DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

ENTERED

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New Mexico Environment Department
Attn: Mr. James Bearzi
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Dear New Mexico Environment Department

Holloman AFB is pleased to submit the SS-39 Missile Fuel Spill Area Accelerated Corrective Measures (ACM) Work Plan for your review.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions, please contact Mr. David Scruggs of our Asset Management Flight at (575) 572-5395.

Sincerely

Michael A. Pate

for A. DAVID BUDAK, YF-3, DAFC

Attachment:
SS-39 ACM Work Plan

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FINAL

SS-39 MISSILE FUEL SPILL AREA (SWMUs 165, 177, 179, AND 181) ACCELERATED CORRECTIVE MEASURES WORK PLAN HOLLOMAN AIR FORCE BASE ALAMOGORDO, NEW MEXICO

Prepared for:

Air Force Center for Engineering and the Environment
San Antonio, Texas

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Contract No. FA4890-06-D-0009
Task Order No. 5002

April 2009

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ACRONYMS

ACC	Air Combat Command
AMC	Air Materiel Command
AOC	Area of Concern
bgs	below ground surface
DPT	direct push technology
EPA	Environmental Protection Agency
HAFB	Holloman Air Force Base
HGL	HydroGeoLogic, Inc.
HHMSSL	Human Health Medium Specific Screening Levels
HSA	Hollow Stem Auger
LTM	Long Term Monitoring
MCLs	Maximum Contaminant Level
mg/kg	milligram per kilogram
mg/L	milligram per liter
NFA	No Further Action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environmental Department
NMWQCC	New Mexico Water Quality Control Commission
NOD	Notice of Deficiency
PCE	Tetrachloroethylene
PR/VSI	Preliminary Review/Visual Site Inspection
PVC	Poly Vinyl Chloride
RCRA	Resource Conservation Recovery Act
RI	Remedial Investigation
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SSL	Soil Screening Levels
SOP	Standard Operating Procedure
SVOCs	Semi-Volatile Organic Compounds
SWMU	Solid Waste Management Unit
TCA	1,1,1-Trichloroethane

TCE	Trichloroethylene
TDS	Total Dissolved Solids
Tetra Tech	Tetra Tech, Inc.
TRPH	total reportable petroleum hydrocarbons
UDMH	unsymmetrical dimethylhydrazine
USACE	United States Army Corps of Engineers
USAF	United States Air Force
µg/L	microgram per liter
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This Accelerated Corrective Measure (ACM) Work Plan was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Holloman Air Force Base (HAFB) for the SS-39 Missile Fuel Spill Area Solid Waste Management Units (SWMUs) 165, 177, 179, and 181 at HAFB, New Mexico. Tetra Tech has prepared this document under contract to the U.S. Air Force Center for Engineering and the Environment, Contract No. FA4890-06-D-0009, Task Order No. 5002.

1.1 INSTALLATION BACKGROUND

1.1.1 Location

Holloman AFB is situated in south-central New Mexico, in the northwest-central part of Otero County. The Base is located approximately 75 miles northeast of El Paso, Texas, and seven miles west of Alamogordo, New Mexico. The Base occupies about 50,000 acres in the northeast quarter of section Township 17 South, Range 8 East. Additional land extending northward is occupied by the White Sands Missile Range testing facilities. An installation location map is included as Figure 1-1.

1.1.2 History

Holloman AFB, formally Alamogordo Army Airfield, was initiated as a temporary facility during World War II, with construction commencing on 6 February 1942. Its status, mission, and Command have periodically changed over the years. Today, HAFB is under the Air Combat Command (ACC).

Prior to 1942, the property occupied by HAFB was undeveloped rangeland. The Alamogordo Army Airfield was established in 1942 and was deactivated in 1945. The facility was again reactivated in 1945 and was operated by the Air Materiel Command (AMC) until 1951. AMC tested pilot-less aircraft, guided missiles, and other equipment. The facility mission remained largely unchanged until 1971, although the facility identification changed several times during the 20-year span: Air Force Missile Test Center (1951-1952), Holloman Air Development Center (1952-1957), and Air Force Missile Test Center (1957-1971). The Tactical Air Command operated the facility from 1972 to 1992 and housed the 49th Tactical Fighter Wing, 479th Tactical Training Wing, 833rd Air Division, and 4449th Mobile Support Squadron. In 1992, HAFB was realigned under the ACC where it operates today.

