FINAL

Decision Document for No Further Action
Solid Waste Management Unit B21
101-41/44 Catchment Pit

January 2012
Version 01

Hawthorne Army Depot

Hawthorne, Nevada

U.S. Army Corps of Engineers - Sacramento District

Contract W91238-06-D-0019
Task Order 0004

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Contract No. W91238-06-D-0019

January 2012

Prepared for:

US Army Environmental Command

Hawthorne Army Depot
Hawthorne, Nevada

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SIGNATURE SHEET SWMU B21

January 2012

The selected remedy is protective of human health and the environment. It has been shown that a complete pathway to human health and the environment does not exist, and there is no potential for an exposure pathway to be completed in the future.

U.S. Army

20120125
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Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
Bay West	Bay West, Inc.
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COPC	Contaminant of potential concern
CPT	Cone Penetration Test
DZB	Day and Zimmermann/Basil Corporation
DZHC	Day and Zimmerman Hawthorne Corporation
E&E	Ecology and Environment
GO/CO	Government owned/contractor operated
HWAAP	Hawthorne Army Ammunition Plant
HWAD	Hawthorne Army Depot
IAP	Installation Action Plan
IRP	Installation Restoration Program
Kg	Kilogram
L	Liter
mg	Milligrams
mg/Kg	Milligrams per kilogram
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
Plexus	Plexus Scientific Corporation
RA	Remedial Action
RAB	Restoration Advisory Board
RBCA	Risk-based corrective action
RBSL	Risk-based screening level
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RSL	Regional screening level
SSTL	Site-specific target level
SWMU	Solid waste management unit
TNT	2,4,6- trinitrotoluene
USAEHA	U.S. Army Environmental Hygiene Agency
USEPA	U.S. Environmental Protection Agency

EXECUTIVE SUMMARY

Introduction

This decision document describes the rationale for the closure of solid waste management unit (SWMU) B21, 101-41/44 Catchment Pit, at the Hawthorne Army Depot (HWAD) located in Hawthorne, Nevada. A site evaluation was performed at SWMU B21 in accordance with Nevada Administrative Code (NAC) 445A.22705: *Contamination of soil: Evaluation of Site by Owner or Operator; Review of Evaluation by Division,* and as described in American Society for Testing and Materials (ASTM) Standard E1739-95, *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM 2002).

Following ASTM E1739-95 guidance, the Nevada Division of Environmental Protection (NDEP) agreed to use the U.S. Environmental Protection Agency (USEPA) Region IX Regional Screening Levels (RSLs) for Residential soil as Tier 1 risk-based screening levels (RBSLs).

Site History

SWMU B21 is located in HWAD's central magazine area, southeast of the main 101 Production Area, and lies south of 3rd Avenue North, as shown on **Figure 1**. SWMU B21 is an inactive unlined surface impoundment pit located between Buildings 101-41 and 101-44 and east of Building 101-41. It measured 150 by 140 by 8 feet. The impoundment was partially eroded and partially filled with windblown sand. Piles of dredged soils were located on the sides of the impoundment. This impoundment operated from 1940 to the early 1970s and was reported to have received large amounts of wastewater containing 2,4,6-trinitrotoluene (TNT) and 1,3,5-Trinitroperhydro-1,3,5-triazine (RDX), also known as Royal Demolition Explosive (US Army 2001).

No visible evidence of TNT or Yellow D (ammonium picrate) stained soils were noted by the U.S. Army Environmental Hygiene Agency (USAEHA) survey team (USAEHA 1988) or during the 1992 site visit and 1994 Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) (Ecology and Environment [E & E] 1995). Because the impoundment was located adjacent to a main steam line and not in proximity to any production building, it is likely that the impoundment may have been used to collect steam condensate. SWMU B21 has never been permitted and has not gone through a formal RCRA closure (E & E 1997).

Site Conditions

No documentary evidence of the disposal contents, duration of use, or construction of the pit at SWMU B21 has been identified; however, it appears that the pit may have been used to collect steam condensate. It had been thought that wastewater containing TNT and RDX was disposed of in the pit, but no significant explosives contamination was found in the soil.

One nearby monitoring well (IRPMW74), was gauged this year in accordance with the Basewide Groundwater Monitoring Program. The depth to groundwater in the vicinity of SWMU B21 was last measured at approximately 138.5 feet below ground surface.

Investigations

Environmental investigations at SWMU B21 began in 1988. The following is a synopsis of the significant dates and events associated with previous investigations at SWMU B21.

- In 1988, USAEHA conducted a visual site inspection at SWMU B21 (USAEHA 1988).

- In 1994, a RFA was conducted at SWMU B21. Surface soil and subsurface soil samples were collected as part of this RFA (E &E 1995).
- In 1997, E & E conducted a RCRA Facility Investigation (RFI). Surface, near-surface, and subsurface soils were collected during this investigation (E&E 1997).

Investigation Results

Following the procedures in ASTM E1739-95, previous investigation results were compared to the U.S. EPA Region IX RSLs for residential soil, which were used as the Tier 1 RBSLs. The investigation results were compared to the lowest EPA Region IX RSL for each analyte. For arsenic and TNT, that is the carcinogenic SL, for beryllium, the non-cancer ingestion SL. The maximum concentration of arsenic was 11 mg/Kg, which exceeded its Tier I RBSL of 0.39 mg/Kg. The concentration of arsenic at SWMU B21 falls within the range of data collected to establish a basewide background level and has been considered background.

For beryllium, the RBSL is 160 mg/Kg. The maximum detection of beryllium was 1.4 mg/Kg so the RBSL was not exceeded.

TNT was detected in two subsurface berm samples at the SWMU at concentrations of 0.43 and 2.1 mg/Kg. The Tier 1 RBSL of 19 mg/Kg was not exceeded.

Excerpts of the investigation results are presented in **Appendix A**.

