review and comment for a period of 30 days. Announcement

of the 30-day public comment period is required to be published in a local newspaper. Written responses to significant comments will be summarized in an Action Memorandum and included in the Administrative Record.

1.2 Purpose and Objectives

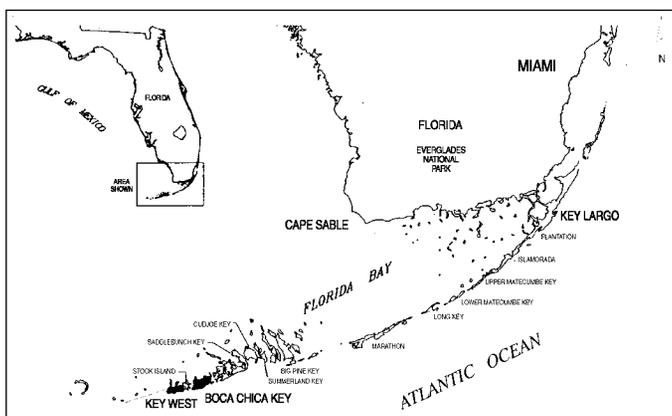
Submittal of this document fulfills the requirements for NTCRAs defined by CERCLA, SARA, and the NCP. This EE/CA has been prepared in accordance with the U.S. Environmental Protection Agency's (EPA's) guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, PB93-963402, August 1993.

The EE/CA compares removal alternatives based on their technical feasibility, ability to protect human health and the environment, ability to prevent the potential release of hazardous constituents, and cost. Individual goals of this EE/CA are to: 1) provide information to the Administrative Record to satisfy the community relations requirements and 2) provide a framework for evaluating alternative technologies and selecting the most appropriate one(s).

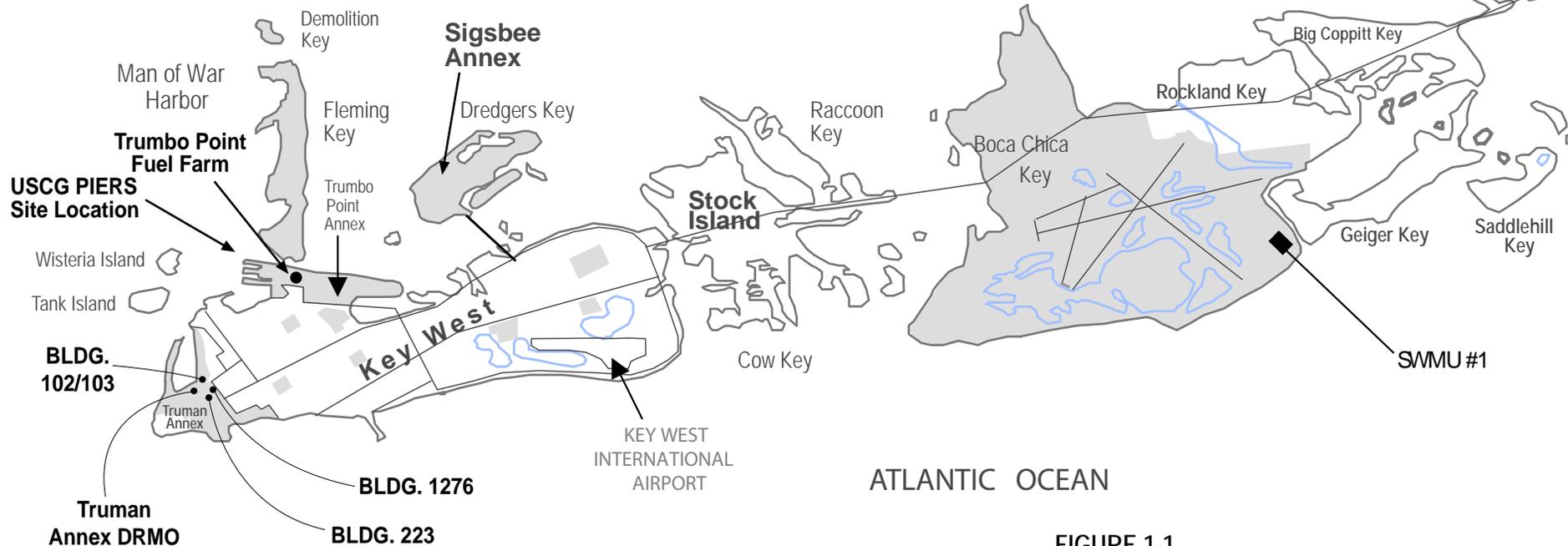
The objective of this EE/CA is to evaluate the removal alternatives to address the potential risks posed by impacted surface soil in preparation for site closeout under CERCLA with no further action (NFA).

The following information is presented within this EE/CA:

- Section 2: Site Characterization
- Section 3: Identification of Removal Action Objectives
- Section 4: Identification and Analysis of Removal Action Alternatives
- Section 5: Comparative Analysis of Removal Action Alternatives
- Section 6: Recommended Removal Action Alternative



GULF OF MEXICO



ATLANTIC OCEAN

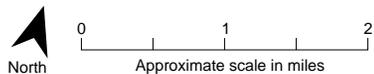


FIGURE 1-1
Sigsbee Annex Location Map
 Engineering Evaluation/Cost Analysis
 at Sigsbee Towers
 NAS Key West
 Key West, Florida



2.0 Site Characterization

This section provides a summary of background information and previous investigation activities, establishes removal areas, and identifies soil cleanup target levels (SCTLs) and groundwater cleanup target levels (GCTLs).

2.1 Site Description and Background

Sigsbee Annex is located on Dredgers Key, in Key West, Florida (Figure 1-1). The North and South SAWTs were public water supply towers, located in the central portion of Dredgers Key (Figure 2-1). The North SAWT is located adjacent to a car wash and is approximately 150 yards north of an elementary school in a residential area of Sigsbee Annex. The South SAWT is located directly behind the elementary school and adjacent to an asphalt-covered basketball/tennis court. The North SAWT, identified as U.S. Navy Tank 989, and the South SAWT, identified as U.S. Navy Tank 1275, were built and maintained by the Navy as part of the NAS Key West public water supply system. The SAWTs provided potable water to the Sigsbee Annex housing area for more than 40 years. The elevated tanks were made of steel and painted with a distinctive red and white checkerboard scheme. As identified during an initial reconnaissance visit by Tetra Tech NUS (TtNUS), the paint observed prior to demolition of the SAWTs was very weathered, with no maintenance work or painting performed on either water tower for many years (TtNUS, 2009).

Although the water distribution system was transferred to the Florida Keys Aqueduct Authority (FKAA), along with the water towers, the Navy retains ownership of the property. Both SAWTs were demolished in December 2008.

2.2 Previous Investigations

According to the TtNUS (2009) final sampling report, the first sampling event was conducted by FKAA in June 2008, prior to demolition activities at both SAWTs. Samples collected from the North SAWT contained lead concentrations ranging from 420 to 3,000 milligrams per kilogram (mg/kg); samples at the South SAWT ranged from 88 to 1,700 mg/kg (TtNUS, 2009). Exact sample locations were not indicated in the report.

The second and third sampling events performed by TtNUS included a surface soil sampling event for lead only (based on similar sites at NAS Key West) at each SAWT prior and subsequent to the water tower demolition. Seventeen surface soil samples were collected at each SAWT during the pre-demolition event in September 2008 and again in January 2009 for the post-demolition event. Samples were collected within the first 6 inches of soil and analyzed for lead. Lead concentrations at the North SAWT ranged from 7 to 4,750 mg/kg (Figure 2-2). The cleanup level for lead in surface soil (400 mg/kg) is based on the Florida Department of Environmental Protection (FDEP) residential SCTLs from Chapter 62-777 Florida Administrative Code (FAC) (FDEP, 2005). Of the 34 samples collected from the North SAWT, 20 exceeded the residential SCTL. Lead concentrations at

the South SAWT ranged from 3.2 to 3,680 mg/kg, with 15 of the 34 samples exceeding the residential SCTL (Figure 2-3). Complete horizontal and vertical delineation of lead was not achieved at either SAWT.

AGVIQ-CH2M HILL conducted a soil sampling event in July 2009 to delineate the lead contamination in soil both vertically and horizontally (AGVIQ-CH2M HILL, 2009a). Soil samples were collected from 0 to 0.5 feet below land surface (bls), 0.5 to 2 feet bls, and 2 to 4 feet bls. Soil samples were pre-screened using an x-ray fluorescence (XRF) analyzer to determine if lead concentrations from the sample location were below the field action level of 280 parts per million (ppm) for lead, which was approved by FDEP (AGVIQ-CH2M HILL, 2009b). If the concentrations from the initial sample location were below the field action level, then the soil samples from the three depth intervals were collected for laboratory analysis. If the field action level was exceeded, then a step-out sample location was established 10 feet away from the source area, until the sample concentration was below the field action level.

Seventeen soil samples were collected from the North SAWT and 10 soil samples were collected from the South SAWT for laboratory analysis of total lead by EPA Method 6010B. Lead concentrations at the North SAWT ranged from non-detect (0.734U) to 2,830 mg/kg (Figure 2-4). Five samples exceeded the Residential SCTL for lead, all within the 0 to 0.5 feet bls interval (AGVIQ-CH2M HILL, 2009c). No exceedances were detected in the 0.5 to 2 and 2 to 5 feet bls intervals. The five surface soil samples that exceeded the residential SCTL for lead are bounded by samples exhibiting lead concentrations below the residential SCTL. Lead concentrations at the South SAWT ranged from non-detect (0.081U) to 185 mg/kg (Figure 2-5). No samples collected by AGVIQ-CH2M HILL exceeded the residential SCTL of 400 mg/kg for lead (AGVIQ-CH2M HILL, 2009c).

Synthetic precipitation leaching procedure (SPLP) testing for lead was performed to evaluate the potential for lead to leach into groundwater at the sites. A total of six soil samples (three from each SAWT) from 0 to 4 feet bls at three locations exhibiting high, medium, and low XRF lead concentrations were composited and submitted to the laboratory for SPLP lead analysis (EPA Method 1312/6010B). One sample from the North SAWT had a detectable concentration of 0.0647 milligram per liter (mg/L), which exceeded the FDEP GCTL for lead (0.015 mg/L). The source of this SPLP exceedance is likely the 0 to 0.5 feet bls interval because the XRF results for soils collected at this boring had lead concentrations of 968 ppm from the 0 to 0.5 feet bls interval and 20 ppm from the 0.5 to 2 feet bls interval; lead was not detected (less than 2.9 ppm) in the 2 to 4 feet bls interval (AGVIQ-CH2M HILL, 2009c).

2.2.1 Nature and Extent of Contamination

Soil

During previous investigations at the North and South SAWTs, lead was detected at elevated concentrations in surface soil. Lead was detected in surface soil at concentrations as high as 4,750 mg/kg and 3,550 mg/kg at the North and South SAWTs, respectively. The extent of lead contamination in soil has been delineated and is limited to the upper 6 inches.

Source Areas

The sources of the lead contamination are the former North and South SAWTs. It is AGVIQ-CH2M HILL's understanding that the towers were covered in lead-based paint and that the paint weathered over time and potentially migrated to the ground surface. Four sampling events at both of the SAWTs have shown elevated concentrations of lead, above the residential SCTL, in surface soil.

