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ENGINEERING EVALUATION/COST ANALYSIS DEFENSE REUTILIZATION MARKETING OFFICE LAND SLIVERS AT TRUMAN ANNEX NAS KEY WEST FL

03/01/2012

AGVIQ ENVIRONMENTAL SERVICES

Engineering Evaluation/Cost Analysis

Revision No. 01

)efense Reutilization Marketing Office Land Slivers

Truman Annex
Naval Air Station Key West
Key West, Florida

Contract No. N62470-08-D-1006
Task Order No. JM31

PREPARED FOR

NAVFAC
Naval Facilities Engineering Command

Department of the Navy,
Naval Facilities Engineering Command, Southeast

March 2012

Engineering Evaluation/Cost Analysis
Defense Reutilization Marketing Office
Land Slivers

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Submitted to:

NAVFAC
Naval Facilities Engineering Command

U.S. Naval Facilities
Engineering Command Southeast

Prepared by:

AGVIQ
ENVIRONMENTAL SERVICES
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JOINT VENTURE

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March 2012

Prepared/Approved By:

Amy Twitty, P.G., Project Manager — March 5, 2012 Date

Approved By:

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Client Acceptance:

U.S. Navy, Responsible Authority — March 7, 2012 Date

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Acronyms and Abbreviations

AGVIQ-CH2M HILL	AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III
ARAR	applicable or relevant and appropriate requirement
BEQ	benzo(a)pyrene equivalent
bls	below land surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
DRMO	Defense Reutilization Marketing Office
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
ft^2	square feet
GRBCA	global risk-based corrective action
LUC	land use control
mg/kg	milligram per kilogram
NAS	Naval Air Station
NAVFAC SE	Naval Facilities Engineering Command, Southeast
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NHPA	National Historic Preservation Act
NTCRA	non-time-critical removal action
O&M	operation and maintenance
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PPE	personal protective equipment
SARA	Superfund Amendments and Reauthorization Act
SCTL	soil cleanup target level
SHPO	State Historic Preservation Officer
SI	Site Inspection
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	semivolatile organic compound
TBC	to-be-considered
TCLP	Toxicity Characteristic Leaching Procedure
TtNUS	Tetra Tech NUS, Inc.
UCL	upper confidence level
VOC	volatile organic compound
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) for two slivers of land (north and south) at the former Defense Reutilization Marketing Office (DRMO), Truman Annex, Naval Air Station (NAS) Key West, Florida. Previous site investigations identified potentially unacceptable risk to human health and the environment posed by exposure to surface and subsurface soils impacted by lead, arsenic, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs).

The removal action objective (RAO) is to prevent exposure to impacted soils above acceptable risk levels given current and reasonably anticipated future land use(s). The intent of the EE/CA is to evaluate the effectiveness, implementability and cost of various alternatives that may satisfy this objective.

The following removal action alternatives were evaluated:

- Alternative 1: No action
- Alternative 2: Excavation, Offsite Disposal, and Backfill
- Alternative 3: Engineering Controls and Institutional Controls

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

Alternative 2, excavation, offsite disposal and backfill, would most effectively eliminate risks posed by potential future exposure to contaminated surface and subsurface soils. It would be relatively easy to implement at reasonable cost, utilizing conventional construction methods and resources. It would also satisfy, to the extent practicable, all ARARs. Therefore, Alternative 2 is the recommended alternative.

Alternative 3, engineering controls (ECs) (a surface soil cap) and institutional controls (ICs), would be effective in preventing exposure to surface and subsurface soils above acceptable risk levels. However, since contaminated surface soils would remain in place after cap placement, long-term operation and maintenance (O&M) to ensure surface cap integrity as well as more elaborate IC implementation, would be required. Because Alternative 3 leaves contamination in place, requires long-term maintenance, and is more costly than Alternative 2, the alternative is not recommended.

1 Introduction

AGVIQ-CH2M HILL Constructors, Inc. 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 soils at the two former Defense Reutilization Marketing Office (DRMO) land slivers at Naval Air Station (NAS) Key West on Truman Annex, Key West, Florida (Figures 1-1 and 1-2). This work is being performed under the terms and conditions of Contract Number N62470-08-D-1006, Task Order No. JM31.

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 DRMO land slivers, under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986 (U.S. Environmental Protection Agency [EPA], 2006a).

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; EPA, 2006b) 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 DRMO sliver 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 that have planning periods of at least six months prior to initiation of onsite removal activities.

The lead agency is required by 40 CFR Section 300.415 to complete 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 making the EE/CA available for public review and comment for a period of not less than 30 calendar days. An announcement as to EE/CA availability and start of the 30-day public comment period is required to be published in a local newspaper. Written responses to any significant comments received must be summarized in an Action Memorandum and included in the Administrative Record.

Soil disturbances have occurred at the land slivers in the past. In 1999, soil excavations were conducted to 2 feet in portions of both the north and south land slivers to remove contaminated soil. Another excavation occurred along the entire length of the south land sliver in 2003 for the installation of a potable water distribution line. However, to date, no studies have been conducted to determine the historical significance of the land slivers. Based on the proximity to Ft. Zachary Taylor and historic railways, the potential exists to impact historic properties. Although the Navy is not subject to the procedural requirements of Section 106 of the National Historic Preservation Act (NHPA) when conducting CERCLA response actions, the substantive portions of the NHPA require the Navy to take into account the effect the CERCLA action would have on historic properties. Accordingly, the Navy will seek input from the Florida State Historic Preservation Officer (SHPO) and the Navy's Historic Preservation Officer throughout the planning process.

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 EPA guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, PB93-963402 (EPA, 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 and subsurface soils.

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

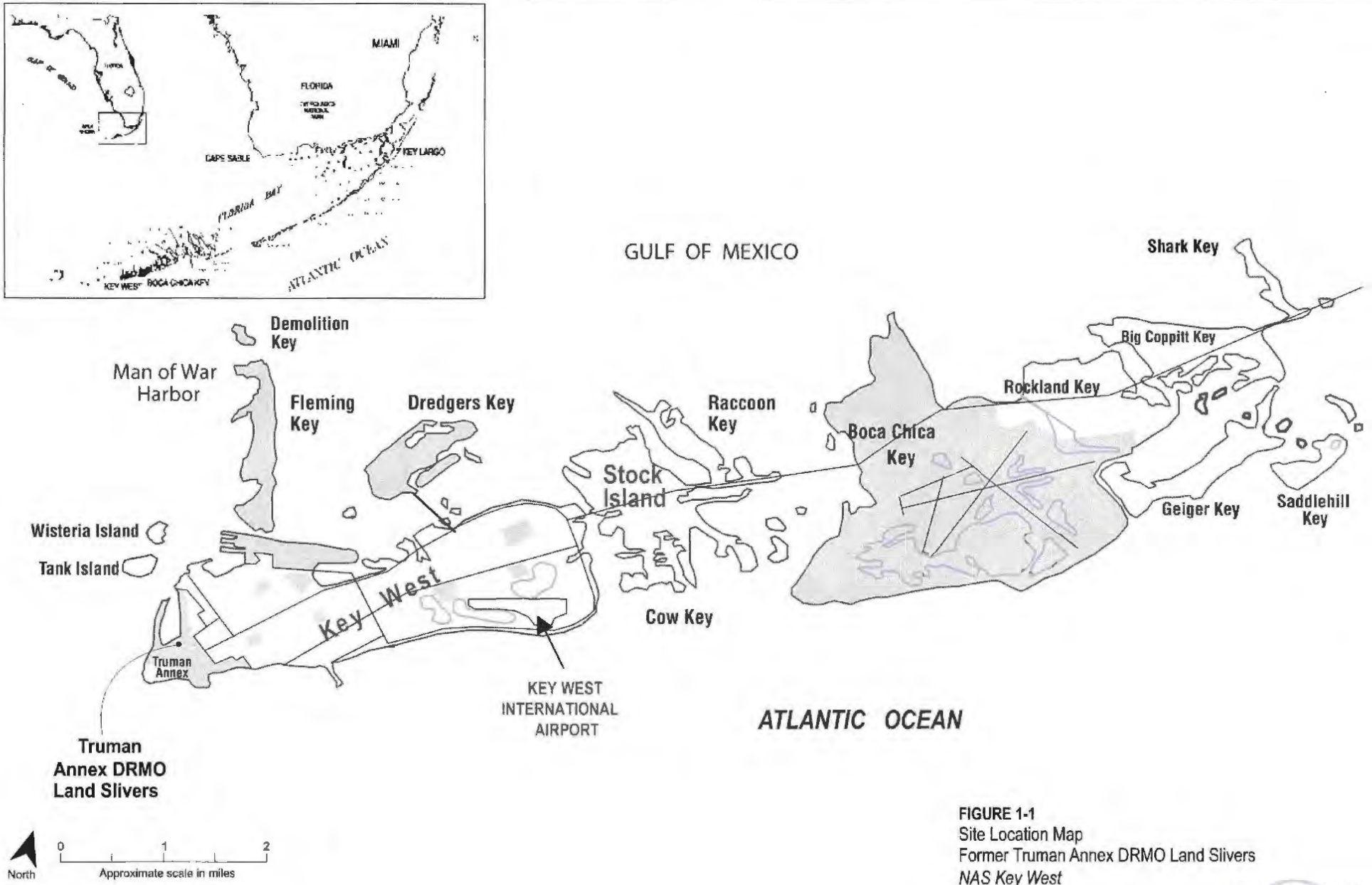


FIGURE 1-1
Site Location Map
Former Truman Annex DRMO Land Slivers
NAS Key West
Key West, Florida