Remediation

No remediation is known to have been performed at this site. The pit was backfilled as shown in Photos 1 and 2 in Appendix B. It is assumed that the steam pipes were removed as well. It is unclear the exact date when the pit was backfilled. From the 2007 HWAP Installation Action Plan (IAP), the Army indicates that a fiscal year 2000 milestone of Remedial Action Construction RA(C) occurred at SWMU B21. The IAP also states the following: "Documentation Title: Five Year Review determined that RA [Remedial Action] effectively remediated contamination below action levels. Awaiting state closure letter." This indicates that the site closure actions were likely completed before the end of fiscal year 2000.

Remediation Results

This is not applicable to this document.

Public Involvement

It is the policy of both the U.S. Department of Defense and the U.S. Army to involve the local community throughout the investigation process at an installation. To initiate this involvement, HWAD has established and maintains a repository library that contains final copies of all past studies and other documents regarding environmental issues at HWAD.

HWAD has solicited community participation in establishment of a restoration advisory board (RAB). To date, there has been insufficient response and HWAD has not formed a RAB. HWAD has held open houses to inform the public of ongoing environmental issues. HWAD will continue to solicit community involvement and will establish a RAB should sufficient community interest be obtained.

Conclusions

Based on the available information and an evaluation of the site, the following conclusions are drawn regarding SWMU B21:

- The primary pathway of exposure at the site is through ingestion, inhalation and dermal contact with site soils.
- The 1994 RFA and 1997 RFI found no levels of contaminants that are both above RBSLs and background levels.
- The maximum detection of arsenic (11 mg/Kg) exceeds the Tier 1 RBSL of 0.39 mg/Kg. However, in the basewide background sampling, two standard deviations of the mean of the arsenic sample set is 18.1 mg/Kg, which is above the maximum detected concentration of arsenic at SWMU B21. This indicates that the arsenic detected at SWMU B21 is within the range of background concentrations.
- The maximum detection of beryllium (1.4 mg/Kg) is less than the RBSL of 160 mg/Kg.
- The maximum detection of TNT (2.1 mg/Kg) is less than the RBSL of 19 mg/Kg.

SWMU B21 is recommended for closure to residential use standards based on the conclusions presented above.

1.0 INTRODUCTION

1.1 Background

Plexus Scientific Corporation (Plexus) has been contracted by Bay West, Inc. (Bay West), to implement environmental remediation services at Solid Waste Management Unit (SWMU) B21—101-41/44 Catchment Pit at the Hawthorne Army Depot (HWAD) in Hawthorne, Nevada, in support of Bay West's prime contract W91238-06-D-0019.

This document provides an assessment of site conditions that was used to provide a recommendation for closure for SWMU B21, also known as the 101-41/44 Catchment Pit. It also provides a review of existing data for the site and an evaluation of that data in support of the recommendation for closure.

1.2 Overview

Section 1.0 of this document introduces the purpose of the document, provides the regulatory setting requiring the corrective action, and details the site evaluation process. Section 2.0 describes the physical setting of the facility as a whole and the specific SWMU. Section 3.0 provides a summary of previous investigations and summarizes the nature and extent of the contamination. Section 4.0 evaluates the existing data in support of closure recommendations. Section 5.0 discusses current site conditions and provides the information required by Nevada Administrative Code (NAC) 445A, *Contamination of soil: Evaluation of Site by Owner or Operator; Review of Evaluation by Division*. Section 6.0 presents a list of the references used in preparing the document.

1.3 Regulatory Setting

The U.S. Environmental Protection Agency (USEPA) provides regulatory oversight of contamination assessment and corrective measures at Resource Conservation and Recovery Act (RCRA) SWMUs under Section 3004 (u) of the 1984 Hazardous and Solid Waste Amendments to RCRA. Corrective action for releases of hazardous wastes or constituents is required under 40 CFR Part 264.101 (a), (b), and (c).

The HWAD also maintains RCRA Permit No. NEV HW0017 (renewed in August 2005), which requires corrective actions for any hazardous waste or hazardous constituents released from any SWMUs at the facility. Authority and responsibility for the implementation of RCRA has been delegated by USEPA to the State of Nevada, making the Nevada Division of Environmental Protection (NDEP) the lead regulatory agency for all RCRA correction actions at HWAD. NAC 445A.226 through 445A.22755 (inclusive) are applicable to SWMU B21.

1.4 Site Evaluation Process

A site evaluation, in accordance with NAC 445A.22705, *Contamination of soil: Evaluation of Site by Owner or Operator; Review of Evaluation by Division,* was performed at SWMU B21. NAC 445A.22705 requires that site evaluations be performed as described in ASTM Standard E1739-95, *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM 2002). Although ASTM E1739-95 was developed for petroleum sites, the principles and process are applicable to sites and chemicals that are not petroleum-based.

ASTM E1739-95 provides a phased approach to evaluating the risk at a site and in determining the need for a corrective action. Part of the ASTM process involves reviewing existing investigation documents and determining whether the site has been adequately characterized. If additional investigation is deemed necessary, the additional investigation must be performed

prior to recommending a final remedy for the site. However, if adequate data are available, a Tier 1, Tier 2, and Tier 3 evaluation may be performed.

1.4.1 Site Characterization

In determining whether the site has been adequately characterized, the following general questions were posed:

- Were the recommended actions provided in previous investigations completed?
- Are there an adequate number of samples available to reflect the distribution of contaminants across the site?
- Has the horizontal limit of any impacted soils been delineated?
- Has the vertical limit of impacted soils been delineated?
- Has groundwater been impacted?
- Have the boundaries of the impacted groundwater been delineated?

Existing investigation reports were considered acceptable if issued as final documents.

1.4.2 Tier 1 Evaluation

This evaluation consists of comparing existing site analytical data to risk-based screening levels (RBSLs). The RBSLs are derived from non-site-specific assumptions for direct and indirect exposure pathways, and use conservative exposure factors and conservative fate and transport assumptions for potential pathways and property uses (residential, industrial, etc.). The RBSLs do not represent site-specific conditions.