Conceptual Site Model

Lead concentrations above the residential SCTL have been found in surface soil immediately surrounding the SAWTs. Previous sampling events have delineated the vertical and horizontal components, with lead contamination limited to the first 6 inches. The soil appears to consist primarily of consolidated and unconsolidated limestone, and depth to water is estimated at between 4 and 6 feet bls. Because lead is not very mobile through the soil column, it is unlikely to have migrated to groundwater. Based on SPLP lead testing of soil at high, medium, and low XRF concentrations at each SAWT site, only one sample at the North SAWT had a detectable concentration above the GCTL for lead. This SPLP exceedance likely resulted from the 0 to 0.5 feet bls interval because the deeper samples analyzed with the XRF analyzer showed decreased lead results of 20 ppm and non-detect from the 0.5 to 2 and 2 to 4 feet bls intervals, respectively (AGVIQ-CH2M HILL, 2009c).

Surface flow at the South SAWT appears to be to the north, away from the nearby canal. A stormwater retention pond located to the west of the North SAWT likely intercepts any surface runoff from the site.

The results of soil sampling demonstrate that contamination exists in surface soil. Consequently, potential receptors include school children and other residents and workers who may come in contact with the soil through dermal contact, inhalation, and ingestion. Additionally, through stormwater runoff, potential receptors may also include aquatic species.

2.3 Cleanup Goals

The primary cleanup goal is lead in surface soil, which was derived from the FDEP residential SCTL of 400 mg/kg, based on the SCTLs from Chapter 62-777 FAC (FDEP, 2005). The secondary cleanup goal is lead in groundwater, which was derived from the FDEP GCTL for lead (0.015 mg/L).

2.4 Determination of Removal Areas

Based on the FDEP residential SCTLs and GCTLs, the removal areas have been identified to reduce human health and ecological risk associated with surface soil to acceptable levels. The removal areas have been defined as the North and South SAWTs, as described below.

North SAWT

Soil represented by samples with lead concentrations in excess of the residential SCTL and GCTL should be removed to prevent potential future exposure to lead. The vertical and

horizontal extent of lead contamination has been delineated for the North SAWT. Only the upper 6 inches of soil exceeded the soil and groundwater cleanup levels. The area defined in Figure 2-6 outlines the extent of lead-contaminated surface soil; the resulting volume of soil contamination is approximately 153 cubic yards (yd³). The majority of the soil exceedances are confined to the currently fenced-in area.

South SAWT

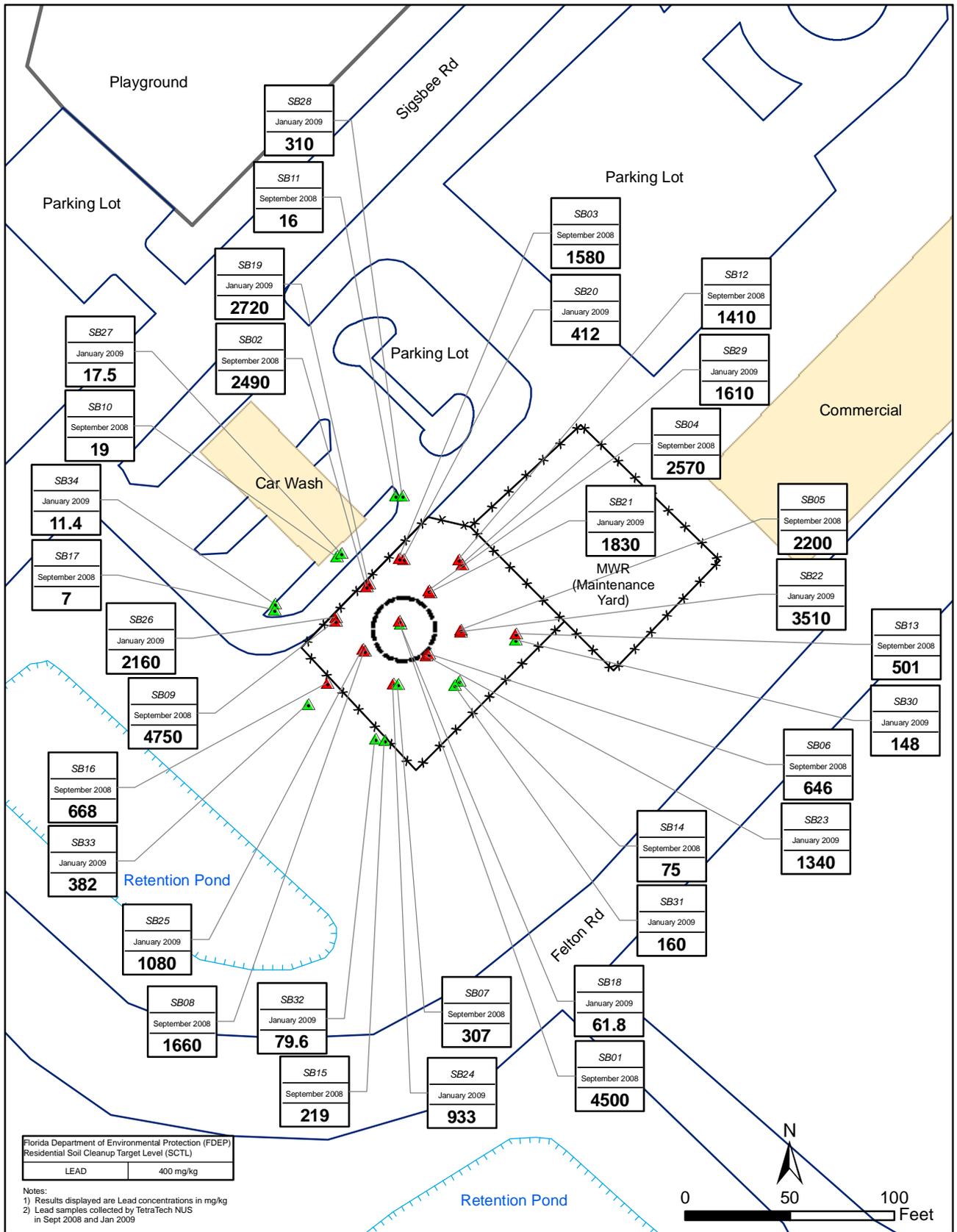
The vertical and horizontal extent of lead contamination has been delineated for the South SAWT. Only the upper 6 inches of soil exceeded the soil and groundwater cleanup levels. The area defined in Figure 2-7 outlines the extent of lead-contaminated surface soil; the resulting volume of soil contamination is approximately 105 yd³. The majority of the soil exceedances are confined to the currently fenced-in area.



Data Source: ArcGIS Online

FIGURE 2-1
Site Location Map
 Engineering Evaluation/Cost Analysis at
 Sigbee Towers
 NAS Key West
 Key West, Florida



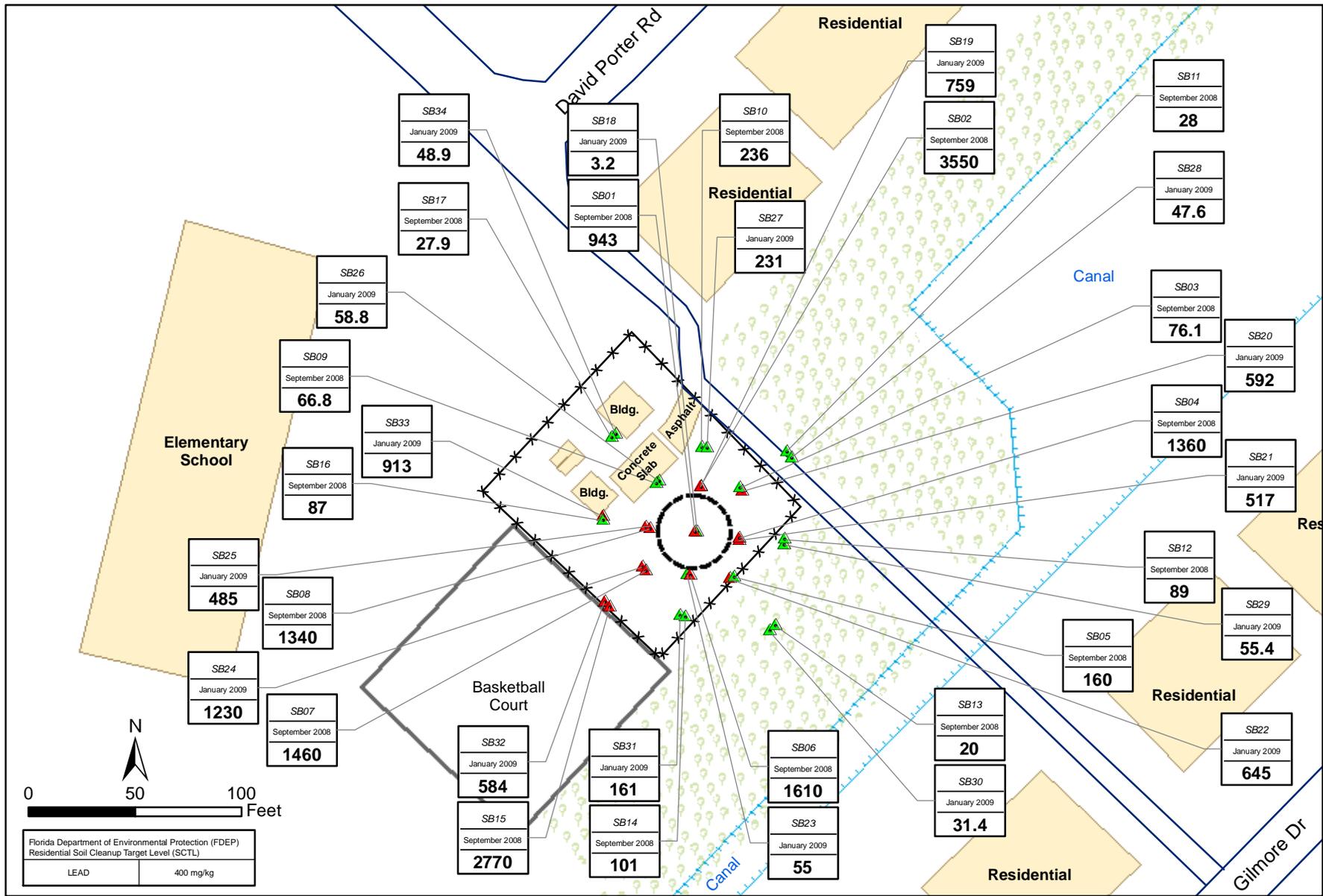


- ▲ SCTL Exceedence (TetraTech NUS)
- ▲ SCTL Non-exceedence (TetraTech NUS)
- Retention Pond
- Buildings
- Roadway
- Fence Line
- Former Water Tower

Originator:	<i>Scott Smith</i>
Checked by:	<i>Jennifer Ottoson</i>

FIGURE 2-2
North SAWT Historic Soil Sample Locations
 Engineering Evaluation/Cost Analysis
 at Sigsbee Towers
 NAS Key West
 Key West, Florida





- ▲ SCTL Exceedence (TetraTech NUS)
- ▲ SCTL Non-exceedence (TetraTech NUS)
- Roadway
- ✂ Fence Line
- Trees and Brush
- Former Water Tower
- Canal
- Buildings