1.2 SS-39 MISSILE FUEL SPILL AREA

1.2.1 Location

SS-39, the Missile Fuel Spill Area, is located in the central portion of HAFB along the Lost River drainage basin. The site is located along the northern slope of the Lost River drainage basin immediately south of Building 1176. The location of SS-39, with respect to HAFB, is shown on Figure 1-2.

1.2.2 Site Description

SS-39 is primarily undeveloped and moderately vegetated with salt cedars, shrubs, and grasses. The area immediately north of the site is relatively flat and heavily improved with the construction of Building 1176 and two asphalt paved vehicle lots east and west of the building. This portion of the site is the only section that has been improved with site features. Although relatively flat, an overall area-wide southerly dip is present. The area immediately south of Building 1176 represents the only other developed portion of SS-39. Two concrete-lined, 1-foot wide drainage ditches (SWMU 181, Drainage Trough) extend south-southeast and southwestward from the southern corners of the building. Each ditch discharges to separate sumps (SWMU 177, Drainage Sump), as shown on Figure 1-3.

1.2.3 Contamination History

SS-39, the Missile Fuel Spill Area, is located at the test sled launch area near Building 1176 (Figure 1-3). The launch pad at the south end of the track was constructed with concrete drains and a water deluge system. Spilled oxidizers and fuels were delivered to separate drains, diluted with water and flushed into the Lost River. In 1975, catch basins were installed to collect the spilled liquid fuels. Oxidizer vent lines from the engines were also installed and designed to discharge into the catch basins. Since 1975, no propellants have been intentionally released to the open drains. Surface and groundwater samples were collected from the Lost River in the vicinity of the test track in July of 1979. The results indicated that the test track had no observable impact upon the Lost River water quality. Waste propellants are currently collected and treated in the treatment system located in Building 1176.

Fueling activities for tests at the Alpha Pad were completed on the track at the Alpha Pad before each sled launch. The fuels were brought on location by truck because no fuels were stored at the launch facility. Before sleds were removed from the track, the fuels were emptied from the sleds into the proper storage container (a process called de-tanking) and then the sleds were taken to Building 1176 where the remainder of the fuel was purged from the engines. Throughout the history of the test track, fuels have included at least the following: JP-4 (jet fuel); unsymmetrical dimethylhydrazine (UDMH); aniline;

inhibited red fuming nitric acid (IRFNA); inhibited white fuming nitric acid (IWFNA); liquid oxygen; JPX (1:1 mixture of JP-4 and UDMH); dyes; solid rocket propellants; and other compounds. The drainage systems for the Alpha Pad and Building 1176 were designed to prevent accidents in the event of a fuel spill during the fueling and/or de-tanking activities.

The drainage systems collected and drained spilled oxidizers and propellants separately. At the test track, for example, fueling and de-tanking of oxidizers were all completed on the east half of the track and the same was done for propellants on the west half of the track. In the event of a spill, the propellants and/or oxidizers were collected in and drained through separate drainage systems.

In addition to these fuels, solvents such as trichloroethylene (TCE) were commonly used for sled maintenance in Building 1176. The management practices of these chemicals at Building 1176 were not extensively reviewed; however, interviews with past employees suggest that the washrack and drainage trenches could have received wastes.

1.3 SCOPE AND OBJECTIVE

The document provides an accelerated corrective measures plan and remedial strategy for the SS-39 Missile Fuel Spill Area. This remedial strategy includes excavation of soils and sediment from the Concrete Collection Basin, Discharge Box, and Drainage Sumps, a direct push technology (DPT) subsurface soil investigation near the Drainage Swale, and installation of permanent groundwater monitoring wells to delineate the groundwater within the Lost River drainage basin. These actions should achieve a determination of Remedy in Place. Once completed, No Further Action (NFA) Site Closure with or without soil and groundwater land use controls (LUCs) which may include monitored natural attenuation (MNA) can be achieved.