AGVIQ CH2M HILL

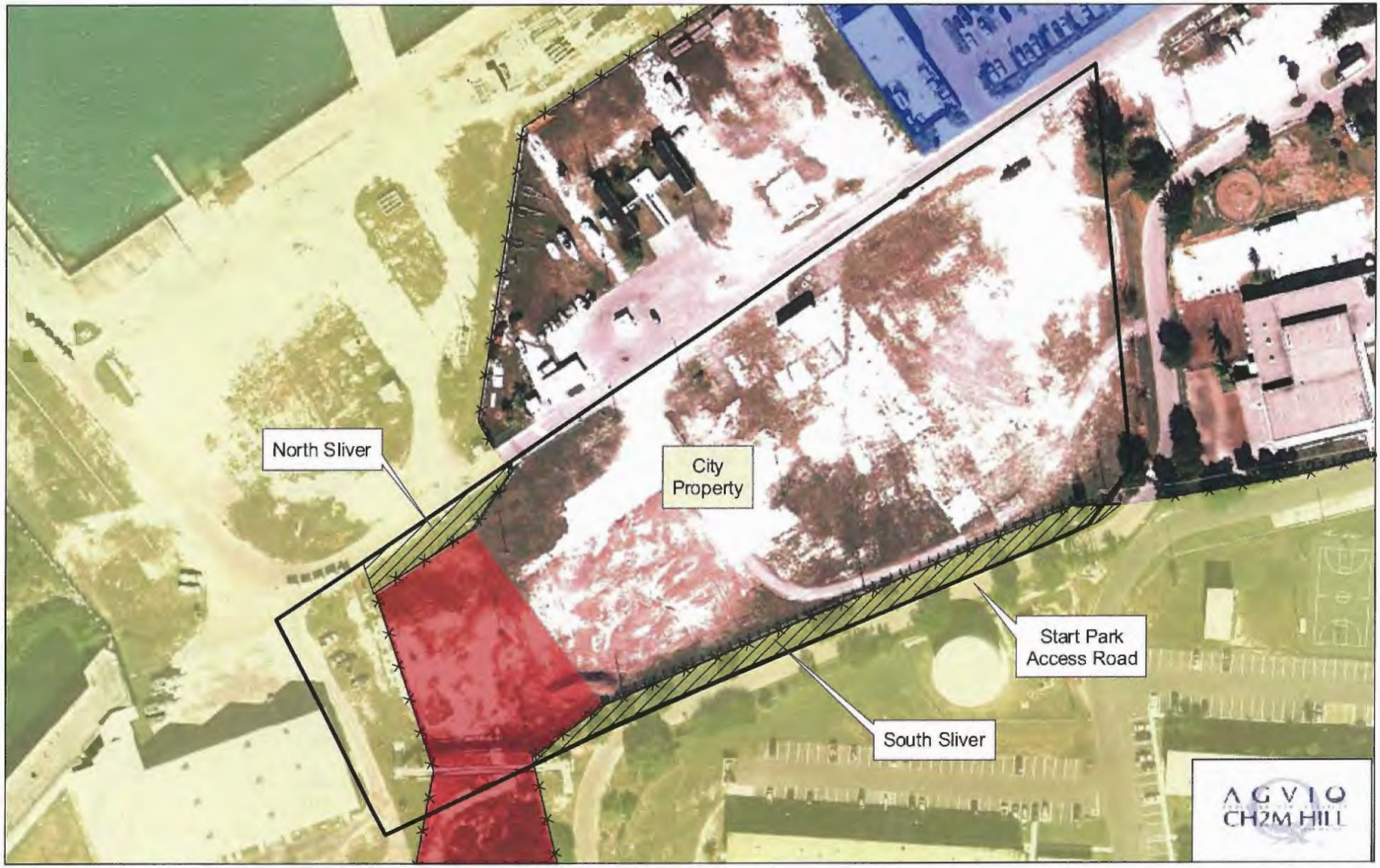


Figure 1-2
Site Layout Map
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida

GNV \\CYPRE ...\ENVIRONMENTAL\DRAWINGS\NASKEYWEST\FIGURE1-2_NORTH-SOUTH DRMOSLIVERS.MXD 12

2 Site Characterization

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

2.1 Site Description and Background

The project area consists of two slivers of land adjacent to the City-owned portion of the former DRMO at NAS Key West, Key West, Florida (Figure 1-1). The land slivers were also formerly part of the DRMO property but were located outside the fenced areas around the DRMO, and thus were retained by the Navy. Figure 1-2 presents the location of the land slivers. The former DRMO site is located on Truman Annex in Key West, Florida. The former DRMO site is approximately 6.25 acres in area and was used as a storage facility for new and used military equipment.

Over time, contaminants were released to site soils. An elevated water storage tank was formerly located at the site and was removed in 2003. This elevated tank was historically painted with lead-based paints. When the tank was demolished, lead from chipped paint was released to the surrounding soil. During a subsequent soil assessment and remediation project, confirmation sampling identified polychlorinated biphenyls (PCBs) as an additional chemical of concern (COC) in the soil at the site. PCBs also were found in backfill material placed at the site during the 1999 interim removal action. Further delineation of the extent of PCB- and lead-contaminated soil at the site was conducted and a soil removal action was performed on the City-owned portion of the former DRMO, which resulted in removal of surface soil COCs to levels within the Florida Department of Environmental Protection (FDEP) SCTLs protective of residential land use, as the target criteria.

The slivers of land were located outside of the fenced portion of the DRMO footprint, and therefore were not covered under the Base Realignment and Closure (BRAC) remedial activities. The southern sliver is approximately 600 feet long by 25 feet wide; the northern sliver is approximately 200 feet long by 30 feet wide.

These slivers had levels of contaminants, specifically PCBs, polycyclic aromatic hydrocarbons (PAHs), and some inorganic compounds above the FDEP Residential and Industrial SCTLs from Chapter 62-777 of the Florida Administrative Code (FAC) (2005).

2.2 Previous Investigations

The former DRMO has been investigated thoroughly in the past and remediated through soil excavations on at least four occasions. The following summarizes the historical investigations:

- Brown & Root performed a Site Inspection (SI) for the DRMO area in 1998; however, no sampling was conducted (as documented in Tetra Tech NUS, Inc. [TtNUS], 1999a).

- TtNUS performed a Supplemental SI in 1998/1999, which included setting up 100-foot by 100-foot grids (including the land slivers). Five samples per grid were composited (0 to 2 feet below land surface (bls), 2 to 5 feet bls, and 5 to 8 feet bls). Each composited sample was analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. The report recommended excavations be performed to remove contaminated soil across the DRMO. The Supplemental SI also included confirmation sampling in association with Bechtel Environmental, Inc.'s Fast Track Soil Removals (Bechtel Environmental, Inc., 1999), including PCB sampling (TtNUS, 1999b).

- From January 11 to April 16, 1999, Bechtel Environmental, Inc. excavated approximately 12,000 cubic yards (yd^3) of contaminated soil from the DRMO, including portions of the slivers (Bechtel Environmental, Inc., 1999).

- In June 2001, the Navy removed the existing chain link fence around the former DRMO perimeter and replaced it with an "aesthetically pleasing" fence. Prior to transfer of property to the City of Key West, the purpose of the existing fence was to keep State Parks patrons from accessing other Navy property; the original fence did not mark any property lines (except roughly the easement that the Navy gave the State Park). An aesthetically pleasing fence was built on the property line as described in the transfer documents to the City. Since the new fence did not encompass as much property as the original fence, several "land slivers" were created outside of the new fence area; these slivers were retained by the Navy.

- A potable water tower was removed from eastern portion of the DRMO in 2003. TN & Associates performed soil excavations around the former location of the water tower in 2004 to remove lead-contaminated soil associated with the lead-based paint. PCBs were also detected during the water tower confirmation sampling, which included the soil that was backfilled in 1999 (TtNUS, 2005).