The RBSLs used in the Tier 1 Evaluation for SWMU B21 consist of the USEPA Region IX Regional Screening Levels (RSLs) (USEPA 2010). The investigation results were compared to the lowest EPA Region IX RSL among all the values for carcinogenic and non-carcinogenic pathways for each analyte. Site constituents that exceed the RBSL in the Tier 1 Evaluation were considered contaminants of potential concern (COPC) and, if performed, these COPCs would be included in a Tier 2 Evaluation.

2.0 FACILITY AND SITE DESCRIPTION

2.1 General Facility Location

HWAD is located in Mineral County, Nevada, approximately 140 miles southeast of Reno, Nevada. The depot covers an area of approximately 150,000 acres and encloses three sides of the town of Hawthorne.

2.2 General Facility Description

HWAD's current mission is to receive issue, store, renovate, inspect, demilitarize, and dispose of conventional ammunition. HWAD is a government-owned/contractor-operated (GO/CO) facility that is currently operated by Day & Zimmermann Hawthorne Corporation (DZHC) (U.S. Army 2001). The installation was constructed originally in 1928 as a U.S. Naval Ammunition Depot. The early mission of the depot was to store, service, and issue ammunition to the Pacific area. Following World War II, the depot was actively involved in the demolition of various types of allied and enemy ammunition. Its role was expanded to include receiving, renovating, loading, maintaining, storing, and issuing ammunition, explosives, expendable ordnance items, and/or weapons and technical ordnance materials. The depot was used also to test weapons and dispose of unserviceable and/or dangerous ammunition and explosives. In 1977, the depot was transferred to the U.S. Army and renamed Hawthorne Army Ammunition Plant (HWAAP).

After the transfer, HWAAP was redesignated as a GO/CO plant in 1980 and operated under the direction of the former Day and Zimmermann/Basil Corporation (DZB). Its mission from 1980-1994 was to:

- Receive, produce, assemble, load, issue, store, renovate, inspect, test, demilitarize, and dispose of conventional ammunition
- Operate and/or maintain in-operational readiness cast and fuel-air explosive loading plants, rocket assembly plants, and medium/major caliber assembly lines
- Provide special/experimental high explosive casting, extruding, and pressing
- Fuel air-explosive loading and support services to designated research and development activities
- Provide storage facilities for war reserve ammunition and maintain designated ammunition in a state of readiness for mobilization, including assembling or otherwise providing base unit materials
- Test solid propelled munitions, high explosive warheads, mechanical and electronic fuses, cartridge cases, primers, rocket motors, and other ballistic devices (U.S. Army 2001)

In 1994, HWAAP was renamed the Hawthorne Army Depot (HWAD) and designated as a Tier II (caretaker) ammunition facility that was used to store war reserve ammunition for use after the first 30 days of a conflict (NDEP 2011, U.S. Army 2001). HWAD has continued to fulfill its revised mission (shipping, storage and recycling of munitions) and operates under the direction of DZHC.

HWAD is not on the National Priority List. Studies and investigations have been conducted in coordination with the NDEP. Releases of various hazardous constituents have been located and classified as cleanup sites to be addressed pursuant to applicable cleanup authorities. Remediation efforts have been ongoing with the Army Installation Restoration Program (IRP)

since 1974, initially pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Following issuance of the RCRA Hazardous Waste Storage and Treatment Permit (Permit Number NEV HW0017, Revision 1, August 2005) for HWAD, remediation of all task order sites is being conducted pursuant to Part VI of the permit, Corrective Division of Environmental Action, with regulatory coordination, as appropriate, from the NDEP. Groundwater monitoring is required as a part of corrective action activities at the facility.

2.3 Geology and Hydrology

HWAD is located in west-central Nevada within the Whiskey Flat-Hawthorne subarea of Walker Lake Valley in the Great Basin section of the Basin and Range physiographic province. Geographically, the depot is bounded on three sides by mountains—the Wassuk Mountain Range on the west, the Gillis Range on the east, and the Excelsior Mountains on the south. Walker Lake bounds the depot on the north (Ecology and Environment [E & E] 1997).

2.3.1 Soils and Geology

The valley floor, alluvial fans and aprons, and the weathered parent material in the higher elevations are composed of Quaternary and Tertiary unconsolidated sedimentary deposits. The surficial deposits on the installation can be divided into three broad depositional and soil types, based on topographic position. The first soil type occupies the mountains/hills, canyons, mountain slopes, and foothills. These deposits are characterized by silty sand, gravel, sand-silt mixtures, silt, and sand and gravel in a clay matrix. Cobbles and boulders are not uncommon. Depth of the overburden is very shallow and interrupted by rock outcrops. The second type consists of deposits forming the alluvial fans and aprons. These are silty sands and gravelly silt-sand mixtures. Fluvial processes have also transported detritus (the third soil type) to the lower elevations. The thicknesses of these units are reported to be at least 850 feet in the installation area. Lacustrine deposits, which are predominantly clays deposited from the Pleistocene-Age Lake Lahontan, comprise the final deposit (E & E 1997).

2.3.2 Surface Waters

The installation occupies the Walker Lake drainage basin. The Wassuk Mountains on the western boundary of the installation are the primary watershed for the installation, with the majority of surface drainage originating there. The installation captures surface water in a series of basins located on major creeks above HWAD for use as drinking water. With the exception of the Walker River, which enters Walker Lake from the north, there are no perennial surface streams on the valley floor. Surface overflow occurs only after a major rainfall or snowmelt. After the drainage paths reach the valley floor, the gradient decreases abruptly and the stream becomes influent. Therefore, surface flow rarely reaches Walker Lake, the only lake within the installation (E & E 1997).

2.3.3 Groundwater

Depths to the water table increase with distance from Walker Lake and toward the apexes of the alluvial fans. Shallow groundwater flows northwest toward Walker Lake at an approximate transport rate of one foot per year (U.S. Army Environmental Hygiene Agency [USAEHA] 1988). Recharge occurs along the mountain front near the apexes of the alluvial fans.