1.4 WORK PLAN ORGANIZATION

This work plan is organized into five sections. Section 1 is the introduction; Section 2 presents the site specific environmental setting of the SS-39, Missile Fuel Spill Area; Section 3 provides the previous site investigation and Supplemental RFI activities; Section 4 presents the ACM for the site; and Section 5 presents the references cited in this work plan.

The site specific Activity Hazard Analysis is provided in Appendix A and HAFB's Standard Operating Procedures (SOPs) are included as Appendix B. In addition to the HAFB SOPs, the Basewide Quality Assurance Project Plan (Bhate, 2003a) will be adopted to use in conjunction with this ACM Work Plan.

2.0 SITE-SPECIFIC ENVIRONMENTAL SETTING

The environmental setting information in the following subsections is reproduced primarily from the Supplemental RFI Report prepared by HydroGeoLogic, Inc (HGL) for SS-39 (HGL, 2007) unless cited otherwise.

2.1 DEMOGRAPHICS

Alamogordo is the county seat of Otero County and the only town of appreciable size within 30 to 50 miles of the Base. The population of Alamogordo was 23,535 in 1975 and has since grown to approximately 35,000 (2000 census). The economy of Alamogordo depends largely upon HAFB and other military installations in the area. Approximately 5,500 people live at HAFB.

2.2 CLIMATE

The climate in the Tularosa Basin is arid with low annual rainfall and low relative humidity. The surrounding mountain ranges greatly influence the local weather. They modify approaching weather systems and provide orographic lifting which produces summer thunderstorms.

Holloman AFB receives most of its total annual rainfall from thunderstorm activity from May through October. Winter is generally dry and is characterized by clear skies and erratic snowfall. The period from March through May is characterized by strong southerly wind flow and periods of blowing dust and sand. Mean annual precipitation is 7.9 inches. The mean annual lake evaporation rate, commonly used as an estimate of the mean annual evapotranspiration rate, is approximately 67 inches per year. As presented by Huff in the 49th Annual New Mexico Water Conference Proceedings (New Mexico Water Resources Research Institute [WRRI], 2005), approximately 30,000 acre-feet per year of groundwater left the Tularosa basin through evapotranspiration under 1995 conditions.

2.3 TOPOGRAPHY

Site SS-39 is located on the northern slope of the Lost River drainage basin. The slope has an overall moderately southward dipping slope towards the Lost River drainage basin. Moderately to steeply incised swales and gullies cut into the slope east, west, and immediately downgradient of Building 1176. At the base of the slope, the topography becomes flat with a very slight southerly dip towards the center of the Lost River drainage basin.

Steeply incised rills and drainage swales are present throughout the central portion of the slope, trending in a north-south orientation toward the Lost River drainage basin. Vegetation in the central portion of the slope consists of salt cedars, shrubs, grasses, and cacti. Near the base of the slope, vegetation primarily consists of grass and shrubs until the edge of the Lost River drainage basin, after which no vegetation is present. The edge of the basin typically marks the high water level within the drainage basin during and slightly after heavy rainstorms. An unpaved service road parallels the basin edge providing access to the lower portion of the site.

2.4 SURFACE WATER

No surface water bodies are present within SS-39. During heavy rain events and the rainy season, surface water runoff collects within the Lost River drainage basin. Numerous swales and gullies emanate from and cross SS-39.

2.5 GEOLOGY

Site-specific geologic information was obtained from lithologic data collected during previous subsurface investigations and from the Supplemental RFI (HGL, 2007). Based on lithologic logging activities, the soils underlying Building 1176 and SS-39 are composed primarily of well-sorted, fine-grained sand. To the west, in the vicinity of MW39-02, two 8 foot sequences of silt separated by a 2 foot thick sand lens were encountered to approximately 18 feet below ground surface (bgs). North of Building 1176, in the vicinity of MW39-01, an 8 foot thick sequence of silty sand was encountered at the surface. Both the silt and silty sand units appear to interfinger the sand unit. Within the Lost River drainage basin, sands with clay and interbedded clay lenses were encountered at the surface to approximately 6 feet bgs.