- In 2004, TtNUS collected additional samples around the hot spots associated with the water tower soil excavation, including the land slivers. COCs included lead, arsenic, and PCBs. The results were documented in TtNUS' Hot Spot Removal Technical Memorandum (TtNUS, 2005).

- In 2006, CH2M HILL set up 26 ¼-acre grids (100 feet by 100 feet) across the BRAC portion of the DRMO (not including the slivers) and collected approximately 10 samples per grid. The intent was to assess PCB and lead contamination. Hot spots were identified for removal based on global risk-based corrective action (GRBCA) guidance from FDEP (average for lead and 95 percent upper confidence level [UCL] for PCBs). Hot spots were also identified based on concentration at three times the FDEP Residential SCTL (CH2M HILL, 2006).

- From January 29 to February 23, 2007, CH2M HILL excavated a total of 37 risk-based sample exceedance grids within the limits of the former BRAC portion of the DRMO site to 2 feet bls. Seven Engineering Control areas and the three additional areas designated as "hot spots" were also excavated to meet the Residential land use standards for the upper 2 feet of soil. A total of 4,392 tons of contaminated soil was removed for disposal (CH2M HILL, 2007). In order for the BRAC portion of the DRMO to meet FDEP Residential criteria, CH2M HILL remobilized in February 2009 and excavated one

remaining area with Residential SCTL exceedance along the northern DRMO boundary. The site currently meets FDEP Residential SCTLs for soil. A Site Rehabilitation Completion Report was submitted to FDEP for the BRAC portion of the DRMO in 2010 requesting unrestricted land use for soil (CH2M HILL, 2010).

- In 2010 and 2011, AGVIQ-CH2M HILL collected soil samples from both the north and south DRMO slivers, and analyzed them for arsenic, lead, PAHs, and PCBs in accordance with AGCIQ-CH2M HILL's Uniform Federal Policy Sampling and Analysis Plan (AGVIQ-CH2M HILL, 2010a) and corresponding Preliminary Assessment Work Plan (AGVIQ-CH2M HILL, 2010b). Figure 2-1 presents the soil sample locations from these events. Samples exceeded the FDEP Residential SCTLs for arsenic, lead, PAHs, and PCBs at both slivers. PAHs were the only constituents identified as soil exceedances above the Industrial SCTLs at the north sliver, and PAHs and PCBs had levels above the Industrial SCTLs in some samples from the south DRMO sliver. Figures 2-2 and 2-3 present the soil exceedances at the north and south DRMO slivers, respectively. Soil samples were also analyzed for lead, PAHs, and PCBs by the Synthetic Precipitation Leaching Procedure (SPLP) for potential for soil-to-groundwater leachability. None of the SPLP results exceeded the FDEP Groundwater Cleanup Target Levels for Low Yield/Poor Quality.

2.3 Nature and Extent of Contamination

2.3.1 Conceptual Site Model

A conceptual site model develops a conceptual understanding of a site to evaluate potential risks to human health and the environment, which are used to determine need for corrective actions. The conceptual site model should include known and suspected sources of contamination, types of contaminants and affected media, known and potential routes of migration, and known or potential human and environmental receptors. This effort, in addition to assisting in identifying locations where sampling is necessary, will also assist in the identification of potential remedial technologies.

2.3.2 Source Areas

The source of the contamination in soil includes historical activities associated with the former DRMO and the former water tower. The DRMO may have stored used equipment such as used transformers, lead-batteries used oil and pesticide containers, which may have contributed to lead, arsenic, PCBs, and PAHs in the area soils. Over time, operations at the DRMO may have released these contaminants to onsite soils and to the low lying areas surrounding the DRMO. Potential anthropogenic background sources also occur for PAHs, such as asphalt used to pave the roads. Arsenic also occurs naturally in soils. AGVIQ-CH2M HILL also understands that the water tower was covered in lead-based paint and that the paint weathered over time and potentially migrated to the ground surface. The lead-based paint could have also migrated to the ground surface during tank demolition activities.

2.3.3 Soil

The aesthetically pleasing fence was erected in June 2001, creating the north and south slivers. Each of the two slivers is narrow strip of land that is less than 1 acre. These slivers were not remediated to FDEP Residential SCTLs during the remediation of the DRMO. Soil contaminants at the DRMO slivers were the same as those detected in the former DRMO and include lead, arsenic, PCBs, and PAHs. The vertical extent of these contaminants in soil in the sliver areas has been delineated by sampling subsurface soil in areas where the contaminants were detected. However, the horizontal extent has not been adequately delineated in some areas where contamination was detected along the edges of the slivers. Contamination at the south sliver may extend south to the road; similarly, contamination at the north sliver may extend further north to the road.

Figure 2-1 presents the soil sampling locations from the north and south DRMO land slivers. Figures 2-2 and 2-3 present the soil exceedances at the north and south DRMO slivers, respectively.

No groundwater contamination is identified for the area based on the absence of contamination in deep subsurface soil at levels above SPLP criteria. Therefore, soils are the only relevant media for sampling for the DRMO slivers.

2.3.4 Potential Migration Pathways

Lead, arsenic, PCB, and PAH concentrations above the FDEP Residential SCTLs were found in surface soil of the DRMO slivers, and concentrations of PAHs and PCBs were found above the Industrial SCTLs in surface soil (Figures 2-2 and 2-3). The vertical extent of contamination has been delineated; however, the horizontal extent of contamination has not been delineated in some areas of the slivers, as previously discussed. The soil appears to consist primarily of consolidated and unconsolidated limestone, and depth to groundwater is between 4 and 6 feet bls. The site is relatively flat and surface flow at the site appears to be to the north, toward the Gulf of Mexico. No significant surface runoff related migration pathways are identified for the slivers. Also, vertical downward migration is identified as an insignificant pathway as subsurface soil sampling of this historical site did not have site-related contamination above the leachability criteria. The area groundwater was investigated as part of the DRMO site, and no groundwater contamination was identified associated with DRMO operations. Therefore, based on the SPLP data for the slivers soil samples, as well as indirect evidence of the absence of DRMO related groundwater contamination, it is concluded that the groundwater medium is not pertinent to the slivers investigations and this EE/CA. Thus, this EE/CA focuses on surface soil for characterization and the corrective actions design.

2.3.5 Potential Receptors

No significant ecological receptors are identified with the slivers which have only mowed and maintained grass. Potential human receptors include the base workers involved with maintenance of the grass, utility workers involved with the underground utilities in the area such as the water line, and tourists and the public accessing the nearby park and cruise terminal. There is an 8-inch water main running through the length of the south land sliver at a depth of approximately 4 feet bgs. Currently, access to this water line is through contaminated soil. Thus, the potential receptors include pedestrians (residents and tourists) and workers that may come in contact with the soil through dermal contact, inhalation, and ingestion. Therefore, the cleanup goals identified for the DRMO slivers were to be protective