Groundwater is present in several productive zones located at various depths at HWAD. The plant's drinking water is currently obtained from surface catch basins and reservoirs in the Wassuk Mountains, and from several groundwater wells upgradient and cross-gradient from the Whiskey Flats area 12 miles south of town. However, the town formerly used municipal wells

located in town that have not been abandoned. On-site production wells are maintained in a state of readiness to provide water to the firefighting system or to produce water for non-potable use at the plant (USAEHA 1988). During periods of high water demand, HWAD production well #1 is used to provide water to blend with water from reservoirs for use as potable water. HWAD production well #3 is non-operational but can be used to produce water for potable uses.

One nearby monitoring well (IRPMW74), was gauged this year in accordance with the Basewide Groundwater Monitoring Program. The depth to groundwater in the vicinity of SWMU B21 was last measured at approximately 138.5 feet below ground surface (bgs).

2.4 General SWMU Description

SWMU B21 is located in HWAD's central magazine area, southeast of the main 101 Production Area, and lies south of 3rd Avenue North, as shown on **Figure 1**. SWMU B21 was an inactive unlined surface impoundment pit located between Buildings 101-41 and 101-44 and east of Building 101-41. It measured 150 by 140 by 8 feet. The impoundment was partially eroded and partially filled with windblown sand. Piles of dredged soils were located on the sides of the impoundment. This impoundment operated from 1940 to the early 1970s and was reported to have received large amounts of wastewater containing 2,4,6-trinitrotoluene (TNT) and 1,3,5-Trinitroperhydro-1,3,5-triazine (RDX), also known as Royal Demolition Explosive (US Army 2001).

No visible evidence of TNT or Yellow D (ammonium picrate) stained soils were noted by the USAEHA survey team (USAEHA 1988) or during the 1992 site visit and 1994 RCRA Facility Assessment (RFA) (E & E 1995). SWMU B21 never has been permitted and has not gone through a formal RCRA closure (E & E 1997).

3.0 INVESTIGATION HISTORY

3.1 Previous Investigation Summary

Environmental investigations at the SWMU B21 began in 1988. The following is a synopsis of the significant dates and events associated with those investigations. Excerpts from previous investigations are provided in **Appendix A**.

- In 1988, USAEHA conducted a visual site inspection at SWMU B21 (USAEHA 1988).
- In 1994, a RFA was conducted at B21. Surface soil and subsurface soil were collected as part of this investigation (E & E 1995).
- In 1997, a RCRA Facility Investigation (RFI) was conducted. Surface, near-surface, and subsurface soils were collected during this investigation (E&E 1997).

3.1.1 1988 Site Inspection

In 1988, a visual site inspection was conducted at SWMU B21to investigate reports that this impoundment was used for containment of wastewater containing explosives. No visible evidence of TNT or Yellow D (ammonium picrate) stained soils were noted by the USAEHA survey team (USAEHA 1988).

3.1.2 RFA 1994

In 1994, a RFA was conducted at SWMU B21. This investigation included collection of surface and subsurface soil samples. Since the impoundment was reported to have received large amounts of wastewater containing TNT and RDX, all samples were analyzed for nitrate, picric acid, metals, explosives and pH. The samples were analyzed using the following methods:

- Nitrate: EPA Method 353.3
- Picric acid: SW-846 Method 8330M
- Arsenic: SW-846 Method 7060
- Barium, Beryllium, Cadmium, Chromium: SW-846 Method 6010
- Lead: SW-846 Method 7421
- Explosives: SW-846 Method 8330

The subsurface investigation of SWMU B21 was performed adjacent to the impoundment and on its downgradient side. Four subsurface soil samples were collected at one Cone Penetration Test (CPT) location from the top 18 inches of four fine-grained horizons at depths of 6, 14, 17, and 21 feet bgs at this SWMU. Two surface soil samples and two hand auger samples from 5 feet beneath the bottom of the impoundment were collected. These surface and near-surface samples were collected from the lowest elevation in the impoundment where liquids would tend to accumulate. The number and types of samples collected are summarized in **Table 3-7** from the 1997 RFI, provided in **Appendix A**. All sample locations are shown on **Figure 2**.

Surface and near-surface hand auger soil samples collected from within the impoundment did not contain any nitroaromatic compounds. Arsenic was detected at levels ranging from 2 to 4.4 mg/Kg in these samples, which exceeds the Residential Region IX carcinogenic RSL of 0.39 mg/Kg. However, the detections are less than the HWAD background level at one standard deviation. All other detected metals were less than the RSL and within the background range at one standard deviation. The results are shown in **Table 3-8** from the 1997 RFI, provided in **Appendix A**.

Arsenic was detected in all of the CPT soil samples collected at concentrations ranging from 4 mg/Kg to 9.6 mg/Kg, which are all greater than the Residential Region IX RSL of 0.39 mg/Kg. However, they are all less than the HWAD background level at one standard deviation. Beryllium was detected at levels from 0.67 mg/Kg to 1.4 mg/Kg. All of these concentrations are less than the Residential Region IX non-cancer ingestion RSL of 160 mg/Kg. The CPT sample collected from 16.5 feet had a beryllium concentration that slightly exceeded the maximum value detected in the background study so additional sampling was recommended. Nitroaromatics were not detected in any of the CPT soil samples (E & E 1995).

3.1.3 1997 RFI

In 1997, a RFI was conducted to investigate further the slightly elevated beryllium and arsenic detections that were observed during the RFA.

Five surface soil samples and seven near-surface soil samples were collected from within this impoundment and bermed area and were screened for TNT and RDX. These results are provided in **Table 3-9** from the 1997 RFI, provided in **Appendix A**. None of the screening results showed elevated levels of these explosive compounds.