Originator: *Scott Smith* (signature)
 Checked by: *Jennifer Ottosen* (signature)

Notes:
 1) Results displayed are Lead concentrations in mg/kg
 2) Lead samples collected by TetraTech NUS in Sept 2008 and Jan 2009

FIGURE 2-3
South SAWT Historic Soil Sample Locations
 Engineering Evaluation/Cost Analysis
 at Sigsbee Towers
 NAS Key West
 Key West, Florida



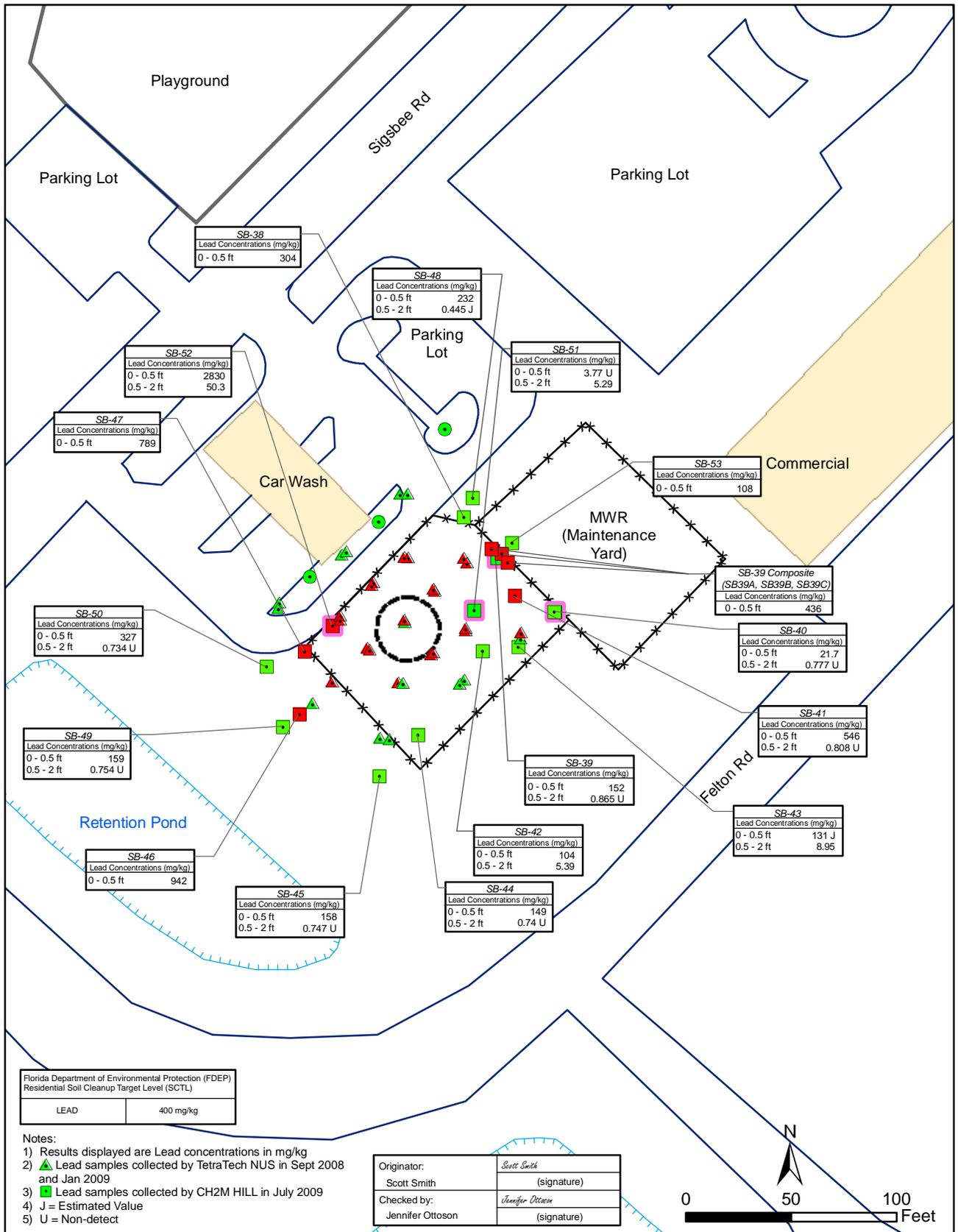
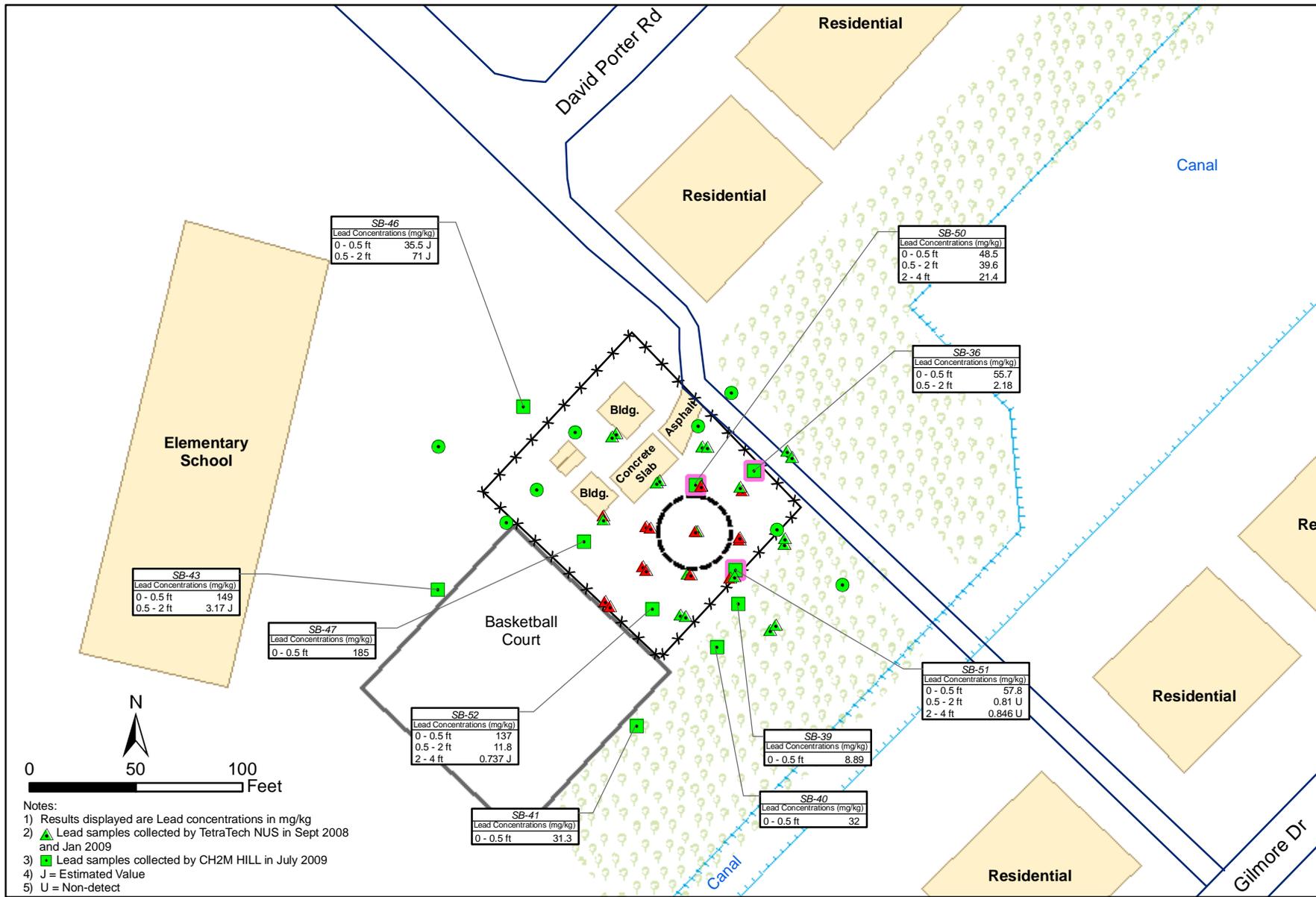


FIGURE 2-4
North SAWT Analytical L
Engineering Evaluation/Cc
at Sigsbee Towers
NAS Key West
Key West, Florida





- Notes:
- 1) Results displayed are Lead concentrations in mg/kg
 - 2) ▲ Lead samples collected by TetraTech NUS in Sept 2008 and Jan 2009
 - 3) ■ Lead samples collected by CH2M HILL in July 2009
 - 4) J = Estimated Value
 - 5) U = Non-detect

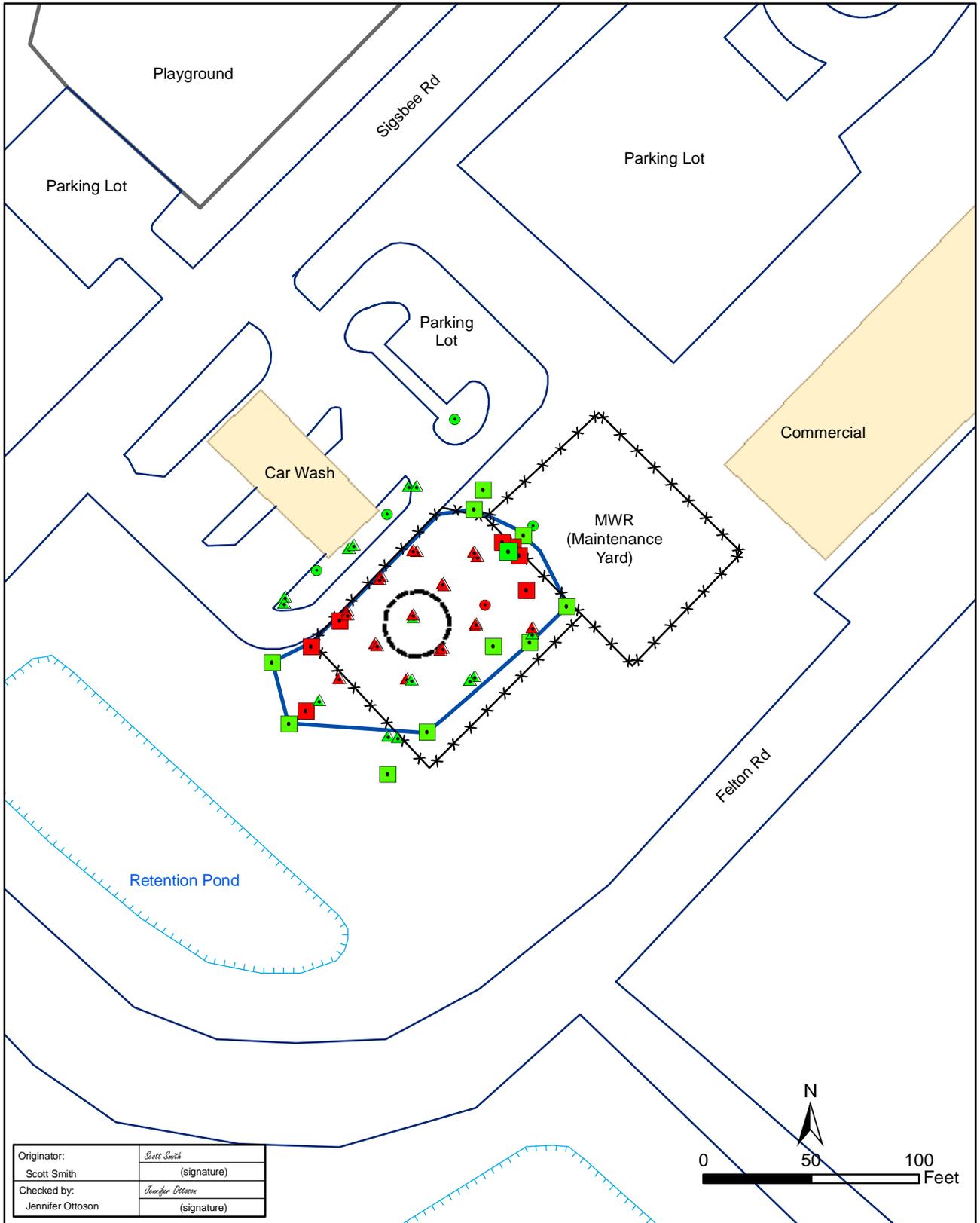
- ▲ SCTL Exceedence (TetraTech NUS)
- ▲ SCTL Non-exceedence (TetraTech NUS)
- SCTL Non-exceedence (CH2M HILL)
- SPLP/TCLP Sample Location (CH2M HILL)
- XRF Non-exceedence (CH2M HILL)
- Roadway
- ✂ Fence Line
- 🌳 Trees and Brush
- 🌊 Canal
- 🏠 Former Water Tower
- 🏠 Buildings