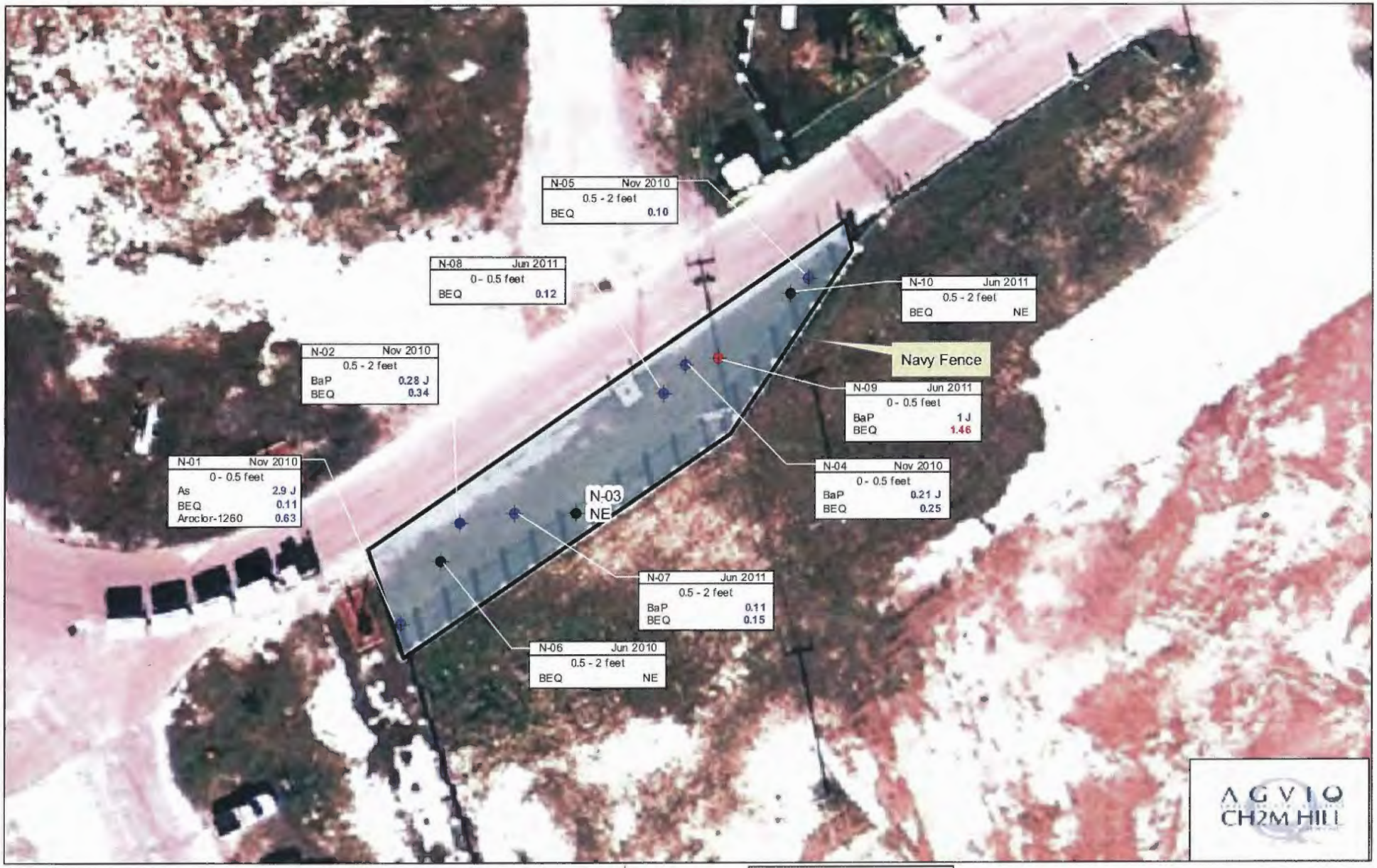
Legend
- Soil Boring
- DRMO Sliver

N

0 50 100 200
Feet

Figure 2-1
Sample Locations
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida

GNV \\CYPRESS\PROJ\ENVIRONMENTAL\DRAWINGS\NASKEYWEST\FIGURE1-2_SAMPLE LOCATIONS NORTH-SOUTH DRMO.MXD 9/22/2011



Legend

- Soil Boring (No Exceedance)
- Soil Boring (Exceeds Residential)
- Soil Boring (Exceeds Industrial)

As = Arsenic
BaP = Benzo(a)pyrene
BEQ = Benzo(a)pyrene Equivalent
J = Estimated
NE = No Exceedance

N

0 20 40
Feet

SCREENING STANDARDS		
Analyte	Residential SCTL	Industrial SCTL
As	2.1	12
BaP	0.1	0.7
BEQ	0.1	0.7
Aroclor-1260	0.5	2.6
Lead	400	1,400

All units in milligrams per kilogram

Figure 2-2
Soil Exceedances in DRMO North Sliver
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida

GNV \\CYPRE ...D\ENVIRONMENTAL\DRAWINGS\NASKEYWEST\FIGURE2-2_DRMO SOIL EXCEEDANCES_9-2011.MX ...2011

Legend

- Soil Boring (Exceeds Residential Criteria)
- Soil Boring (Exceeds Residential & Industrial Criteria)
- Soil Boring (No Exceedance)

N

0 40 80

Feet

Notes:

1. Excavation limits based on exceedances of recreational criteria.
2. Borings were sampled from 0 to up to 4 feet.

As = Arsenic
BaP = Benzo(a)pyrene
BEQ = Benzo(a)pyrene Equivalent
J = Estimated
NE = No Exceedance

SCREENING STANDARDS		
	Residential	Industrial
Analyte	SCTL	SCTL
As	2.1	12
BaP	0.1	0.7
BEQ	0.1	0.7
Aroclor-1260	0.5	2.6
Lead	400	1,400

All units in milligrams per kilogram

Figure 2-3
Soil Exceedances in DRMO South Sliver
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida

GNV \\CYPRESS\PROJ\ENVIRONMENTAL\DRAWINGS\NASKEYWEST\FIGURE2-3_DRMO-SOIL EXCEEDANCES SOUTH SLIVER_9-2011 MXD 9/22/2011

of tourists and public, and the levels protective of residential receptors are expected to also protect the maintenance workers and occasional visitors such as the tourists.

2.4 Cleanup Goals

Cleanup goals were identified to be conservatively protective of all potential receptors in the area. Therefore, residential land use based target levels were selected from the FDEP SCTLs for the site COCs. The cleanup goals for arsenic, lead, PAHs, and PCBs in surface soil were selected from the FDEP Residential SCTLs from Table II from Chapter 62-777 FAC (FDEP, 2005), and are listed below:

- Arsenic – 2.1 milligrams per kilogram (mg/kg)
- Lead – 400 mg/kg
- PAHs as benzo(a)pyrene equivalents (BEQs) – 0.1 mg/kg
- PCBs – 0.5 mg/kg

Arsenic occurs naturally in soils and some concentrations may exceed the SCTL as risk-based SCTLs tend to be lower than the naturally occurring background levels for this chemical. Therefore, in the absence of any other contamination, if arsenic alone slightly exceeds the SCTL, professional judgment may be used to limit further removal actions.

2.5 Determination of Removal Areas

Based on the FDEP Residential SCTLs, the removal areas have been identified to reduce exposure related risks associated with surface soil to acceptable levels. The removal areas have been defined as the north and south DRMO slivers, as described below.