Five surface soil samples (0- to 6-inch depths), were collected from the bottom of the impoundment. Seven near-surface soil samples and one duplicate sample were collected from the bermed area of the impoundment. These near-surface samples were collected at a minimum depth of 6 inches below the soil surface and at the horizontal and vertical centers of the berm.

Six subsurface soil samples and one duplicate sample were collected from two soil borings each drilled to a total depth of 25 feet below ground surface. One boring was drilled outside of the impoundment approximately 75 feet from the western edge. The other was drilled in the bottom of the pit near the center. Continuous soil cores were collected from each boring for lithologic logging and analytical sampling. Analytical samples were collected from 5-, 15- , and 25-foot depths in each boring. All soil sample locations collected during the RFI investigation are identified in **Figure 2**. The samples were analyzed using the following methods:

- Explosives: SW-846 Method 8330
- Arsenic: SW-846 Method 7060
- Beryllium: SW-846 Method 6010

The analytical results are provided in Table 3-10 from the 1997 RFI, provided in **Appendix A**. Arsenic was detected in all of the soil samples collected at concentrations ranging from 2.2 mg/Kg to 11 mg/Kg, all of which are more than the Residential Region IX RSL of 0.39 mg/Kg. However, they are all less than the HWAD background level at one standard deviation. Beryllium was analyzed also; however, it was not detected in any of the samples.

TNT was detected in two berm soil samples (BM1-09 and BM1-I0), collected from the western side of the impoundment, at 2.1 mg/Kg and 0.43 mg/Kg, respectively. These concentrations do not exceed the Residential Region IX carcinogenic RSL of 19 mg/Kg. No other nitroaromatic compounds or picric acid were detected in any of the soil samples collected at SWMU B21.

3.2 Previous Investigation Conclusions

All surface and subsurface soil samples collected exceeded the Residential Soil Region IX RSL for arsenic. However, all the results were within one standard deviation of results from the HWAD background study so no further consideration of these detections is needed. Beryllium was detected in one subsurface sample during the RFA at a level higher than those observed

during the background study, but it was below the Residential Soil Region IX RSL. No samples collected during the RFI contained beryllium above the laboratory reporting limit.

TNT was detected in two samples below the Residential Soil Region IX RSL. No other nitroaromatic compounds or picric acid were detected at SWMU B21.

4.0 SITE EVALUATION

4.1 Introduction

Consistent with the requirements of NAC 445A.22705, an evaluation of SWMU B21 was performed using the risk-based corrective action (RBCA) approach outlined in ASTM Standard E1739-95, Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM 2002). The following sections provide details of the evaluation, beginning with a brief characterization of the site.

4.2 Nature and Extent of Contamination

Previous investigations have not detected metals or explosives in the surface or subsurface soils in the pit that exceed both the background and the action levels for HWAD.

4.3 Ecological Risk Screening

A screening ecological risk assessment was not considered for SWMU B21 due to lack of contamination.

4.4 Corrective Action Assessment for Soil

The following steps were used to evaluate the soil data and determine the need for further corrective action:

1. The maximum detected concentrations for all sampling points were compared to background levels.
2. Detections exceeding background were compared to the Tier 1 RBSLs.
3. Compounds exceeding the Tier 1 and/or background concentrations were compared to Tier 2 site specific target levels (SSTLs).

4.4.1 Arsenic

Appendix A provides a summary of the detected analytical results of the surface and subsurface soil samples collected during E & E's 1994 and 1997 investigations at SWMU B21. Twenty eight surface and subsurface soils samples were analyzed for arsenic. Arsenic was detected in all samples. Detected arsenic concentrations ranged from a minimum of 2 mg/Kg to a maximum of 11 mg/Kg. The Tier 1 RBSL for arsenic is the Region IX Residential Soil RSL of 0.39 mg/Kg.

A technical memorandum (Tetra Tech 1997) was prepared to establish background concentrations for metals at HWAD. The technical memorandum compiled data from 120 background soil samples collected by International Technology Corporation in 1988, Tetra Tech in 1994, and E & E in 1996. The average (mean) concentration of each metal in the study was then derived. The background concentration was proposed as two standard deviations from the mean. For arsenic, two standard deviations of the mean of the sample set is 18.1 mg/Kg.

The maximum detected concentration at SWMU B21 is 11 mg/Kg, which is less than the background concentration proposed in the technical memorandum.

4.4.2 Beryllium

Appendix A provides a summary of the detected analytical results of the surface and subsurface soil samples collected during E & E's 1994 and 1997 investigations at SWMU B21. Twenty eight surface and subsurface soils samples were analyzed for beryllium. Beryllium was

detected in three subsurface samples in concentrations ranging from a minimum of 0.67 mg/Kg to a maximum of 1.4 mg/Kg.

The metals background technical memorandum reported the background concentration of two standard deviations of the mean of the sample set as 0.58 mg/Kg (Tetra Tech 1997), which is less than the detections at SWMU B21 in 1994. However, there were no detections in 1997.

The Tier 1 RBSL for beryllium is the Region IX Residential Soil RSL of 160 mg/Kg. The maximum detection of 1.4 mg/Kg is well below the Tier 1 RBSL.

4.4.3 TNT

Appendix A provides a summary of the detected analytical results of the surface and subsurface soil samples collected during E &E's 1994 and 1997 investigations at SWMU B21. Twenty one surface and subsurface soils samples were analyzed for TNT. TNT was detected in two subsurface samples. Detected TNT concentrations were 0.43 mg/Kg and 2.1 mg/Kg.

The Tier 1 RBSL for TNT is the Region IX Residential Soil RSL of 19 mg/Kg. The maximum detection of 2.1 mg/Kg is well below the Tier 1 RBSL.

5.0 CONCLUSIONS

5.1 Current Site Conditions

The pit at SWMU B21 has been backfilled (refer to Photos 1 and 2 in **Appendix B**). It is assumed that the steam pipes have been removed as well. It is unclear the exact date when the pit was backfilled. From the 2007 HWAP Installation Action Plan (IAP), the Army indicates that a fiscal year 2000 milestone of Remedial Action Construction RA(C) occurred at SWMU B21. The IAP also states the following: "Documentation Title: Five Year Review determined that RA (Remedial Action) effectively remediated contamination below action levels. Awaiting state closure letter." This indicates that the site closure actions were likely completed before the end of fiscal year 2000.