2.6 HYDROGEOLOGY

Groundwater occurs beneath SS-39 in a shallow unconfined aquifer ranging from 18 feet bgs at the top of the northern slope to less than 0.5 foot bgs in the Lost River drainage basin. Groundwater potentiometric surface maps generated from water level data obtained during the July 2006 and January 2007 Long Term Monitoring (LTM) sampling events are provided in Figure 2-2. During the July 2006 sampling event, the groundwater elevations of MW-39-06 and MW-39-06D were 4031.30 feet msl and 4033.89 feet msl, respectively, indicating upward groundwater flow is occurring in the vicinity of the cluster wells. During the January 2007 LTM sampling event, water elevations were 4034.84 feet msl (MW-39-06) and 4034.38 feet msl (MW-39-06D), indicating a slightly downward groundwater flow is occurring in the vicinity of

the cluster wells. The difference in groundwater flow between the clustered wells may be attributable to the flooding of the Lost River drainage basin after several rainstorms occurring two weeks prior to the January 2007 LTM sampling event.

The hydraulic conductivities for the SS-39 wells installed during the RI and presented in the Supplemental RFI are:

- MW39-01 - 1.24 feet/day;
- MW39-02 - 2.92 feet/day;
- MW39-03 - 2.51 feet/day; and
- MW39-04 - 0.97 feet/day

Using an average hydraulic conductivity of 1.91 feet/day, hydraulic gradient of 0.0047 ft/ft (2003 LTM event), and an estimated porosity of 30%, the linear groundwater flow velocity across the site was estimated to be 0.029 feet/day, or 10.9 feet/year.

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3.0 SITE INVESTIGATIONS

3.1 BASE INSTALLATION RESTORATION PROGRAM

In September 1988, the RCRA Facility Assessment (RFA) Preliminary Review (PR) / Visual Site Inspection (VSI) were completed by A.T. Kearney and DPRA Incorporated for U.S. Environmental Protection Agency (EPA) Region VI. In accordance with RCRA, HAFB had initially submitted a RCRA Part A Permit Application (a request for interim status for existing facilities and the initial permitting step for new facilities) in November 1980 for 11 SWMUs and a Part B Permit Application (describing how the facility is designed, constructed, maintained, and operated to be protective of public health and the environment, as well as release prevention measures and a contingency plan in the event of a spill or release) for the Defense Reutilization and Marketing Office. Hazardous Waste Storage Facility was submitted by HAFB at U.S. EPA's request in July 1985. The 1984 Hazardous and Solid Waste Amendments provided new authority to U.S. EPA to require comprehensive corrective actions at SWMUs and other areas of concern (AOCs) at interim status facilities. These corrective actions were intended to address unregulated releases of hazardous constituents. The intent of the RFA was to support this authority by identifying releases or potential releases warranting further investigation. The RFA PR/VSI process identified 228 SWMUs (35 of which no longer existed or could not be located) and 21 AOCs at HAFB. Five additional SWMUs and 1 AOC were identified at the Primate Research Institute operated by New Mexico State University on HAFB property. The SWMUs and AOCs included all 43 ERP sites previously identified by HAFB.

The SS-39 is one of the four ERP sites that was included and was previously addressed in the Supplemental RFI Report (HGL, 2007). The SS-39 site was placed on the original 1991 Holloman RCRA permit issued jointly by the U.S. EPA Region VI and NMED.

3.2 REGULATORY CRITERIA FOR ANALYTICAL DATA EVALUATION

Analytical data obtained from previous investigations and the Supplemental RFI was evaluated against applicable regulatory screening data as specified in Appendix 4-F Section III.1.2 of the HAFB Hazardous Waste Permit No. NM6572124422 (NMED, 2004). Data evaluation consisted of a direct comparison to applicable screening criteria. The associated screening criteria are included on the individual analytical data tables. Specifically, the following regulatory criteria were and will be used to evaluate the analytical data (Figure 3-1).