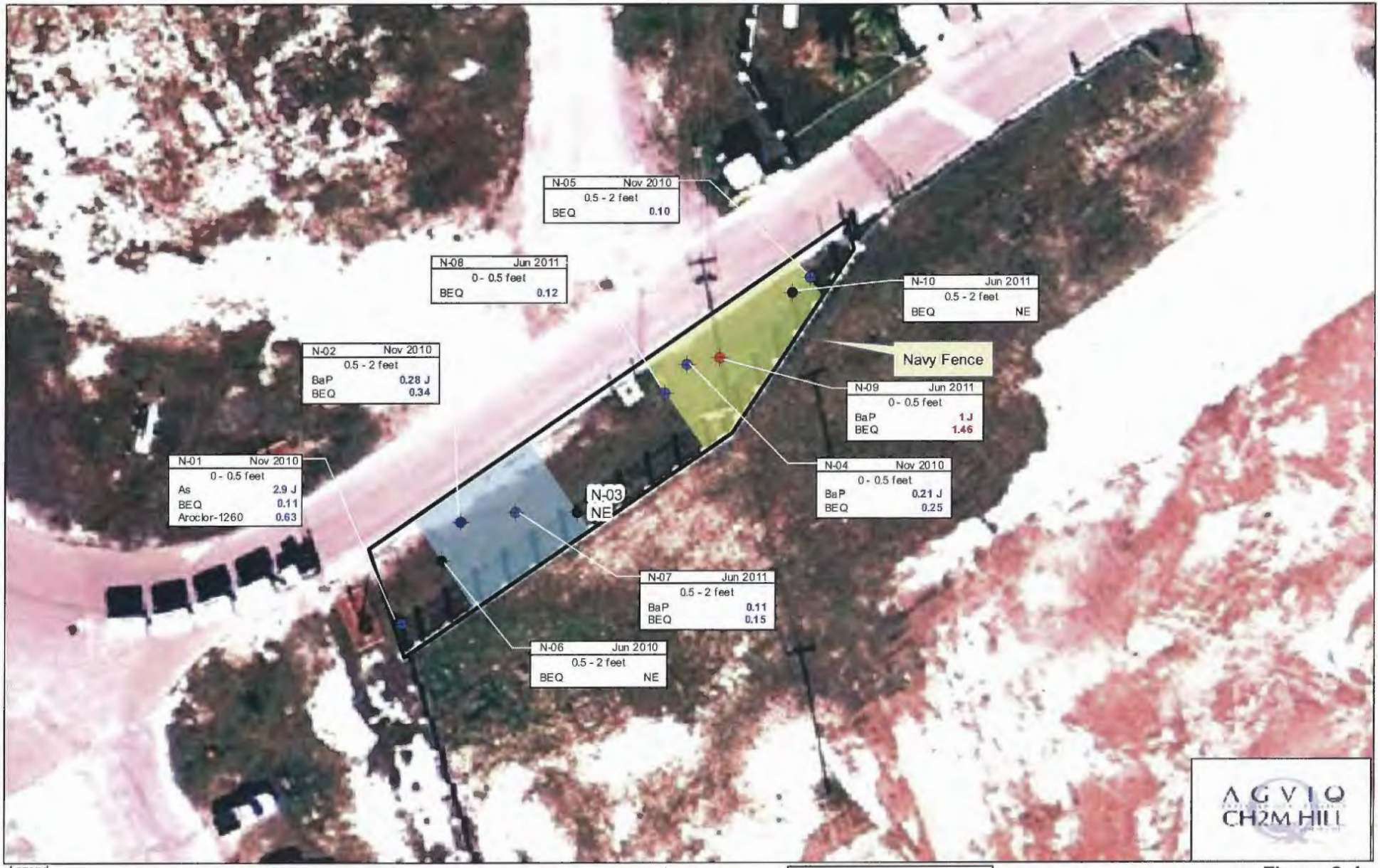
2.5.1 North DRMO Sliver

Soil represented by samples with COC concentrations in excess of the target levels should be removed or covered to prevent potential future exposure to these contaminants. Soil will be removed from two separate impacted areas at the north DRMO sliver. One area is impacted to 6 inches bls (approximately 1,327 square feet [ft^2]) and a second area extends to 2 feet bls (approximately 1,301 ft^2); however, the upper 6 inches of this area is not impacted in this area and can be reused as backfill. The impacted areas extend to the road to the north and to the Navy fence to the south. Figure 2-4 depicts the soil at the north DRMO sliver exceeding the FDEP Residential SCTLs and the proposed excavation areas; the resulting volume of soil contamination is approximately 97 yd^3. Confirmation samples will be collected along the northern excavation wall and analyzed for PAHs to assess whether contamination reaches the road.

2.5.2 South DRMO Sliver

The vertical extent of COC contamination has been delineated for the south DRMO sliver. Soil exceeded the FDEP Residential SCTLs to a depth of 6 inches in four discrete areas encompassing approximately 1,839 ft^2 and to a depth of 2 feet bls in six discrete areas encompassing approximately 6,616 ft^2 (Figure 2-5). Additionally, in order to avoid LUCs on soil greater than 2 feet, one area will be excavated to 4 feet bls near the east end of the south DRMO sliver. Figure 2-6 depicts this area encompassing approximately 122 ft^2. The

excavation at the south DRMO sliver will extend to the north to the aesthetically pleasing fence; the soil north of the fence currently meets FDEP Residential SCTLs as a result of past DRMO soil removal actions, as discussed in Section 2.2. The excavation proposed in this EE/CA will extend to the south to the former DRMO property line. Figures 2-5 and 2-6 depicts the extent of contaminated surface and subsurface soil and the proposed excavation areas in the south DRMO sliver; the resulting volume of contaminated soil for excavation is approximately 533 yd^3. Confirmation samples will be collected along the southern excavation wall and analyzed on 24-hour turnaround time for PCBs and PAHs, while lead and arsenic will be collected on a 72-hour turnaround time to assess whether contamination extends to the road. Because of the presence of numerous utilities in the subsurface near the road, the excavation will not extend to the road at this time.



Legend

- Soil Boring (No Exceedance)
- Soil Boring (Exceeds Residential)
- Soil Boring (Exceed Industrial)
- 0.5 ft Excavation (1,327 square feet)
- 2 ft Excavation (1,301 square feet)

As = Arsenic
BaP = Benzo(a)pyrene
BEQ = Benzo(a)pyrene Equivalent
J = Estimated
NE = No Exceedance

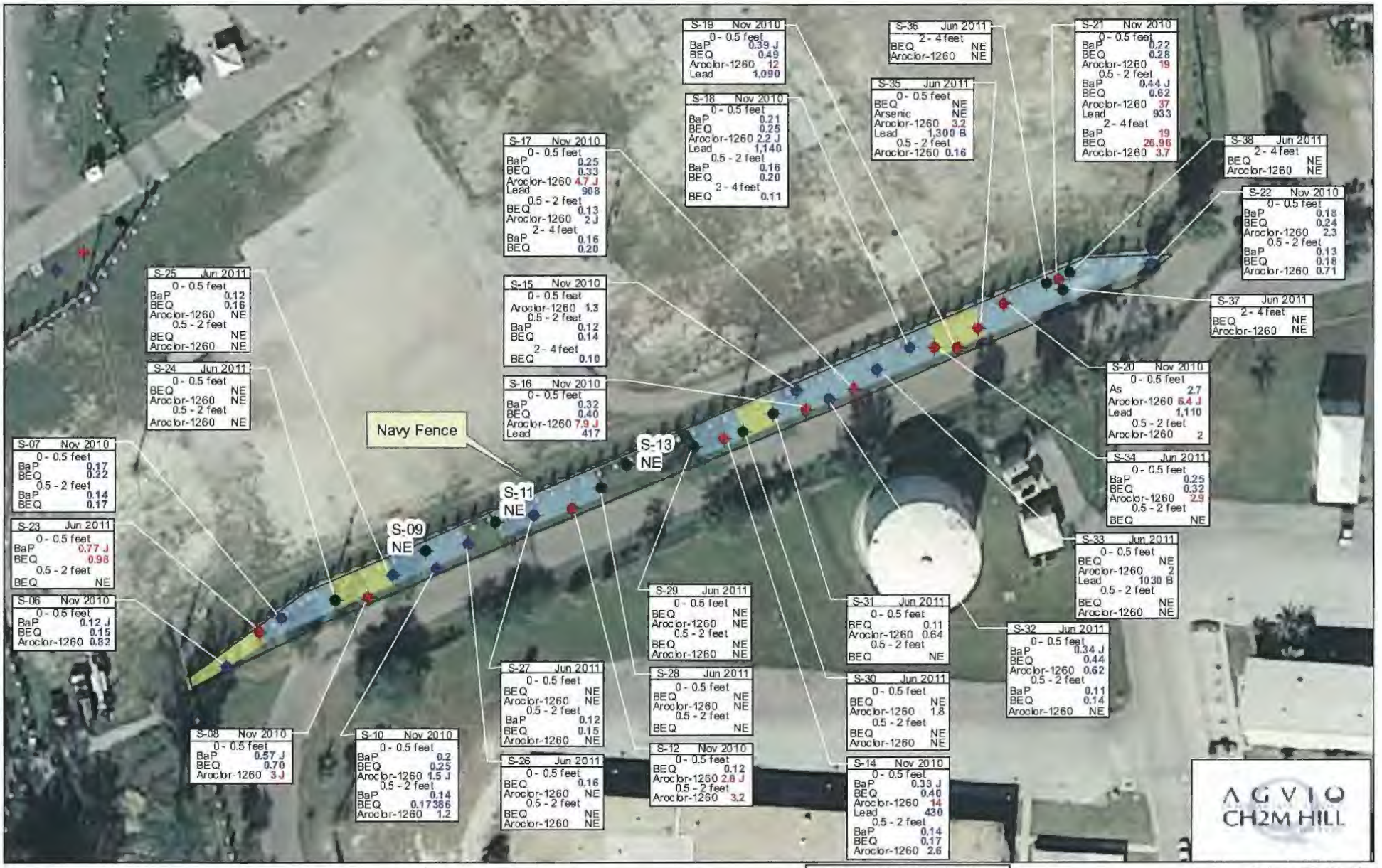
N

0 20 40
Feet

SCREENING STANDARDS		
Analyte	Residential SCTL	Industrial SCTL
As	2.1	12
BaP	0.1	0.7
BEQ	0.1	0.7
Aroclor-1260	0.5	2.6
Lead	400	1,400

All units in milligrams per kilogram

Figure 2-4
Excavation Based on
Residential Criteria in DRMO North Sliver
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida



Legend

- Soil Boring (Exceeds Residential Criteria)
- Soil Boring (Exceeds Residential & Industrial Criteria)
- Soil Boring (No Exceedance)
- 0.5 feet Deep Excavation (1,839 square feet)
- 2 feet Deep Excavation (6,616 square feet)

N

0 40 80

Feet

Notes:

1. Excavation limits based on exceedances of recreational criteria.
2. Borings were sampled from 0 to up to 4 feet.

As = Arsenic
BaP = Benzo(a)pyrene
BEQ = Benzo(a)pyrene Equivalent
J = Estimated
NE = No Exceedance

SCREENING STANDARDS		
Analyte	Residential SCTL	Industrial SCTL
As	2.1	12
BaP	0.1	0.7
BEQ	0.1	0.7
Aroclor-1260	0.5	2.6
Lead	400	1,400

All units in milligrams per kilogram

Figure 2-5
Excavation Based on Residential Criteria in DRMO South Sliver
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida

Legend

- Soil Boring (Exceeds Residential Criteria)
- Soil Boring (Exceeds Residential & Industrial Criteria)
- Soil Boring (No Exceedance)
- 2-4 fee Deep Excavation (122 square feet)

N

0 10 20

Feet

Notes:

1. Excavation limits based on exceedances of recreational criteria.
2. Borings were sampled from 0 to up to 4 feet.

As = Arsenic
BaP = Benzo(a)pyrene
BEQ = Benzo(a)pyrene Equivalent
J = Estimated
NE = No Exceedance

SCREENING STANDARDS

Analyte	Residential SCTL	Industrial SCTL
As	2.1	12
BaP	0.1	0.7
BEQ	0.1	0.7
Aroclor-1260	0.5	2.6
Lead	400	1,400

All units in milligrams per kilogram

Figure 2-6
Excavation of S-21 Based on Residential Criteria in DRMO South Sliver
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida

CH2MHILL

GNV \\CYPRE[illegible]OJ\ENVIRONMENTAL\DRAWINGS\NASKEYWEST\FIGURE2-8_DRMO_S-21_9-2011.MXD 9/14/2011

3 Identification of Removal Action Objectives

3.1 Removal Action Requirements

As previously noted, CERCLA requires that effectiveness, implementability, and cost be considered in evaluating removal action alternatives. Because the contemplated NTCRA is being funded by the Navy as lead agency, the $2 million and a 12-month statutory time limits specified in Section 104(c)(1) of CERCLA do not apply.