5.2 A Through K Assessment

In accordance with NAC 445A.227, the following factors were evaluated to determine whether further corrective actions are required:

a. The depth of any groundwater: 138.6 feet bgs.

b. The distance to irrigation wells or wells for drinking water: The nearest pumping well to SWMU B21 is water supply well #7. Water supply well #7 is not used as a potable water supply source due to the naturally high levels of fluoride and nitrate that exceed drinking water standards. The well is approximately 2.3 miles downgradient of SWMU B21.

c. The type of soil that is contaminated: Fine to medium sand, silty sands.

d. The annual precipitation: 4.6 inches (evapotranspiration potential is 45 inches per year).

e. The type of waste or substance that was released: No wastes have been identified and the pit was likely used for steam condensate.

f. The extent of the contamination: All of the COPC's concentrations are within NDEP acceptable limits. Arsenic was detected in concentrations that ranged from 2 mg/Kg to 11 mg/Kg, which are concentrations within the range of background detections. Beryllium was detected at concentrations that ranged from 0.67 mg/Kg to 1.4 mg/Kg, which are below the Tier 1 RBSL of 160 mg/Kg. TNT was detected at concentrations that ranged from 0.43 mg/Kg to 2.1 mg/Kg, which are below the Tier 1 RBSL of 19 mg/Kg.

g. The present and potential use for the land: Industrial (present and future); however, residential use is possible based on the analytical results.

h. The preferred routes of migration: None, no analyte exceeded both background and its RBSL.

i. The location of structures or impediments: Three structures are near the SWMU. Building 101-45 is located approximately 600 feet southeast of the pit, Building 101-44 is located approximately 700 feet southeast of the pit, and Building 101-41 is located approximately 600 feet northwest of the pit.

j. Potential fire, vapor, or explosion: None.

k. Other factors: The pit has been backfilled and it is assumed that the steam lines have been removed.

6.0 REFERENCES

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Figures

FIGURES

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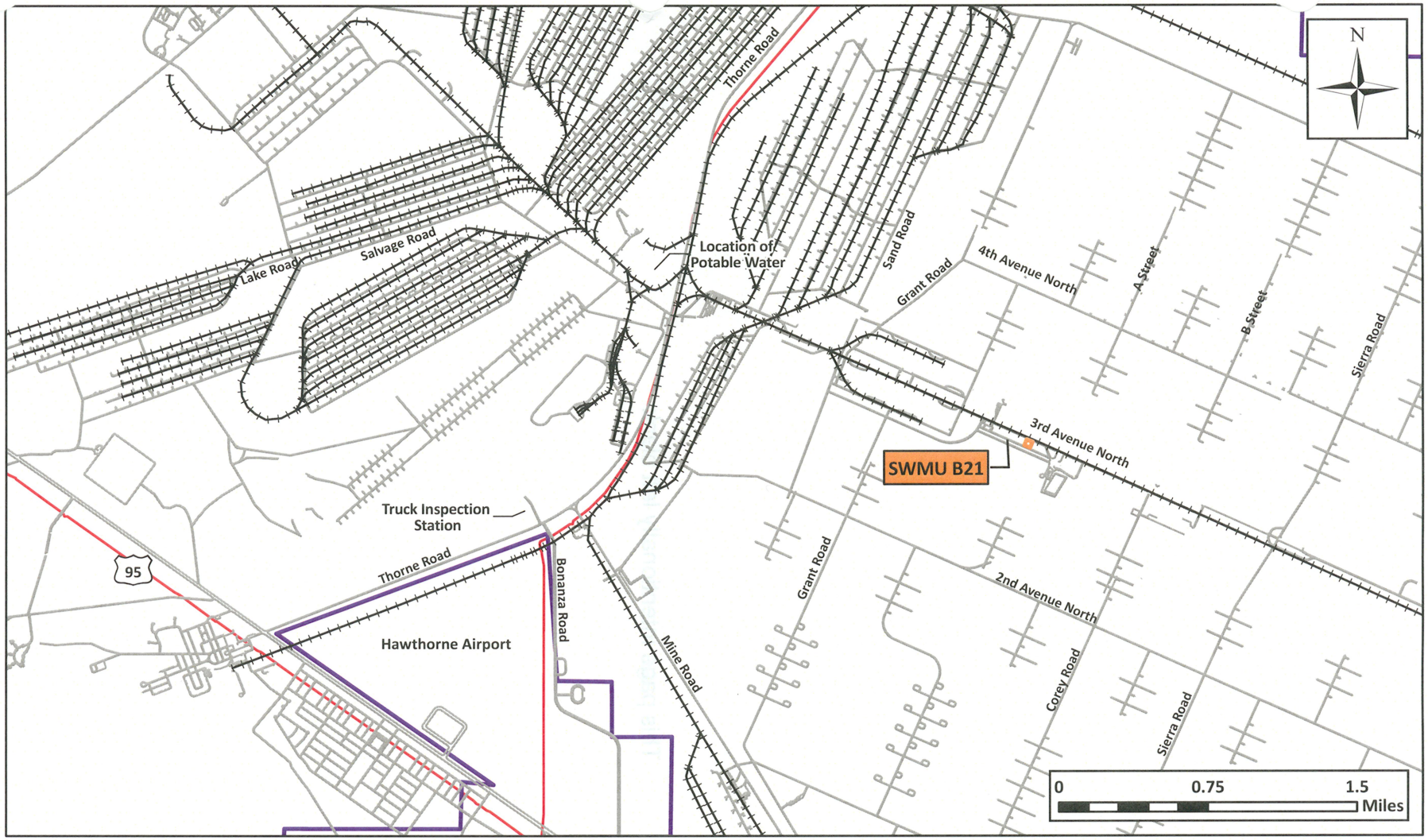