Florida Department of Environmental Protection (FDEP)	
Residential Soil Cleanup Target Level (SCTL)	
LEAD	400 mg/kg

Originator:	<i>Scott Smith</i>
Checked by:	<i>Jennifer Ottoson</i>
	(signature)
	(signature)

FIGURE 2-5
South SAWT Analytical Laboratory Data Results
 Engineering Evaluation/Cost Analysis
 at Sigsbee Towers
 NAS Key West
 Key West, Florida

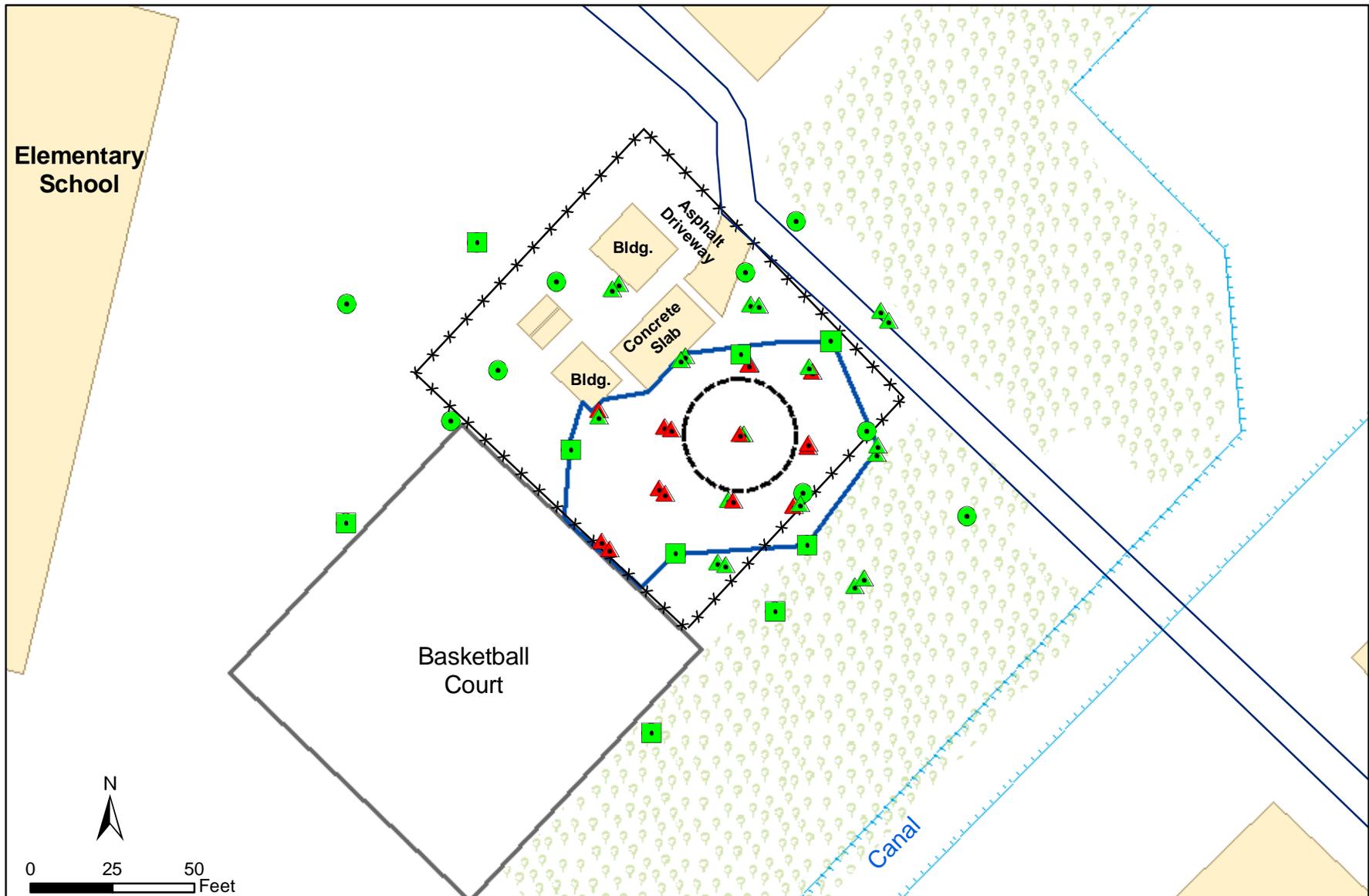




- ▲ SCTL Exceedence (TetraTech NUS)
- ▲ SCTL Non-exceedence (TetraTech NUS)
- SCTL Exceedence (CH2M HILL)
- SCTL Non-exceedence (CH2M HILL)
- XRF Exceedence (CH2M HILL)
- XRF Non-exceedence (CH2M HILL)
- Roadway
- ✕✕✕ Fence Line
- ▭ Excavation Limits
- ⌚ Retention Pond
- Buildings
- Former Water Tower

FIGURE 2-6
North SAWT Proposed Excavation Limits
 Engineering Evaluaiton/Cost Analysis
 at Sigsbee Towers
 NAS Key West
 Key West, Florida





- ▲ SCTL Exceedence (TetraTech NUS)
- ▲ SCTL Non-exceedence (TetraTech NUS)
- SCTL Non-exceedence (CH2M HILL)
- XRF Exceedence (CH2M HILL)
- XRF Non-exceedence (CH2M HILL)
- Roadway
- Fence Line
- Excavation Limits
- Canal
- Buildings
- Former Water Tower
- 🌳 Trees and Brush

Originator:	<i>Scott Smith</i>
Scott Smith	(signature)
Checked by:	<i>Jennifer Ottosen</i>
Jennifer Ottosen	(signature)

FIGURE 2-7
South SAWT Proposed Excavation Limits
 Engineering Evaluation/Cost Analysis
 at Sigsbee Towers
 NAS Key West
 Key West, Florida



3.0 Identification of Removal Action Objectives

3.1 Removal Action Requirements

NTCRAs funded by EPA have a \$2 million and a 12-month statutory limit pursuant to Section 104(c)(1) of CERCLA. Because removal actions at NAS Key West are not funded by the EPA, these statutory limits do not generally apply. CERCLA requires that effectiveness, implementability, and cost be considered in evaluating the removal action alternatives.

3.2 Removal Action Scope

The scope of this removal action is to address potential risk to human health and ecological receptors associated with impacted surface soil. In this EE/CA, several removal action alternatives have been developed to meet the following removal action objectives for the SAWTs:

- Mitigate potential unacceptable risk to human health and the environment posed by exposure to lead in surface soil, by removing the contaminated soil to below FDEP direct exposure residential SCTL for lead (400 mg/kg).
- Remove the potential source of contamination to the shallow groundwater, by meeting the FDEP GCTL for lead (0.015 mg/L).
- Close site with NFA decision.

The scope of the engineering measures for each removal alternative developed is discussed in Section 4.

3.3 Determination of Removal Schedule

This EE/CA will be placed in the information repository for a 30-day public comment period. Notice of its availability, along with a brief summary, will be published in the local newspaper. A 30-day public comment period will commence once the notice is published.

Since this removal action has been designated non-time critical, the start date will be determined by factors other than the urgency of the threat. Possible factors include the elementary school session schedule, weather conditions, availability of resources, and site constraints.

The total project period is predicted to last approximately 6 months from the end of the public comment period through completion of CERCLA documentation. Critical milestone periods related to the EE/CA are summarized below:

- EE/CA Public Comment Period – 1 month
- Work Plan, Subcontracting, and Mobilization – 2 months
- Removal Action – 1 month
- CERCLA Documentation – 2 months

The estimated removal action schedule includes the time required for mobilization and setup of equipment and performance of the selected removal actions.

3.4 Applicable or Relevant and Appropriate Requirements

As required by Section 121 of CERCLA, remedial actions carried out under Section 104 or secured under Section 106 must attain the levels of standards of control for hazardous substances, pollutants, or contaminants specified by the applicable or relevant and appropriate requirements (ARARs) of federal and state environmental laws and state facility-siting laws, unless waivers are obtained. The requirements of CERCLA generally apply as a matter of law only to remedial actions. However, as required by EPA's policy 40 CFR Section 300.415(j), ARARs will be identified and attained for removal actions to the extent practicable. Three factors will be applied to determine whether the identification and attainment of ARARs is practicable in a particular removal situation: 1) the exigencies of the situation; 2) the scope of the removal action to be taken; and 3) the effect of ARAR attainment on the statutory limits for removal action duration and cost.

ARARs are identified by EPA as either being applicable to a situation or relevant and appropriate to it. These distinctions are critical to understanding the constraints imposed on response alternatives by environmental regulations other than CERCLA. The definitions of ARARs below are from the EPA guidance (EPA, 1988).

“Applicable requirements” are standards and other environmental protection requirements of federal or state law dealing with a hazardous substance, pollutant, contaminant, action being taken, location, or other circumstance at a CERCLA site.

“Relevant and appropriate requirements” are standards and environmental protection criteria of federal or state law that, although not “applicable” to a hazardous substance, pollutant, contaminant, action being taken, location, or other circumstance, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. The procedure to determine if a requirement is relevant and appropriate is a two-step process. A requirement is “relevant” if it addresses problems or situations sufficiently similar to the circumstances of the proposed response action. A requirement is “appropriate” if it would also be well suited to the conditions of the site.

A requirement may be “relevant” to a particular situation but not “appropriate,” given site-specific circumstances; such a requirement would not be an ARAR for the site. A requirement that is relevant and appropriate must be met as if it were applicable. Relevant and appropriate requirements that are more stringent than applicable requirements take

precedence. However, more discretion is allowed in determining relevant and appropriate requirements than in determining applicable requirements.