The scope of this removal action is to prevent exposures to soil identified in areas in the north and south DRMO slivers that have contaminants above cleanup target levels. In this EE/CA, removal action alternatives have been developed to meet the following removal action objective for the DRMO slivers: prevent exposure to soil above the acceptable risk to receptors for current and future land use. This language is all rehash of previous sections. Should spell out intended scope of action in broad terms but with some specifics.

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

3.2 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.

3.3 Applicable or Relevant and Appropriate Requirements

Under Section 121 of CERCLA and the NCP at 40 CFR Section 300.415(j), NTCRAs must comply, to the extent practicable, with all applicable or relevant and appropriate requirements (ARARs) promulgated under other federal environmental and state environmental or facility-siting laws. The two factors which the Navy as lead agency may consider in determining whether the attainment of an identified ARAR is practicable in a particular situation are: 1) the exigencies of the situation; 2) the scope of the removal action to be taken.

The definitions of both "applicable" and "relevant and appropriate" requirements are set forth in the NCP at 40 CFR Section 300.5, as follows:

Applicable requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

Relevant and appropriate requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

"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 ARARs. TBCs are evaluated along with ARARs and may be implemented when ARARs are not fully protective of human health and the environment.

Appendix A contains a listing of all those federal and state ARARs deemed to be either directly applicable or which are relevant and appropriate for application to this proposed NTCRA. As specified in EPA ARARs guidances, there are three distinct types of ARARs: chemical-specific, location-specific, and action-specific (EPA, 1988). Each is generally described below:

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 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.

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.

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances.

4 Identification and Analysis of Removal Action Alternatives

A removal action is planned for the DRMO slivers 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. As required, all 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 contemplates that the two land slivers will be left as they currently exist, leaving the impacted surface and subsurface soils in place. Under this alternative, no controls or soil removal, backfilling or soil capping efforts would be undertaken.

4.1.2 Alternative 2— Excavation, Offsite Disposal, and Backfill

Alternative 2 includes the excavation of impacted surface and subsurface soils to a maximum depth of 4 feet bls to meet FDEP direct exposure Residential SCTLs for arsenic, lead, PAHs, and PCBs; and backfill of the excavated area with clean backfill to original grade including six (6) inches of topsoil. Confirmation samples would be collected since the horizontal limits toward the existing roads have not been fully delineated. No excavations would be conducted beyond the roads.

Specific erosion control features would be developed in the Removal Action Work Plan. Erosion control features would include installing perimeter controls as necessary to prevent offsite migration of pollutants and establishing a cover material once the site is remediated.

Waste characterization samples would be collected for offsite disposal of material. Waste characterization analysis would consist of full toxicity characteristic leaching procedure (TCLP), PCBs, corrosivity, reactivity, and ignitability, along with any additional testing required by the disposal facility. Waste characterization samples would be collected at the rate required by the disposal facility. Once analytical results are received, the disposal options would be selected based on the results of the waste-characterization samples analyses; however, previous sampling at these areas indicates that the soil will be non-hazardous. The facility would be approved by the Navy prior to transport of any material. All excavated materials would be loaded into haul trucks and transported to the approved offsite facility for disposal.

Because there is no onsite borrow source, all fill material would be brought from offsite. Backfill material will consist of topsoil in the upper 6 inches. Topsoil would be a 50/50 mix of soil and sand that will support vegetation. From 6 inches to 2 feet or the bottom of the excavation areas, general backfill material will be used. Offsite backfill material would be certified clean through analytical testing of VOCs, SVOCs, pesticides, PCBs, and metals, and compared to FDEP Residential SCTLs. Backfill material would be compacted by a track-type tractor or equivalent traversing 100 percent of the backfilled area, and restored to match the original grade. Care would be taken during the compaction process to not disturb the underlying water main. The total volume of soil to be excavated is approximately 97 yd^3 from the north DRMO sliver and 533 yd^3 from the south DRMO sliver. Figures 2-4, 2-5 and 2-6 illustrate the limits of the excavation and restoration area for the north and south DRMO slivers.

4.1.3 Alternative 3—Engineering Controls and Institutional Controls

Alternative 3 contemplates the implementation of engineering (EC) and institutional (IC) controls at the site. The ECs would consist of constructing an asphalt cap on both DRMO sliver sites to prevent future exposures to the affected soils. Institutional controls would include applying a no-unauthorized-digging restriction on the two sliver properties to preclude unauthorized disturbance of the cap.

This alternative leaves contaminated soils in place, but the installed cap above the affected areas and the implemented institutional controls would preclude contaminant contact or migration caused by disturbance of the affected media. Figure 4-1 illustrates the approximate location of the proposed caps at the north and south DRMO slivers. Two areas in the north DRMO sliver will require capping; however, since 10 inches of surface soil will require removal prior to placing the lime rock base and asphalt, one of the impacted areas will be remediated in place via soil removal. Therefore, the cap at the north sliver will be constructed in one area and will be placed from the existing fence line, north to the asphalt road, as shown on Figure 4-1. The cap at the south sliver will be placed from the existing fence line, south to the asphalt road, as shown on Figure 4-1.

Because this alternative leaves contaminated media in place, annual inspections and 5-year reviews, as required by CERCLA, will be required. It is assumed that the current level of maintenance will be sustained.

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).

Legend
- Aesthetically Pleasing Fence
- DRMO Facility Boundary
- Proposed Cap
- DRMO Sliver

N

0 50 100
Feet

Figure 4-1
Proposed Cap North and South DRMO Slivers
Former DRMO Slivers, Truman Annex
NAS Key West
Key West, Florida

GNV \\CYPRESS\PROJ\ENVIRONMENTAL\DRAWINGS\NASKEYWEST\FIGURE2-6_EE-CA.MXD 12/20/18/2011

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 (Appendix B).

Annual O&M costs, which are costs required to ensure the continued effectiveness of the site control actions, are applicable to Alternative 3, and are incorporated into the cost estimate. These costs are not applicable to Alternative 2 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 2010), 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 are 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 Excavation, Offsite Disposal, and Backfill	Alternative 3 Engineering Controls and Institutional Controls
EFFECTIVENESS			
Overall Protection of Human Health and the Environment	This alternative is not protective of human health and the environment, as 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.	This alternative provides risk reduction through the application of engineering and institutional controls to affected soils. However, arsenic-, lead-, polycyclic aromatic hydrocarbon (PAH)-, and polychlorinated biphenyl (PCB)-impacted surface soil would remain in place.
Compliance with ARARs and Other Criteria	This alternative does not meet the removal action objectives or ARARs established for the site.	This alternative will comply with all identified ARARs. This alternative would also meet the removal action objective established for the site.	This alternative will comply with all identified ARARs.
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 removal of the affected surface and subsurface soil (<4 feet).	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 land use control (LUC) implementation.
Reduction of Toxicity, Mobility or Volume through Treatment	This alternative does not reduce toxicity, mobility, or volume of impacted soil.	This alternative reduces toxicity, mobility, and volume of impacted soil through removal and offsite disposal.	This alternative reduces the volume of impacted soil to some extent and reduces the mobility of impacted soil and direct exposure of contaminants to human and ecological receptors through engineering and institutional controls. However, this alternative does not reduce the toxicity of the contaminants.
Short-term Effectiveness	This alternative does not reduce the short-term risks associated with contaminant impacts.	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 personal protective equipment (PPE).	In the short-term, this alternative slightly reduces the risks to the community through engineering and institutional controls by limiting access to impacted soils.
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 will likely be acceptable to the State and community.	This alternative may not be acceptable to the State and community.
COST			
Capital Cost (Direct and Indirect)	$0	$295,164	$312,282
Total Operations and Maintenance (O&M) Cost	$0	$0	$1,850 per year for 30 years
Present Value	$0	$295,164	$357,300

5 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 DRMO slivers. The removal actions are summarized for comparison in Table 4-1.