Map Key:

- Rails
- Roads
- Highways
- HWAD Boundary
- SWMU Boundary

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Figure 1

SWMU B21
Site Location Map

Hawthorne Army Depot
Hawthorne, Nevada

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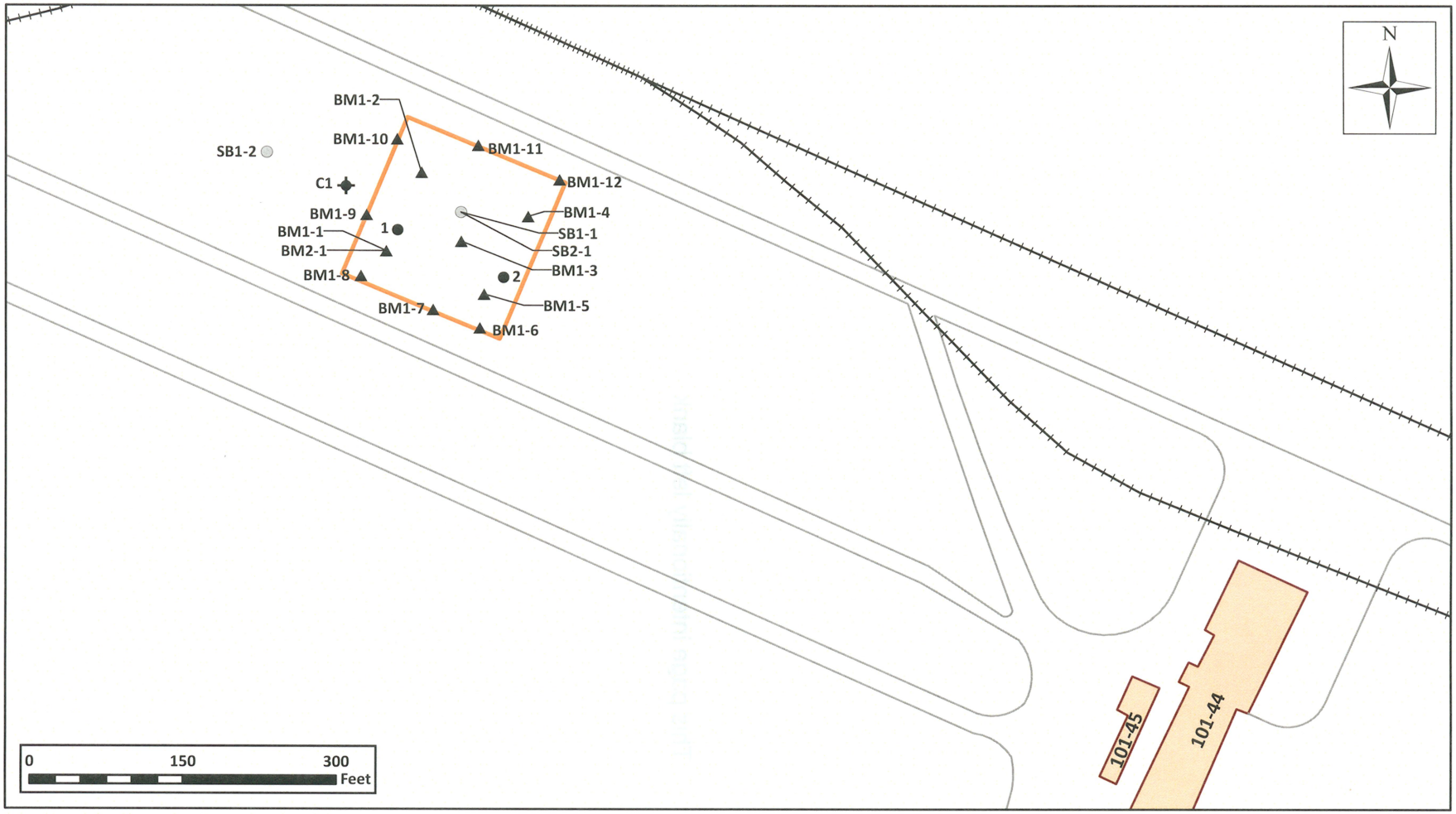

Map Key:

- RFA Cone Pentrometer Test Sample Location
- RFA Surface Soil/Hand Auger Sample Location
- RFI Soil Boring Sample Location
- RFI Surface Soil Sample Location
- Buildings
- Rails
- Roads
- SWMU Boundary

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Figure 2

SWMU B21
Site Layout with RFA and RFI Sampling Locations

Hawthorne Army Depot
Hawthorne, Nevada

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Appendix A

Appendix A—Excerpts from Previous Investigations

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E & E 1997 RFI– Soil Data Tables from the 1994 RFA and 1997 ~~RFAI~~ RFI

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Table 3-7

SWMU B-21
101-41/44 CATCHMENT PIT
SOIL SAMPLE SUMMARY
HAWTHORNE ARMY DEPOT
HAWTHORNE, NEVADA

EPA Method Number	Analytical Parameter	RFA Samples (August 1994)			RFI Samples (September 1996)			
		Surface Soil	Hand Auger	CPT Samples	Berm Samples	Subsurface Samples Per Depth Interval (2 Boring Locations)		
						5 feet	15 feet	25 feet
8330	Explosives	2	2	4	12	2	2	2
8330M	Picric Acid	2	2	4	12	2	2	2
7000/6000	Metals[1]	2	2	4	---	---	---	---
7060	Arsenic	---	---	---	12	2	2	
6010	Beryllium	---	---	---	12	2	2	2
353.2	Nitrate	2	2	4	---	---	---	---
Field Screening	TNT/RDX	2	2	4	12	2	2	2

Note: Sample numbers do not include QA/QC samples.