“To-be-considered” (TBCs) are non-promulgated advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential ARARs. TBCs are evaluated along with ARARs and may be implemented by EPA when ARARs are not fully protective of human health and the environment.

Another factor in determining which response requirement must be met is whether the requirement is substantive or administrative. Onsite CERCLA response actions must meet substantive requirements but not administrative requirements. Substantive requirements are those dealing directly with actions or with conditions in the environment.

Administrative requirements implement the substantive requirements by prescribing procedures such as fees, permitting, and inspection that make substantive requirements effective. This distinction applies to onsite actions only; offsite response actions are subject to all applicable standards and regulations, including administrative requirements such as permits.

Three classifications of requirements are defined by EPA 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 (COCs) in the designated media or set safe concentrations of discharge for response activity. Chemical-specific requirements are generally set for a single chemical or closely related group of chemicals and do not typically consider mixtures of chemicals. When chemical-specific requirements do not adequately protect human health or the environment, cleanup goals may be set below the TBC value. Federal and state chemical-specific regulations that have been reviewed are summarized in Appendix A.

Location-specific ARARs restrict response activities and media concentrations based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on response actions within wetlands or floodplains, near locations of known endangered species, or on protected waterways. Location-specific regulations that have been reviewed are summarized in Appendix A.

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances. Action-specific ARARs that may affect the development and conceptual arrangement of response alternatives are summarized in Appendix A.

4.0 Identification and Analysis of Removal Action Alternatives

A removal action is planned for the SAWT sites based on the removal areas identified in Section 2.4. The alternatives for this NTCRA were considered using professional judgment and information from previous investigations. 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

The no action alternative implies that no removal work will be done. The area will be left as it currently exists, leaving the impacted surface soil in place. Under this alternative, no controls or removal technologies will be implemented. CERCLA (Section 121(c)), as amended by SARA (1986), requires that the site be reviewed every 5 years since the impacted surface soil will remain onsite. It is assumed that the current level of maintenance will be sustained.

4.1.2 Alternative 2—Engineering Controls and Institutional Controls

Alternative 2 provides for engineering controls and institutional controls at the site. Engineering controls would consist of fencing around both tower areas to limit access to affected media. Institutional controls would include land use control (LUC) measures within both fenced areas to prevent disturbance of contaminated media.

This alternative leaves contaminated soil in place, but the installed fencing around the affected areas and the implemented institutional controls would reduce the potential for contaminant contact or migration caused by disturbance of the affected media. Figures 2-6 and 2-7 illustrate the North and South SAWTs, respectively. Fencing at the North SAWT would remain as shown on Figure 2-6, except that the western portion of the fence would be extended by approximately 20 feet to encompass the lead exceedances. Thus, a total of 80 feet of new fencing, including 20 feet each on the north and south sides plus 40 feet of fencing on the west end, would be required. The fence would retain the rectangular shape and be constructed of similar materials and fence specifications as the existing fencing. The fence at the South SAWT would remain as shown on Figure 2-7 with no modifications required. The areas inside the fencing at both tower locations would be subject to LUCs to prevent disturbance of the impacted soil.

As this alternative leaves contaminated media in place, site reviews, as required by CERCLA, would be required every 5 years. It is assumed that the current level of maintenance will be sustained.

4.1.3 Alternative 3—Excavation and Backfill

Alternative 3 includes the excavation of impacted surface soil to 6 inches bls to meet FDEP SCTLs and GCTLs for lead, backfill of the excavations to original grade with imported uncontaminated backfill material (topsoil), and restoration to the original condition. Confirmation samples will not be collected, as the vertical and horizontal limits have been delineated during the July 2009 sampling event (AGVIQ-CH2M HILL, 2009c).

Specific erosion control features will be developed in the Removal Action Work Plan. Erosion control features will include placing the impacted surface soil on a plastic liner, berming, and covering, and installing perimeter controls as necessary to prevent offsite migration of pollutants.

Waste characterization samples will be collected for offsite disposal of material. Waste characterization analysis consists of full toxicity characteristic leaching procedure (TCLP), polychlorinated biphenyls (PCBs), corrosivity, reactivity, and ignitability, along with any additional testing required by the disposal facility. Waste characterization samples will be collected at the rate required by the disposal facility. Once analytical results are received, the disposal options will be selected based on the results of the waste-characterization samples and the facility will be approved by the Navy prior to transport of any material. All excavated materials will be loaded into haul trucks and transported to the approved offsite facility for disposal.

Because there is no onsite borrow source, all fill material will be brought from offsite. Backfill material will be topsoil and is defined as native or amended soil with an organic salt concentration less than 500 ppm, organic content at a minimum of 1.5 percent, and a pH of 6 to 7.5. Topsoil will be classified as a loam, sandy loam, silt loam, sandy clay loam, or clay loam and have a maximum particle size of $\frac{3}{4}$ inch. Offsite backfill material (topsoil) will be certified clean through analytical testing of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs and metals and compared to FDEP Residential SCTLs. Backfill material (topsoil) will be compacted by a track walking over 100 percent of the backfilled area with a track-type tractor or equivalent and restored to match the original grade. The total volume of soil to be excavated is approximately 153 yd³ from the North SAWT and 105 yd³ from the South SAWT. Figures 2-6 and 2-7 illustrate the limits of the excavation and restoration area for the North and South SAWT respectively.

4.2 Evaluation Criteria

The evaluation criteria are based on the EPA guidance document *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA, 1993).

4.2.1 Effectiveness

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

To be protective, the removal alternative must be:

- Protective of public health and community,
- Protective of workers during implementation,

- Protective of the environment, and
- Compliant with ARARs.

To successfully achieve the removal objectives, the removal alternative must:

- Meet the expected level of treatment or containment,
- Have no residual effect concerns, and
- Maintain long-term control.

4.2.2 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 includes:

- 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 includes:

- Availability of equipment
- Availability of personnel and services
- Laboratory testing capacity
- Offsite treatment and disposal capacity
- Post-removal site control

Administrative feasibility includes:

- 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)

4.2.3 Cost

The cost criterion encompasses the life-cycle costs of a project, including the projected implementation costs and the long-term operation and maintenance (O&M) costs of the removal 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, transportation, and disposal. Indirect costs include engineering expenses and contingency allowances.

It is assumed that the current level of maintenance will be sustained with implementation of any of the alternatives; thus, this maintenance is not included as an additional item in any of the cost estimates.

Annual O&M costs, which are costs required to ensure the continued effectiveness of the site control actions, are applicable to Alternative 2, and are incorporated into the cost estimate. These costs are not applicable to Alternative 3 because the excavation and offsite disposal will remove all of the impacted soils, and thus no O&M costs will be incurred.

Expenditures that occur over a time period are analyzed using present worth analysis, which discounts all future costs to a common base year. 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, will be sufficient to cover all costs associated with the life of the removal action. Assumptions associated with present worth calculations include a discount rate of 3.0 percent (based on *OMB Circular No. A-94, Appendix C*, revised December 2009), cost estimates in the planning years in constant dollars, and a period of performance that will vary with the activity, but will not exceed 30 years.

The costs estimates are provided to an accuracy of +50 percent and -30 percent. The cost estimates were developed in current dollars and based on unit pricing from engineering estimates, phone quotes, similar projects, or published values. Published cost values were based on information in *Site Work and Landscape Cost Data* (Means, 2005). Since these costs were developed in 2005 dollars, the estimates for each referenced unit cost were adjusted by 3 percent per year to reflect inflation. Appendix B provides cost estimate details pertaining to each alternative.

4.3 Evaluation of Alternatives

Table 4-1 presents a comparison of these removal action alternatives with respect to effectiveness, ease of implementation, and present worth cost over 30 years.

TABLE 4-1
Summary of Alternative Comparison

Evaluation Criteria	Alternative 1 No Action	Alternative 2 Engineering Controls and Institutional Controls	Alternative 3 Excavation, Offsite Disposal and Backfill
EFFECTIVENESS			
Overall Protection of Human Health and the Environment	This alternative is not protective of human health and the environment, as lead impacted surface soil would remain in place.	This alternative does not meet remedial action objectives for the protection of human health and the environment, as lead impacted surface soil would remain in place.	This alternative meets the remedial action objectives for the protection of human health and the environment and reduction of contaminant migration through excavation and offsite disposal of lead impacted surface soil.
Compliance with ARARs and Other Criteria	This alternative does not meet the removal action objectives established for the site.	This alternative does not meet the removal action objectives established for the site.	This alternative will comply with chemical-related ARARs. This alternative would also meet the removal action objectives established for the site.
Long-term Effectiveness and Permanence	This alternative does not reduce the long-term risk associated with lead-impacted soil at the site.	This alternative provides risk reduction through engineering and institutional controls of the affected soil. However, contaminants will remain in place at the site, and the site must be monitored and maintained for LUC implementation.	This alternative provides risk reduction through removal of the affected soil.
Reduction of Toxicity, Mobility or Volume through Treatment	This alternative does not reduce toxicity, mobility, or volume of impacted soil.	This alternative reduces the toxicity and mobility of impacted soil through engineering and institutional controls. However, this alternative does not reduce the toxicity and volume of the contaminants.	This alternative reduces toxicity, mobility, and volume of impacted soil through removal and offsite disposal.
Short-Term Effectiveness	This alternative does not reduce the short-term risks associated with contaminant impacts.	In the short-term, this alternative slightly reduces the risks to the community through engineering and institutional controls by limiting access to impacted soils.	In the short-term, this alternative produces a minor disturbance to the community because of soil excavation and transport to an offsite facility. Risks would be controlled through traffic controls and covering hauling trucks. Construction workers would be required to use PPE.
IMPLEMENTABILITY			
Technical Feasibility	This alternative is technically feasible.	This alternative is technically feasible.	This alternative is technically feasible.
Administrative Feasibility	This alternative is not considered administratively feasible as it does not meet the objectives established for the site.	This alternative is administratively feasible.	This alternative is administratively feasible.
Availability of Services and Materials	Services and materials are available for this alternative.	Services and materials are available for this alternative.	Services and materials are available for this alternative.
State and Community Acceptance	This alternative will not be acceptable to the State and community.	This alternative might not be acceptable to the State and community.	This alternative is likely to be acceptable to the State and community.
COST			
Capital Cost (Direct and Indirect)	\$0	\$50,065	\$343,700
Total O&M Cost	\$0	\$1,850 per year for 30 years	\$0
Present Value	\$0	\$87,700	\$343,700

5.0 Comparative Analysis of Removal Action Alternatives

5.1 Comparative Criteria

Section 4 provided an evaluation of the alternatives based on their effectiveness, ease of implementation, and cost. In this section, the alternatives are directly compared to one another for each of these three criteria.

The analysis presented in this section clarifies which alternative is preferable in each category and consequently, which will be recommended for implementation at the North and South SAWTs. The removal actions are summarized for comparison in Table 4-1.

5.1.1 Effectiveness

Alternative 1 is not effective. It is not protective of human health and the environment, does not achieve compliance with ARARs, and does not achieve the removal action objectives of this EE/CA. An action must be taken at the tower sites to meet these compliance requirements.

Alternative 2 is moderately effective because it limits direct exposure to impacted soil onsite and to the surrounding community through engineering and institutional controls. However, since impacted soil is left onsite, there is the potential for contaminants to migrate via trespassing, storm water runoff or by excavation of soil-burrowing animals to the surrounding media over time. Alternative 2 does not comply with ARARs, nor does it achieve the removal action objectives, since the impacted soil will be left in place.