5.1.1 Effectiveness

Alternative 1 would not be effectively protective of human health or the environment, would not achieve, to the extent practicable, compliance with all identified ARARs. Nor would it achieve the removal action objective of this EE/CA. It has been determined that an action must be taken at the DRMO sliver sites to meet those requirements.

Although the excavation portion of Alternative 2 would create low potential risks to surrounding communities during the transport of the impacted soil offsite, it would be highly effective in eliminating for the long term those risks currently posed to human health and the environment from future exposure to contaminated surface and subsurface soils. Alternative 2 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. By effectively precluding direct human exposures to both contaminated surface and subsurface soils onsite, Alternative 2 would comply with all identified ARARs.

Upon implementation, the EC (asphalt cap) and IC contemplated under Alternative 3 would serve to effectively preclude future direct exposure to impacted surface and subsurface soils posing unacceptable human health risk. However, since impacted surface soils would be left on-site if the cap is not properly maintained, there would be greater risk that both contaminate migration and/or site user exposure to that affected media could occur. As contemplated, Alternative 3 would comply with all identified ARARs since future direct exposure to impacted soils would be precluded.

5.1.2 Implementability

5.1.2.1 Alternative 1

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.

5.1.2.2 Alternative 2

Alternative 2 can be accomplished utilizing conventional construction methods and available resources. Generally, this alternative is easily implementable because dig and haul activities are routine construction activities. It requires excavation of impacted soil, offsite disposal, and backfilling and compaction of excavated areas to grade. An existing 8-inch water main runs parallel through the south DRMO sliver and a water main valve vault is located at the eastern corner. The depth to the water main is reportedly 4 feet below grade; therefore, the excavation and backfill should be routine. However, if the top of water main is within 2 feet of land surface, excavation may need to be staged such than sections no longer than 100 feet are exposed at any time. This will keep sufficient weight over the top of pipe to prevent thrust and potential movement of the pipe. As an alternative, the water main could be isolated by shutting the valve at the nearby valve box, which will reduce the thrust forces. Depending on the depth of the water main, compaction above the piping may require hand-tapping. Coordination with the utility is recommended.

Stormwater treatment or conveyance is not required for this area, since no new impervious area will be introduced and the proposed improvement will not impact existing drainage patterns. The backfill grade of the new soil will match the existing grade. A topographic survey for stormwater purposes is not required.

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. No O&M monitoring costs are associated with this alternative. Alternative 2 is expected to be acceptable to the State and community because it removes impacted soils and restores the sites.

5.1.2.3 Alternative 3

The overall implementation of Alternative 3 is straightforward and can be accomplished in a relatively short time frame utilizing conventional construction methods and available resources. However, the issue of stormwater conveyance and treatment may add to the costs and long-term maintenance of the capped areas. The location of the asphalt caps at both land sliver sites will be based on sample locations to encompass all COC exceedances. For the initial design at the north DRMO sliver, the asphalt cap would cover two separate areas. For the south DRMO sliver, the asphalt cap would cover the entire length of the area for consistency. The asphalt cap would be composed of 1.25 inches of asphalt and 8 inches of limerock base material. Therefore, the total thickness of the asphalt cap is 9.25 inches. In order to install the asphalt and base and maintain existing elevation, approximately 10 inches of soil within these segments would be removed during the clearing and grubbing phase. Once this is completed, the associated contamination would be completely removed in the segments where contamination exists only in the upper 6 inches, making the asphalt cap unnecessary in these areas. This would eliminate nearly half of the north DRMO sliver cap.

For the south DRMO sliver, trees may need to be removed and asphalt would need to be placed over a water main and around a water main vault. Signs warning of buried soil contamination would be required along both sliver areas.

A topographic survey would be required to determine the grading of the asphalt cap. Grade would be established such that surface runoff does not flow offsite and does not create ponding. Additionally, depending on the nature of the existing grade, curbing, stormwater swales, piping, and inlets may be required to capture and redirect runoff from flowing offsite, to prevent ponding, or to convey it to a stormwater treatment system. Currently, no stormwater treatment system exists in the vicinity of the site; therefore, stormwater treatment would have to be designed and implemented.

Because impacted soil remains in place, maintenance, monitoring, inspections, deed restrictions, LUCs, and 5-year reviews are required. Alternative 3 may not be acceptable to the State and community because impacted soil will remain in place.

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, making it the least expensive alternative. Alternative 2 is estimated at a present value of $295,164 Alternative 3 is estimated at a present value of $357,300 and includes costs for stormwater conveyance. Alternate 3 involves many unknowns regarding the stormwater treatment and conveyance, and these costs may increase or decrease significantly depending on topography and stormwater regulations. Alternative 3 is the most costly alternative and will have annual O&M costs following the initial capital expense.

6 Recommended Removal Action Alternative

Based on the comparative analysis of the removal alternatives provided in this EE/CA, the recommended removal action is Alternative 2 – Excavation, Offsite Disposal, and Backfill. Alternative 2 consists of excavation of the contaminated surface and subsurface soil to a maximum depth of 4 feet. The excavation will be backfilled and the site restored to its original grade.

Alternative 2 achieves the removal action objective, 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. Both EPA and FDEP will be afforded the opportunity to review and concur with this NTCRA. If public comments are received when this NTCRA is made available for public comment, a Responsive Summary addressing any significant comments will be prepared as part of the Action Memorandum and included in the Administrative Record, along with the Final EE/CA.

7 References

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Appendix A
ARARs Tables

TABLE A-1

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

EE/CA,DRMO Slivers,NAS Key West, Florida

Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Florida Contaminant Cleanup target Levels (CTLs) Rule Chapter 62-777.170(2)(a) FAC	Applicable	This rule provides default cleanup criteria for soils and process for deriving site-specific CTLs for soils.	Florida's cleanup level for lead in soil is 400 mg/kg and based on a residential direct exposure scenario. The site-wide average concentration should be below the SCTL identified. Cleanup level for arsenic in soil is 2.1 mg/kg and based on a residential direct exposure scenario. Cleanup level for PAHs in surface soil are based on the benzo(a)pyrene equivalent (BEQ) value of individual PAHs. The BEQ cleanup level is 0.1 mg/kg and based on a residential direct exposure scenario. Cleanup level for PCBs in soil is 0.5 mg/kg and based on a residential direct exposure scenario.

Notes:

ARAR	Applicable or Relevant and Appropriate Requirement
BEQ	benzo(a)pyrene equivalent
CTL	Cleanup Target Level (FDEP)
DRMO	Defense Reutilization and Marketing Office
FAC	Florida Administrative Code
mg/kg	milligrams per kilogram
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl

TABLE A-2

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

EE/CA, DRMO Slivers,NAS Key West, Florida

Location	Regulatory Citation	ARAR Status	Description	Comments
Cultural Resources				
Presence of Archaeological Resources	Protection of Archaeological Resources, 43 CFR 7.4(a) and 43 CFR 7.5(b)(1)	Potentially applicable 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.
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.

Notes:

ARAR Applicable or Relevant and Appropriate Requirement
CFR Code of Federal Regulations

TABLE A-3

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

EE/CA, DRMO Slivers, NAS Key West, Florida

Action	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Site Preparation, Construction, Remediation and Excavation Activities				
Activities Causing Air 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.
South Florida Water Management District Rules for Incidental [Construction] Site Activities	Rule 40E-40.302, FAC.	Relevant and Appropriate	Relevant and appropriate to any land clearing, excavation, or similar construction activity in the South Florida Water Management District where landclearing activities are not within 50 feet of, and excavation activities are not within 200 feet of wetlands or other waters of the state. Requires that reasonable assurances that the conditions specified in Rule 40E-40.302, FAC, have been met.	The landclearing activities are not within 50 feet, and excavation activities are not 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 and assure compliance with the conditions specified in Rule 40E-40.302, FAC.
Activities Causing Stormwater Runoff	Florida Regulations for Stormwater Discharges 62-25.025(7) FAC	Relevant and Appropriate	Activities that will disturb more than one acre. Requires preventing the discharge of pollutants in stormwater from these activities to waters of the state through the use of best management practices. The NPDES general permit also covers water discharged due to dewatering activities.	The proposed work will disturb less than one acre of land. However, appropriate best management practices for erosion and sediment control will be implemented to prevent the discharge of soil/sediment to waters of the state.