Key:

[1] = Metals analysis include arsenic, barium, beryllium, cadmium, chromium, and lead.
--- = Sample not collected.

Table 3-8

SWMU B-21
RFA ANALYTICAL RESULTS
HAWTHORNE ARMY DEPOT
HAWTHORNE, NEVADA
mg/kg (ppm)

Sample No./ Parameter	B-21 HA1-1-000	B-21 HA1-1-005	B-21 HA1-2-000	B-21 HA1-2-005	B-21 CPS1-1-005	B-21 CPS1-1-014	B-21 CPS1-1-16.5	B-21 CPS1-1-020
Sample Depth (feet)	0.5 to 1.0	5.0 to 5.5	0.5 to 1.0	4.0 to 4.5	5.0 to 6.0	14.0 to 15.0	16.5 to 17.5	22.0 to 23.0
Nitrate-nitrogen (9200)	ND	ND	ND	ND	ND	ND	ND	ND
Metals								
Arsenic (Method 7060)	4.4	3.6	4.1	2.0	4.6	9.6	7.9	4.0
Barium (Method 6010)	72	190	70	190	230	300	310	350
Beryllium (Method 6010)	ND	ND	ND	ND	ND	0.88	1.4	0.67
Chromium (total) (Method 6010)	8.6	5.6	6.3	3.5	5.2	12	18	7.7
Lead (Method 7421)	ND	ND	13	ND	5.2	24	32	8.4

NOTE: Nitroaromatics analyzed for, but not detected in these samples.

Key:

ND = Not detected above quantitation limit.
Shaded Area = Values exceed remediation criteria listed on Table 1-2.

Table 3-9

SWMU B-21
TNT AND RDX
FIELD SCREENING DATA
HAWTHORNE ARMY DEPOT
HAWTHORNE, NEVADA
September 1996

SWMU #	Sample Location	Sample Depth (ft. BGS)	Screening Results	
			RDX Concentration Range (ppm)	TNT Concentration Range (ppm)
B-21	BM1-1	.5	1.5 to 2.5	<0.5
B-21	BM1-2	.5	0.5 to 1.5	<0.5
B-21	BM1-3	.5	<0.5	<0.5
B-21	BM1-4	.5	<0.5	<0.5
B-21	BM1-5	.5	<0.5	<0.5
B-21	BM1-6	3.0	<0.5	<0.5
B-21	BM1-7	3.0	<0.5	<0.5
B-21	BM1-8	3.0	0.5 to 1.5	<0.5
B-21	BM1-9	3.0	0.5 to 1.5	<0.5
B-21	BM1-10	3.0	<0.5	<0.5
B-21	BM1-11	3.0	0.5 to 1.5	<0.5
B-21	BM1-12	3.0	<0.5	<0.5

Table 3-10

SWMU B-21
101-4/44 CATCHMENT PIT
RFI ANALYTICAL RESULTS
HAWTHORNE ARMY DEPOT
HAWTHORNE, NEVADA

Sample Number	Surface Soil Samples						Berm Samples				Soil Remediation Criteria
	2-B21-BM1-01-000	2-B21-BM2-01-000	2-B21-BM1-02-000	2-B21-BM1-03-000	2-B21-BM1-04-000	2-B21-BM1-05-000	2-B21-BM1-06-003	2-B21-BM1-07-003	2-B21-BM1-08-003	2-B21-BM1-09-003	
Depth (feet)	0 to 0.5	0 to 0.5	0 to 0.5	0 to 0.5	0 to 0.5	0 to 0.5	2.5 to 3.0	2.5 to 3.0	2.5 to 3.0	2.5 to 3.0	
Nitroaromatics (Method 8330) (mg/kg)											
2,4,6-TNT	ND (1.0 U)	ND (1.0 U)	ND (1.0 U)	ND (1.0 U)	ND (1.0 U)	ND (1.0 U)	ND (1.0 U)	ND (1.0 U)	ND (1.0 U)	2.1	233.3
Metals (Method 7060) (mg/kg)											
Arsenic	3.7	2.2	4.0	2.5	3.6	3.6	5.7	9.5	6.7	3.7	100

Key at end of Table.

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Table 3-10

SWMU B-21
101-41/44 CATCHMENT PIT
RFI ANALYTICAL RESULTS
HAWTHORNE ARMY DEPOT
HAWTHORNE, NEVADA

Sample Number	Berm Samples			Soil Boring 1				Soil Boring 2			Soil Remediation Criteria
	2-B21-BM1-10-003	2-B21-BM1-11-003	2-B21-BM1-12-003	2-B21-SB1-1-005	2-B21-SB1-1-015	2-B21-SB1-1-025	2-B21-SB2-1-025	2-B21-SB1-2-005	2-B21-SB1-2-015	2-B21-SB1-2-025	
Depth (feet)	2.5 to 3.0	2.5 to 3.0	2.5 to 3.0	5.0 to 7.5	15.0 to 17.5	25.0 to 27.5	25.0 to 27.5	5.0 to 7.5	15.0 to 17.5	25.0 to 27.5	
Nitroaromatics (Method 8330) (mg/kg)											
2,4,6-TNT	0.43 J	ND (1.0 U)	ND (1.0 U)	NA	NA	NA	NA	NA	NA	NA	233.3
Metals (Method 7060) (mg/kg)											
Arsenic	8.2	8.0	7.6	4.6	11	3.4	2.9	5.8	4.4	8.2	100

Note: Beryllium was analyzed for, but not detected.

Key:

NA = Not analyzed.
ND = The material was analyzed for, but was not detected. The associated numerical value in parentheses is a method quantitation limit adjusted for sample weight/sample volume, extraction volume, percent solids, and sample dilution.
U = Not detected.
mg/kg = Milligrams per kilogram.

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Appendix B

Appendix B—Photos of SWMU B21 Backfilled Pit From September 14, 2011

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Photo 1: HWAD SWMU B21, taken September 14, 2011

Photo 2: HWAD SWMU B21, taken September 14, 2011