Although the excavation portion of Alternative 3 results in a low potential risk to surrounding communities during the transport of the impacted soil offsite, it is considered highly effective because the complete removal of the impacted soil eliminates the onsite risks to human health and the environment for the long-term. Alternative 3 provides a permanent method of reducing contaminant concentrations with long-term effectiveness. Additionally, the excavation area is backfilled and re-vegetated with no restrictions for future land use.

Given the appropriate training and personal protective equipment (PPE), Alternative 3 is protective of workers during construction. Precautions are required to protect workers against contact with impacted soil. Impacted soil is removed during the implementation of Alternative 3; thus, chemical-specific ARARs are achieved and this alternative meets all of the removal action objectives.

5.1.2 Implementability

Alternative 1 involves no action and therefore is easy to implement. However, it is anticipated that because Alternative 1 leaves impacted soil in place, this alternative would not be acceptable to the State and community.

The overall implementation of Alternative 2 is straightforward and can be accomplished in a relatively short time frame utilizing conventional construction methods and available resources. The location of fencing around both tower sites will be based on sample locations to encompass all lead exceedances. Existing gate access to both sites will be maintained for site maintenance. Because impacted soil remains in place, maintenance, monitoring, inspections, deed restrictions, LUCs, and 5-year reviews are required. Alternative 2 may not be acceptable to the State and community because impacted soil will remain in place.

Alternative 3 can also be accomplished utilizing conventional construction methods and available resources. This alternative is easily implementable because dig and haul activities are routine construction activities, although it is more difficult to implement than Alternative 2 because it requires excavation of impacted soil, offsite disposal, and backfilling and compaction of excavated areas to grade. Trucks transporting excavated soil for disposal or clean fill material would need to be covered. The most significant disturbance to the community would result from the vehicles on local roads during the excavation and backfilling activities. There are no O&M monitoring costs associated with this alternative. Alternative 3 is expected to be acceptable to the State and community because it removes impacted soils and restores the sites.

5.1.3 Cost

The cost estimates for the alternatives are provided in Appendix B and summarized in Table 4-1. Alternative 1 would not involve any construction or O&M activities and, therefore, is assumed to have no costs and is thus the least expensive. Alternative 2 is estimated at a present value of \$87,700. Alternative 3, estimated at a present value \$343,700, is the most costly alternative. However, Alternative 3 will have no annual O&M costs following the initial capital expense.

6.0 Recommended Removal Action Alternative

Based on the comparative analysis of the removal alternatives provided in this EE/CA, the recommended removal action is Alternative 3 - Excavation and Backfill. Alternative 3 consists of excavation of the contaminated surface soil to a depth of 6 inches. The surface soil will be backfilled and restored to its original grade.

Alternative 3 achieves the removal action objectives, complies with ARARs, eliminates the onsite risks to human health and the environment through the removal of impacted surface soil, and is straightforward to implement utilizing conventional construction methods and resources. NAVFAC SE and FDEP 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. 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 Administrative Record, along with the Final EE/CA. Although this alternative is more costly than Alternative 2 – Engineering Controls and Institutional Controls, Alternative 2 does not achieve the removal action objectives of this EE/CA since the impacted surface soil would remain in place.

After finalization of the EE/CA, the path forward for the North and South SAWTs is the completion of the removal action and preparation of the completion report requesting NFA.

7.0 References

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Appendix A
ARARs Tables

ARARs, Potential Remedial Alternatives, and DQOs

Potential ARARs

Section 300.415 of the National Contingency Plan (NCP) requires that remedial actions implemented under CERCLA be consistent with the requirements of federal and state environmental laws, regulations, standards, criteria, and limits that are legally determined to be ARARs. To be applicable, a state or federal requirement must directly and fully address the circumstances at a site and satisfy all of the jurisdictional prerequisites for legal applicability. A requirement that is not applicable may be relevant and appropriate if it addresses situations sufficiently similar to be of use in evaluating the site.

Only substantive requirements can be ARARs; administrative requirements such as permits, reporting, recordkeeping, or consultation with administrative bodies are not ARARs. Non-promulgated advisories or guidance issued by federal or state governments are not legally binding and are not ARARs. However, such advisories or guidance may be useful and are “to be considered” (TBC) during the identification of ARARs. TBCs are intended to complement the use of ARARs and may be used to establish remedial action objectives in circumstances for which ARARs do not exist.

Pursuant to EPA guidance, ARARs are generally divided into three categories:

- *Chemical-specific ARARs* establish numerical standards limiting the concentrations of substances in the medium of concern and/or the medium affected by the removal action. Florida’s 400 mg/kg cleanup level for lead in soil is an example of a chemical-specific ARAR.
- *Location-specific ARARs* are restrictions or considerations placed on the conduct of activities in specific locations.
- *Action-specific ARARs* are technology-based or activity-based restrictions controlling the removal action, and include performance and design standards. Requirements for handling and disposing of waste soil in Federal RCRA rules apply during work to excavate lead contaminated soil from the water tower sites. Additionally, erosion and sediment control best management practices would be required during earth moving or land clearing activities to meet substantive requirements of Florida’s Environmental Resource Permit Program.

Using the available investigation data, and considering the likely remedial technologies for the chemicals of concern (COCs), it is possible to produce a preliminary list of project-specific ARARs. **Tables B-1** through **B-3** in Appendix B summarize the chemical-specific, location-specific, and action-specific ARARs that have been identified for the EE/CA project as part of the Work Plan process.

TABLE B-1

Potential Chemical-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Contaminant Cleanup Target Levels (CTLs) 62-777 FAC	Applicable	Provides cleanup levels for sites regulated under the following programs: brownfield site rehabilitation (62-785 Florida Administrative Code [FAC]), hazardous waste site cleanup (62-730 FAC), contaminated site cleanup criteria (62-780 FAC), petroleum contamination sites cleanup criteria (62-770 FAC), and dry cleaning solvent cleanup criteria (62-713 FAC). The CTLs can be found at http://www.dep.state.fl.us/waste/quick_topics/rules/#62-777	Florida's cleanup level for lead in soil is 400 mg/kg and based on a residential direct exposure scenario. This value is based on federal guidance (1994 Revised Interim Soil Lead (Pb) Guidance for CERCLA Sites and RCRA Corrective Action Facilities, OSWER Directive #9355.4-12 and Clarification to the 1994 Revised Interim Soil Lead (Pb) Guidance for CERCLA Sites and RCRA Corrective Action Facilities, OSWER Directive #9200.4-27P.) The groundwater cleanup level for lead is 0.015 mg/L and is based on Primary Drinking Water Quality Standards, Chapter 62-520, F.A.C.
Resource Conservation and Recovery Act (RCRA) Hazardous Waste Determination Identification and Listing Hazardous Waste Regulations, 40 CFR 261 Subparts C and D, as adopted by 62-730.030 FAC	Applicable	A waste is considered a RCRA hazardous waste if it exhibits any of the characteristics of ignitability, corrosivity, reactivity, or toxicity, or if it is listed as a hazardous waste. TC level for lead in waste is 5.0 mg/L.	Wastes generated during remediation must be characterized and managed in accordance with RCRA requirements (see Action-Specific Applicable or Relevant and Appropriate Requirements [ARARs]). Soil samples tested for TCLP during previous investigations did not exceed this threshold.
Disposal of Soils and Debris Containing Hazardous Waste Land Disposal Restrictions, 40 CFR 268, as adopted by 62-730.183 FAC	Not an ARAR	If hazardous waste is to be disposed of on land (for example, placed in a landfill), it must first be treated to meet the land disposal restrictions (LDRs) found in 40 CFR 268.	No waste will land disposed onsite during in this removal action.

Notes:

ARAR Applicable or Relevant and Appropriate Requirement
 CFR Code of Federal Regulations
 CTL Cleanup Target Level (FDEP)
 EPA U.S. Environmental Protection Agency
 FAC Florida Administrative Code

FDEP Florida Department of Environmental Protection
 LDR land disposal restriction
 RCRA Resource Conservation and Recovery Act
 TCLP toxicity characteristic leaching procedure
 TSCA Toxic Substances Control Act
 mg/kg milligrams per kilogram

TABLE B-2

Potential Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Location	Regulatory Citation	ARAR Status	Description	Comments
Cultural Resources				
Presence of Archaeological Resources	Protection of Archaeological Resources, 43 Code of Federal Regulations (CFR) 7.4(a) and 43 CFR 7.5(b)(1)	Not an ARAR	The regulation prohibits excavation, removal, damage, or otherwise alteration or defacement of declared archaeological resources unless by permit or exception. Establishes protection of any such archaeological resources if discovered.	Applicable only if activities uncover archaeological resources. No known archaeological features exist at this site. If buried historic or prehistoric remains are discovered during construction, mitigation measures to protect the area would be required if such a discovery were uncovered.
Presence of Historic Properties	National Historic Preservation Act (NHPA); 16 USC 470, 36 CFR 800	Not an ARAR	Federal agencies must take into account the effect of all of its actions on historic properties.	No historic properties are present.
Presence of Human Remains, Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony for Native Americans	Native American Graves Protection and Repatriation Regulations 43 CFR 10.4(c) and (d)	Not an ARAR	Must stop activities in the area of discovery and make a reasonable effort to secure and protect the objects discovered. Must consult with Native American organization likely to be affiliated with the objects to determine further disposition per 43 CFR 10.5(b).	Applicable only if construction activities uncover human remains, funeral objects, sacred objects, or objects of cultural patrimony. Human remains, funerary objects, sacred objects, or objects of cultural patrimony for Native Americans are not expected at this site. If these objects or potential objects subject to these regulations are encountered during construction, the site will be evaluated further.
Remains, Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony for Native Americans	Offenses Concerning Dead Bodies and Graves 872.02 Florida Statutes	Not an ARAR	Unmarked tombs or human remains must be immediately reported to law enforcement. All activity must cease until the site is investigated by the State Archeologist or by law enforcement.	Applicable only if construction activities uncover human remains, funeral objects, sacred objects, or objects of cultural patrimony. Funerary objects, sacred objects, and objects of cultural patrimony for Native Americans are not expected to be at the sites. If these suspected tombs to human remains are encountered during construction, the site will be evaluated further.

TABLE B-2

Potential Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Location	Regulatory Citation	ARAR Status	Description	Comments
Floodplains				
Within Floodplain	Executive Order 11988, Floodplain Management 44 CFR 9, Floodplain Management and Protection of Wetlands	Potentially applicable	Action that will occur in a floodplain and relatively flat areas adjoining inland and coastal waters and other flood-prone areas must avoid, to the extent possible, the long- and short-term adverse effects associated with occupancy and modification of floodplains.	Measures taken to mitigate adverse effects include erosion and sediment controls.
Wetlands and Surface Waters				
In Wetlands	Executive Order 11990, Protection of Wetlands 40 CFR 6.302(a) and Appendix A	Not an ARAR	Actions must be taken to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible. If no practicable alternative exists, design or modify selected alternatives to minimize harm to or mitigate adverse impacts on wetlands.	Excavation work will not be conducted in wetlands.
Fish, Wildlife, and Plants				
	Endangered Species Act of 1973 (ESA) and Endangered and Threatened Wildlife and Plants, 50 CFR 17	Not an ARAR	The purpose of the ESA is to “conserve the ecosystems upon which threatened and endangered species depend” and to conserve and recover listed species. Federal agencies must consult with the USFWS to ensure that the actions they authorize, fund, or carry out will not jeopardize listed species. The law provides for critical habitat designations for listed species. Critical habitat designations affect Federal agency actions and federally funded or permitted activities.	Threatened and endangered species are not expected to be at the sites. If endangered or threatened species are potentially in the area of the site, a site-specific endanger and threatened species evaluation may be needed.