TABLE A-3
Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs)
EE/CA, DRMO Slivers, NAS Key West, Florida

Action	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
Waste Management				
Hazardous Waste Determination	40 CFR 262.11 adopted by reference in 62-730.160	Applicable	Require anyone who generates a solid waste (including environmental media that may contain a solid waste) to determine if that waste is a hazardous waste, in accordance with 40 CFR 261.	
PCB Remediation Waste	40 CFR 761.3	Potentially Applicable	Soils that contain ≥50 ppm PCBs, at as-found concentrations must be managed as PCB remediation waste.	Note: to date only soils less than 50 ppm PCBs has been detected
Container Handling Prior to Transport	Standards Applicable to Generators of Hazardous Waste 40 CFR 262.30 through .33, as referenced in 62-730 FAC	Potentially Applicable	Prior to transportation, containers would be packaged, labeled, marked, and placarded in accordance with RCRA and Department of Transportation requirements if testing determined remediation soils were hazardous.	Note: Soil samples tested in previous investigations did not exhibit a hazardous waste characteristic, as determined using TCLP.

Notes:
ARAR status depends on the specific remedial alternatives evaluated.
ARAR applicable or relevant and appropriate requirement
CFR Code of Federal Regulations
FAC Florida Administrative Code
PCB polychlorinated biphenyl
RCRA Resource Conservation and Recovery Act
TCLP toxicity characteristic leaching procedure

Appendix B
Cost Estimates

Alternative 2: Excavation, Offsite Disposal and Backfill

Site: DRMO Slivers
Location: NAS Key West, Key West, FL
Phase: EE/CA
Date: February 2012

Description: Alternative 2 includes the excavation of impacted surface soil to 4 feet bls to meet FDEP SCTLs for arsenic, lead, PAHs, and PCBs; backfill of the excavations to original grade with imported clean topsoil and restoration to the original condition. Confirmation samples will be collected along the road at both DRMO Slivers. 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 97 CY from the North DRMO Sliver and 533 CY from the South DRMO Sliver

CALCULATIONS

Impacted Area (0.5 ft excavation)	
North Sliver (CY)	97
South Sliver (CY)	533
Assumed soil weight (tons/CY)	1.35
In-Place Volume of soil to be excavated (CY)	630
Volume of soil to be excavated (tons)	851
Total for disposal (tons)	**851**

ASSUMPTIONS

1) Excavation
- * Soil to be excavated = 97 CY from the North DRMO Sliver and 533 CY from the South DRMO Sliver
- * Maximum depth of impacted soil areas is 4 ft
- * Excavated materials disposed at offsite landfill as non-hazardous waste
- * Soil weight assumed as 1.35 tons/CY (engineer's estimate)

2) Erosion and Sediment Controls
- * Perimeter controls around the perimeter are assumed

3) Removal of Excavated Soil

4) Confirmation Sampling
- * Samples will be collected along the road at both slivers for horizontal delineation

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

CAPITAL COSTS

Project Total Costs taken from Cost Estimate, AGVIQ-CH2M HILL JV - Contract No. N62470-08-D-1006: Option Year 3: 07MAR2011- 06MAR2012
Key West Slivers JM31 Soil Removal to Residential Criteria for Unrestricted Use

Description	Qty	Unit	Unit Cost	Total Cost	Notes
Total Labor Costs					
Project Total Cost	1	LUMP	$66,496.34	$66,496	Engineer's Estimate
SUBTOTAL				$66,496	
Support Subcontractors Costs					
Project Total Cost	1	LUMP	$102,436.44	$102,436	Engineer's Estimate
SUBTOTAL				$102,436	
Other Direct Costs					
Project Total Cost	1	LUMP	$28,512.40	$28,512	Engineer's Estimate
SUBTOTAL				$28,512	
Travel Costs					
Project Total Cost	1	LUMP	$27,633.91	$27,634	Engineer's Estimate
SUBTOTAL				$27,634	
Total Fees					
Project Total Cost	1	LUMP	$31,584.89	$31,585	Engineer's Estimate
SUBTOTAL				$31,585	
SUBTOTAL				$256,664	
Contingency	15%			$38,500	Engineer's Estimate
SUBTOTAL				$295,164	
TOTAL CAPITAL COST				$295,164	

OPERATION AND MAINTENANCE COSTS

SUBTOTAL				$0	
Contingency	15%			$0	
SUBTOTAL				$0	

PRESENT VALUE ANALYSIS

i = 0.014
t = 2

2011 Discount Rates for OMB Circular No. A-94, Published February 3, 2011.

Cost Type	Year	Total Cost	Total Cost Per Year	Discount Factor (1.4%)	Present Value
Capital	0	$295,164	$295,164	1.000	$295,164
O&M	N/A	$0	$0	1.96	$0
					$295,164
TOTAL PRESENT VALUE OF ALTERNATIVE					$295,200

*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.

CY = cubic yard
CF = cubic feet
ft = foot, feet
LF = linear foot
mobe/demobe = mobilization/demobilization
sq ft = square feet

Alternative 3: Engineering Controls and Institutional Controls (Cap)

Site: DRMO Slivers
Location: NAS Key West, Key West, FL
Phase: EE/CA

Date: November 2011

Description: Alternative 3 provides for engineering controls and institutional controls at the DRMO Sliver sites. Engineering controls would consist of a 2-inch asphalt cap over contaminated areas at both DRMO Slivers to limit access to affected media. Institutional controls would include land use control (LUC) measures within all capped areas to prevent disturbance of contaminated media.

CALCULATIONS

Pricing Quote from Affordable Asphalt, Islamorada, FL - October 2011

Project Total $35,100.00

Paving Thickness 2 in
* Make all necessary key cuts for smooth transitions and tie-ins into existing asphalt surfaces
* Remove debris from site
* Apply emulsified asphalt tack solution to all surfaces to be paved
* Pave prepared surfaces totaling 15,000 square feet with hot type S-3 asphalt at two inches in thickness
* Price includes mobe/demobe to Key West
* Permitting completed by others
* Sub-base grade and compaction completed by others

ASSUMPTIONS

1) Soil Excavation, Transportation, and Disposal
* Up to 10 inches of surface soil must be removed to make room for the cap
* A total of 324 CY (438 tons) of soil will be excavated, transported off site and disposed
* Soil weight assumed as 1.35 tons/CY (Engineer's Estimate)

2) Capping
* ~9,756 SF of 2-inch thick asphalt and ~8 inches of base materials
* Only one area at the North DRMO Sliver will be capped (1301 SF).
* The entire South DRMO Sliver will be capped (8455 SF).

3) Stormwater Controls
* Stormwater collected and/or treatment may be required at the South DRMO Sliver
* $27,500 in stormwater treatment is assumed for this project

4) Labor & Equipment
* Labor will be not local (per diem included)

CAPITAL COSTS

Project Total Costs taken from Cost Estimate, AGVIQ-CH2M HILL JV - Contract No. N62470-08-D-1006:
Option Year 3: 07MAR2011- 06MAR2012
Key West Slivers JM31 Place a Cap over the North and South DRMO Slivers with LUCs

Description	Qty	Unit	Unit Cost	Total Cost	Notes
Total Labor Costs					
Project Total Cost	1	LUMP	$58,168.83	$58,169	Engineer's Estimate
SUBTOTAL				$58,169	
Support Subcontractors Costs					
Project Total Cost	1	LUMP	$143,116.62	$143,117	Engineer's Estimate
SUBTOTAL				$143,117	
Other Direct Costs					
Project Total Cost	1	LUMP	$21,377.60	$21,378	Engineer's Estimate
SUBTOTAL				$21,378	
Travel Costs					
Project Total Cost	1	LUMP	$14,743.74	$14,744	Engineer's Estimate
SUBTOTAL				$14,744	
Total Fees					
Project Total Cost	1	LUMP	$34,143.03	$34,143	Engineer's Estimate
SUBTOTAL				$34,143	
SUBTOTAL				$271,550	
Contingency	15%			$40,732	Engineer's Estimate
SUBTOTAL				$312,282	
TOTAL CAPITAL COST				**$312,282**	

OPERATION AND MAINTENANCE COSTS (1 to 30 years)

5-year Reviews					
5-year Review and Report (per year)	0.2	EVENT	$7,700.00	$1,540	Engineer's Estimate
SUBTOTAL				$1,540	
SUBTOTAL				$1,540	
Contingency	15%			$308	Engineer's Estimate
SUBTOTAL				$1,848	
				$1,850	Rounded

PRESENT VALUE ANALYSIS

i = 0.014
t = 30

2011 Discount Rates for OMB Circular No. A-94, Published February 3, 2011.

Cost Type	Year	Total Cost	Total Cost Per Year	Discount Factor (2.7%)	Present Value
Capital	0	$312,282	$312,282	1.000	$312,282
O&M	1-30	$55,440	$1,848	24.36	$45,017
					$357,299
TOTAL PRESENT VALUE OF ALTERNATIVE					**$357,300**

*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.

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