TABLE B-2

Potential Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Location	Regulatory Citation	ARAR Status	Description	Comments
Migratory Birds Present	Migratory Bird Treaty Act; 16 USC 703	Not an ARAR	The taking of any native species of wild bird is prohibited. Remediation activities that might affect migratory birds will require informal consultation with USFWS.	Migratory birds are not expected to be at the sites.

Notes:

- AFB Air Force Base
- CFR Code of Federal Regulations
- FAC Florida Administrative Code
- UIC Underground Injection Control
- USC United States Code

TABLE B-3

Potential Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Action	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Site Preparation, Construction, Remediation and Excavation Activities				
Cleanup of Releases to the Environment	Contaminated Site Cleanup Criteria 62-780 FAC	Applicable	Evaluation of remedial alternatives must consider achievement of risk level of 10^{-6} , must be protective of public health and the environment, and must evaluate a removal treatment alternative for source control and a limited treatment alternative (for example, institutional controls)	Although the NTCRA is being conducted under CERCLA, the Contaminated Site Cleanup Criteria has many of the same and similar requirements.
Activities Causing Emissions	Stationary Sources: Emissions Standards 62-296.320(4)(c) FAC	Applicable	Unconfined emissions of dust are not allowed, including dust from construction activity.	Dust must be controlled during excavation of debris.
Environmental Resource Permit Program Rules	South Florida Water Management District Chapter 40e-4, Surface Water Management	Applicable	Applies to any activity that alters the flow of surface waters in Florida. An Environmental Resource Permit is required, and implementing rules are triggered by landclearing activities within 50 feet or excavation within 200 feet of wetlands or other waters of the state.	The landclearing activities are not within 50 feet, and excavation activities are within 200 feet of waters of the state. Appropriate erosion and sediment controls will be implemented to prevent the discharge of soil/sediment to waters of the state.
Activities Causing Stormwater Runoff	Regulations for Stormwater Discharges 62-25 FAC	Not an ARAR	Requires construction projects to be apply for coverage under a general storm water permit. The NPDES general permit covers discharges composed entirely of storm water runoff associated with construction activities, including clearing, grading, and excavation that result in the disturbance of one acre or more of total land area. The NPDES general permit also covers water discharged due to dewatering activities.	The proposed work will disturb less than one acre of land.
Waste Management				
Solid Waste Disposal	Solid Waste Disposal Act, 42 USC §6901 et. Seq., 40 CFR 258 as referenced in 62-701 FAC	Not an ARAR	Establishes procedures and minimum requirements for land disposal of solid waste.	No wastes will be land disposed onsite.

TABLE B-3

Potential Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Action	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Hazardous Waste Site	Florida Rules on Hazardous Waste Warning Signs 52-730.225(4)	Potentially applicable if hazardous waste is managed at the site	Requires warning signs at hazardous waste sites to inform the public of the presence of potentially harmful conditions.	Signs need to be maintained at the site.
General Hazardous Waste Management	Hazardous Waste System: General 40 CFR 260, as referenced in 62-730 FAC	Applicable	Established definitions and references, as well as procedures and criteria for rulemaking petitions, including variances and delistings.	Applicable if hazardous wastes are generated. The <i>NAS Key West Hazardous Waste Management Plan</i> discusses the requirements for managing hazardous waste. Refer to this plan for specific information applicable to NAS Key West.
Hazardous Waste Generation	Identification and Listing of Hazardous Waste, 40 CFR 261, as referenced in 62-730.160 FAC	Applicable	Defines solid wastes that are subject to regulation as hazardous wastes. Characterization of wastes generated during the NTCRA should be conducted to determine if such wastes are hazardous (for example, contaminated PPE, equipment, wastewater) or excluded under 40 CFR 261.4. Determine if the waste is hazardous by testing using prescribed methods (that is, the waste is reactive, corrosive, ignitable, or toxic [the D waste codes]) or by applying generator knowledge based on information regarding material or processes used. Determine if the waste is listed hazardous waste under 40 CFR 261 (that is, is F-, K-, P-, or U-listed waste).	Applicable if hazardous wastes are generated. See also Potential Chemical-Specific ARARs table.
Hazardous Waste Accumulation	Standards Applicable to Generators of Hazardous Waste 40 CFR 262.34	Applicable	These requirements are applicable to hazardous waste that is held temporarily onsite prior to offsite disposal. Very specific requirements are discussed in the regulations, including labeling, management, training, and others. Consult the regulations for specific information.	Applicable if hazardous wastes are generated and accumulated onsite. If wastes may be hazardous (e.g., are stored pending analysis), they must be managed as hazardous waste, including labeling as "hazardous waste" pending analysis, and the label changed if the waste proves to be non-hazardous.

TABLE B-3

Potential Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Action	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Container Accumulation	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities 40 CFR 265.171 through .174, ; 40 CFR 265.175 (a) and (b)	Applicable	Containers of RCRA hazardous waste must: <ul style="list-style-type: none"> - Be maintained in good condition - Be compatible with hazardous waste to be stored - Be closed during storage except to add or remove waste - Have adequate secondary containment when stored onsite - Be marked with "hazardous waste" or other words identifying contents Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide a containment system with a capacity of 10 percent of the volume of containers with liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.	The generator requirements in 62-730 FAC reference these requirements and are applicable if hazardous wastes are generated. Note that if hazardous wastes are accumulated for longer than 90 days, the hazardous waste accumulation would be subject to the substantive requirements for storage facilities (that is, 40 CFR 264).
Container Handling Prior to Transport	Standards Applicable to Generators of Hazardous Waste 40 CFR 262.30 through .33, as referenced in 62-730 FAC	Applicable	Prior to transportation, containers would be packaged, labeled, marked, and placarded in accordance with RCRA and Department of Transportation requirements.	Applicable if containers of hazardous waste are packaged for offsite transportation and disposal. The <i>NAS Key West Waste Management Plan</i> discusses the requirements for managing hazardous waste. Refer to this plan for specific information.
Staging Piles	RCRA 40 CFR 264.554	Applicable	During corrective action, remediation waste can be placed in piles without triggering LDRs or MTRs. Staging piles must: <ul style="list-style-type: none"> • Be designed to prevent or minimize releases of hazardous waste and hazardous waste constituents (e.g., through the use of liner, covers, runoff/runoff controls) • Not operate for more than 2 years • Have all remediation waste, containment system components, and structures and equipment contaminated with waste or leachate removed at staging pile closure. 	This provision allows for temporary storage in staging piles of remediation wastes (for example, excavated debris and soil) characterized as hazardous. Any wastes that are potentially hazardous must be managed in this manner until it is shown that they either are or are not hazardous. The <i>NAS Key West Waste Management Plan</i> discusses the requirements for managing any waste in a stockpile (i.e., staging pile). Refer to this plan for specific information.

TABLE B-3

Potential Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

Draft EE/CA, Sigsbee Towers, NAS Key West, Florida

Action	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Hazardous Waste Land Disposal Restrictions (LDRs)	LDRs 40 CFR 268 62-730.265(4)	Not an ARAR	If hazardous waste is to be disposed of on land (e.g., placed in a landfill), it must first be treated to meet the LDRs found in 40 CFR 268.	No waste will land disposed onsite during in this removal action.
Offsite Disposal of Wastes from Site Remediation	CERCLA Off-Site Rule, 40 CFR 300.440	Applicable, if waste are disposed of offsite	Any waste from a CERCLA site that is disposed of off-site must be sent to a facility reviewed by EPA under the Off-Site Rule, once a decision document is signed for the waste (e.g., ROD, Action Memo). The concentrations in the waste may be extremely low (below risk based standards or below TCLP concentrations), but the waste must still go to an Off-Site Rule EPA-approved facility (http://www.epa.gov/osw/hazard/wastetypes/wasteid/offsite/).	

Notes:

ARAR status depends on the specific remedial alternatives evaluated.

- | | | | |
|--------|---|-------|---|
| ARAR | applicable or relevant and appropriate requirement | LDR | land disposal restriction |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act | NPDES | National Pollutant Discharge Elimination System |
| CFR | Code of Federal Regulations | NPL | National Priorities List |
| EPA | U.S. Environmental Protection Agency | PPE | Personal Protective Equipment |
| FAC | Florida Administrative Code | RCRA | Resource Conservation and Recovery Act |
| FDEP | Florida Department of Environmental Protection | ROD | Record of Decision |
| FR | Federal Register | TCLP | toxicity characteristic leaching procedure |
| | | USC | United States Code |

Appendix B

Cost Estimates

Alternative 2: Engineering Controls and Institutional Controls

Site: Sigsbee Annex Water Towers
Location: NAS Key West, Key West, FL
Phase: EE/CA
Date: April 2010

Description: Alternative 2 provides for engineering controls and institutional controls at the site. Engineering controls would consist of fencing around both tower areas to limit access to affected media. Institutional controls would include land use control (LUC) measures within both fenced areas to prevent disturbance of contaminated media.

CALCULATIONS

ASSUMPTIONS

Pricing quotes from F&W Fence, Key West, FL - April 2010

Labor (local) & Equipment Cost

Schedule (in days)	2	
Schedule (in weeks)	0.4	
Schedule (hours)	20	
Fencing - 8 foot, 9 gauge, galvanized, no barbed wire, top rail (per LF)	\$ 30	
Total fence installed (LF)	80	
Disposal fee for removed fence and concrete footings	\$ 100	
Labor Rate (per hour)	\$ 80	
Total Labor Cost	\$ 1,600	
Total Equipment Cost	\$ 2,500	
Mobe & demobe/Contingency - 20% of time and materials cost	\$ 820	
SUBTOTAL	\$ 4,920	

- 1) Fencing
 - * Fencing at North SAWT extended 20 feet on each side and 40 feet on end
 - * 80 feet total of new fencing required
 - * Fencing at South SAWT requires no modification
- 2) Install New Fence
 - * 80 LF of new fence
 - * install new concrete footers and remove old concrete footers (4-5 hours)
 - * client must call for utility locates prior to fence removal and installation
 - * cost is time and materials plus 20% mobe/demobe and contingency
- 3) Removal of Fence
 - * remove and replace 40 feet of fence along west end, remove footers (2-3 hours)
 - * can not reuse fence - aesthetics and ease to replace
- 4) Labor & Equipment
 - * Labor will be local (no per diem included)
 - * Work crew will include 2 laborers
 - * No heavy equipment or bobcats required for small job

CAPITAL COSTS

Description	Qty	Unit	Unit Cost	Total Cost	Notes
<i>Work Plan & Closeout Report</i>					
Draft and Final Submissions of Work Plan	1	LUMP	\$12,000.00	\$12,000	Engineer's Estimate
Draft and Final Submissions of Closeout Report	1	LUMP	\$8,000.00	\$8,000	Engineer's Estimate
Draft and Final Submissions of Operation and Maintenance Plan	1	LUMP	\$5,000.00	\$5,000	Engineer's Estimate
				<u>\$25,000</u>	
<i>Engineering and Institutional Controls</i>					
Fence removal and install (time and materials) - see above	1	LUMP	\$4,920.00	\$4,920	F&W Fence, Key West, FL
Gate - not required	0	EACH	\$400.00	\$0	F&W Fence, Key West, FL
Sign (large)	2	EACH	\$348.36	\$697	RS Means 10400-200-2200
Sign (small)	6	EACH	\$72.45	\$435	RS Means 10400-200-1200
Deed Restrictions	1	EACH	\$3,500.00	\$3,500	Engineer's Estimate
SUBTOTAL				<u>\$9,551</u>	
SUBTOTAL				\$34,551	
<i>Contingency</i>	15%			\$5,183	Engineer's estimate
SUBTOTAL				<u>\$39,734</u>	
<i>Project Management</i>	6%			\$2,384	Source: A Guide to Developing and Documenting Cost
<i>Project Design</i>	12%			\$4,768	Estimates During the Feasibility Study - USEPA/USACE,
<i>Construction Management</i>	8%			\$3,179	July 2000
TOTAL CAPITAL COST				\$50,065	

OPERATION AND MAINTENANCE COSTS (1 to 30 years)

<i>5-year Reviews</i>					
5-year Review and report (per year)	0.2	EVENT	\$7,700.00	\$1,540	Engineer's Estimate
SUBTOTAL				<u>\$1,540</u>	
SUBTOTAL				\$1,540	
<i>Contingency</i>	15%			\$308	Engineer's estimate
SUBTOTAL				<u>\$1,848</u>	
				\$1,850	Rounded

PRESENT VALUE ANALYSIS

i = 0.027 2010 Discount Rates for OMB Circular No. A-94,
 t = 30 Revised December 2009.

Cost Type	Year	Total Cost	Total Cost Per Year	Discount Factor (2.7%)	Present Value
Capital	0	\$50,065	\$50,065	1.000	\$50,065
O&M	1-30	\$55,440	\$1,848	20.38	\$37,668
					<u>\$87,733</u>

*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, June 25, 1993.

TOTAL PRESENT VALUE OF ALTERNATIVE **\$87,700**

The costs estimates are provided to an accuracy of +50 percent and -30 percent.

cu yd = cubic yard
 ft = foot, feet
 LF = linear foot
 mobe/demobe = mobilization/demobilization

Alternative 3: Excavation, Offsite Disposal and Backfill

Site: Sigsbee Annex Water Towers
Location: NAS Key West, Key West, FL
Phase: EE/CA
Date: April 2010

Description: Alternative 3 includes the excavation of impacted surface soil to six inches bls to meet FDEP SCTLs and GCTLs for lead, backfill of the excavations to original grade with imported clean topsoil and restoration to the original condition. Confirmation samples will not be collected as the vertical and horizontal limits have been delineated. Backfill material will consist of topsoil, which will be compacted by a track walking over 100 percent of the backfilled area with a track-type tractor or equivalent and restored to match the existing conditions. The total volume of soil to be excavated is approximately 153 CY from the North SAWT and 105 CY from the South SAWT.

CALCULATIONS

ASSUMPTIONS

<i>Impacted Area (0.5 ft excavation)</i>	
North SAWT (cu yd)	153
South SAWT (cu yd)	105
Assumed soil weight (tons/cu yd)	1.6
In-Place Volume of soil to be excavated (cu yd)	258
Volume of soil to be excavated (tons)	413

- 1) Excavation
 - * Soil to be excavated = 153 CY from the North SAWT and 105 CY from the South SAWT
 - * Depth of impacted soil and sediment areas is 0.5 ft
 - * Excavated materials disposed at offsite landfill as non-hazardous waste
 - * Soil weight assumed as 1.6 tons/cu yd (engineer's estimate)
- 2) Erosion and Sediment Controls
 - * Perimeter controls around the perimeter are assumed
- 3) Removal of Excavated Soil
- 4) Confirmation Sampling
 - * Not required because areas have been delineated by previous investigations
- 5) Fill Material
 - * Backfill material will come from an offsite borrow source
 - * Complete backfill of material removed, restoring original grade
 - * Top soil will be used for the top 6 inches
 - * Additional % of excavated material to allow for compaction
- 6) Disposal Characterization
 - * Actual frequency of disposal characterization samples will be based on facility
 - * price per sample for TCLP

Total for disposal (tons) 413

CAPITAL COSTS

Project Total Costs taken from Attachment B, Cost Estimate, AGVIQ-CH2M HILL JV - Contract No. N62470-08-D-1006: Option Year 2 (07MAR2010 - 06MAR2011)
 SOW SADRH1003 - Site 23 Interim Removal Action at Sigsbee Annex Water Towers - NAS Key West

Description	Qty	Unit	Unit Cost	Total Cost	Notes
<i>Project Management and Meetings</i>					
Project Total Cost	1	LUMP	\$53,590.63	\$53,591	Engineer's Estimate
Percentage of total cost applicable to Alternative 3			87%	0.87	Engineer's Estimate
SUBTOTAL				\$46,624	
<i>Work Planning</i>					
Project Total Cost	1	LUMP	\$15,607.46	\$15,607	Engineer's Estimate
SUBTOTAL				\$15,607	
<i>Soil Excavation, Transportation, and Disposal</i>					
Project Total Cost	1	LUMP	\$198,321.62	\$198,322	Engineer's Estimate
SUBTOTAL				\$198,322	
<i>Soil Sample Analysis - Waste and Backfill Characterization</i>					
Project Total Cost	1	LUMP	\$16,708.36	\$16,708	Engineer's Estimate
SUBTOTAL				\$16,708	
<i>Completion Report</i>					
Project Total Cost	1	LUMP	\$21,609.36	\$21,609	Engineer's Estimate
SUBTOTAL				\$21,609	
SUBTOTAL				\$298,871	
<i>Contingency</i>					
	15%			\$44,831	Engineer's estimate
SUBTOTAL				\$343,701	
TOTAL CAPITAL COST				\$343,701	

OPERATION AND MAINTENANCE COSTS

SUBTOTAL				\$0
<i>Contingency</i>				
	15%			\$0
SUBTOTAL				\$0

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Total Cost Per Year	Discount Factor (2.7%)	Present Value
Capital	0	\$343,701	\$343,701	1.000	\$343,701
O&M	N/A	\$0	\$0	1.92	\$0
					\$343,701
TOTAL PRESENT VALUE OF ALTERNATIVE					\$343,700

i = 0.027
t = 2
2010 Discount Rates for OMB Circular No. A-94, Revised December 2009.

*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, June 25, 1993.

The costs estimates are provided to an accuracy of +50 percent and -30 percent.

cu yd = cubic yard
 cu ft = cubic feet
 ft = foot, feet

LF = linear foot
 mobe/demobe = mobilization/demobilization
 sq ft = square feet

Reference Unit Costs (Not Used Directly in the Cost Estimate)
Alternative 3: Excavation, Offsite Disposal and Backfill

Site: Sigsbee Annex Water Towers
Location: NAS Key West, Key West, FL
Phase: EE/CA
Date: April 2010

Description: Alternative 3 includes the excavation of impacted surface soil to six inches bls to meet FDEP SCTLs and GCTLs for lead, backfill of the excavations to original grade with imported clean topsoil and restoration to the original condition. Confirmation samples will not be collected as the vertical and horizontal limits have been delineated. Backfill material will consist of topsoil, which will be compacted by a track walking over 100 percent of the backfilled area with a track-type tractor or equivalent and restored to match the existing conditions. The total volume of soil to be excavated is approximately 153 CY from the North SAWT and 105 CY from the South SAWT.

CALCULATIONS

ASSUMPTIONS

<i>Impacted Area (0.5 ft excavation)</i>	
North SAWT (cu yd)	153
South SAWT (cu yd)	105
Assumed soil weight (tons/cu yd)	1.6
In-Place Volume of soil to be excavated (cu yd)	258
Volume of soil to be excavated (tons)	413
Total for disposal (tons)	413

- 1) Excavation
 - * Soil to be excavated = 153 CY from the North SAWT and 105 CY from the South SAWT
 - * Depth of impacted soil and sediment areas is 0.5 ft
 - * Excavated materials disposed at offsite landfill as non-hazardous waste
 - * Soil weight assumed as 1.6 tons/cu yd (engineer's estimate)
- 2) Erosion and Sediment Controls
 - * Perimeter controls around the perimeter are assumed
- 3) Removal of Excavated Soil
- 4) Confirmation Sampling
 - * Not required because areas have been delineated by previous investigations
- 5) Fill Material
 - * Backfill material will come from an offsite borrow source
 - * Complete backfill of material removed, restoring original grade
 - * Top soil will be used for the top 6 inches
 - * Additional % of excavated material to allow for compaction
- 6) Disposal Characterization
 - * Actual frequency of disposal characterization samples will be based on facility
 - * price per sample for TCLP

Excavation Cost Unit Rates for Reference

<i>Equipment (all from Means, except mobe/demobe for screen - eng. est.)</i>	
Dozer - weekly rate	\$ 1,770
Excavator - weekly rate	\$ 1,030
Front End Loader - weekly rate	\$ 835
Excavator - weekly rate	\$ 1,030
Screen Plant - weekly rate	\$ 1,390
Off-road Dump - weekly rate	\$ 2,495
Mobe & Demobe (dozer, excavators, loader)	\$ 1,656
Mobe & Demobe (dump)	\$ 610
Mobe & Demobe (screen)	\$ 1,000
<i>Labor (engineer's estimate)</i>	
Equipment Operators - hourly rate	\$ 22
Equipment Operators - number	5
Laborers - hourly rate	\$ 12
Laborers - number	2
<i>Schedule</i>	
Production Rate (cu yd screened per day)	400
Duration of excavation activity (weeks)	0.3
Duration of excavation activity (days)	1.3
<i>Cost</i>	
Equipment	\$ 5,472
Labor	\$ 1,729
	\$ 7,201
Cost per ton	\$ 17.44

Fill Cost Unit Rates for Reference

<i>Material</i>	
North and South SAWTs (cu yd)	258
25% for compaction	65
Total Fill Material (cu yd)	323
<i>Equipment (all from Means, except mobe/demobe for screen - eng. est.)</i>	
Dozer - weekly rate	\$ 1,770
Mobe & Demobe (dozers, excavator, loader)	\$ 414
<i>Labor (engineer's estimate)</i>	
Equipment Operators - hourly rate	\$ 22
Laborers - hourly rate	\$ 12
Equipment Operators - number	1
Laborers - number	1
<i>Schedule</i>	
Production Rate (cu yd fill per day)	1000
Duration of fill activity (weeks)	0.1
Duration of fill activity (days)	0.3
<i>Cost</i>	
Equipment	\$ 528
Labor	\$ 88
	\$ 616
Cost per yard	\$ 1.91

The costs estimates are provided to an accuracy of +50 percent and -30 percent.

cu yd = cubic yard
 cu ft = cubic feet
 ft = foot, feet

LF = linear foot
 mobe/demobe = mobilization/demobilization
 sq ft = square feet