3.2.1 Soil/Sediment

- NMED residential, industrial and construction worker Soil Screening Levels (SSLs) (NMED, 2006a, 2006c).
- U.S. EPA Region VI Human Health Medium Specific Screening Levels (HHMSSL) (U.S. EPA Reg VI, 2007), if NMED SSLs were not available (NMED, 2004).
- The U.S. EPA Region VI HHMSSL for total chromium was used to evaluate chromium analytical data since the HHMSSL for total chromium assumes a 1:6 ratio between hexavalent and trivalent chromium.
- U.S. EPA radionuclide SSLs (U.S. EPA, 2000).

3.2.2 Groundwater

- New Mexico Water Quality Control Commission (NMWQCC) standards, New Mexico Administrative Code (NMAC) 20.6.2.3103.
- U.S. EPA Maximum Contaminant Levels (MCLs).
- U.S. EPA Region VI tap water HHMSSL (U.S. EPA Reg VI, 2007) for Perchlorate.

3.3 PREVIOUS INVESTIGATIONS

Previous investigations conducted at SS-39 include:

1. Phase I Remedial Investigation (1991)
2. Phase II RCRA Facility Investigation (1993)
3. Supplemental Groundwater Investigation (1998)
4. Groundwater LTM (1997 – 2005)
5. Supplemental RFI Activities (2006)

A general discussion of the previous investigations, results, and associated conclusions are presented below.

3.3.1 Phase I Remedial Investigation

The 1991 Phase I RI consisted of completing several soil borings and the installation and sampling of four groundwater monitoring wells, MW-39-01 through MW-39-04. During the Phase I RI, two soil borings were completed with a DPT drill rig, five soil borings were completed with a hand auger, and the four groundwater monitoring wells were installed using a hollow stem auger (HSA) drill rig.

The DPT soil borings, SB-39-01 and SB-39-02, were located at the ends of the drainage troughs for Building 1176. Hand auger borings, HA-39-04 and HA-39-05, were located in a sump at the end of a third drainage trough for Building 1176 on the east side of the Building. Hand auger boring HA-39-01 was located in the outfall for the oxidizer spill drainpipe. Hand auger boring HA-39-02 was located outside of the discharge box for the propellant spill drainpipe, and HA-39-03 is located inside the discharge box. The soil analyses included volatile organics, total metals, and petroleum hydrocarbons. Since the Alpha Pad is constructed of structural concrete and associated with active operations, no drilling was completed through the pad.

One monitoring well, MW-39-01, was installed upgradient of the site. The remaining wells were installed downgradient of the outfall of the Oxidizer Spill Drainpipe (MW-39-04), the Discharge Box (MW-39-03), and Building 1176 (MW-39-02). The monitoring well and soil boring locations are shown on Figure 3-2.

Soil analytical results obtained during the Phase I RI are presented in Table 3-1. Metals concentrations were highest in HA-39-02 and HA-39-03, in or near the discharge box for propellants, where lead was notably elevated at concentrations of 1,300 milligram per kilogram (mg/kg) in HA-39-02 and 1,100 mg/kg in HA-39-03, above NMED SSLs for all receptors. Other health-based Soil Screening Levels (SSLs) exceedances in the samples were primarily limited to cadmium and chromium for the construction worker.

Almost all of the organic constituents, predominantly chlorinated volatile organic compounds (VOCs) in soils at the site were detected in the drainage sumps for Building 1176, in SB-39-01 and SB-39-02. Trichloroethylene (TCE) was detected in SB-39-01, 10 to 12 feet bgs, at a concentration of 40 mg/kg, exceeding the residential, industrial, and construction worker NMED SSLs. TCE was also detected at 10 to 12 feet bgs in boring SB-39-02 at a concentration of 11 mg/kg, exceeding the residential, industrial, and construction worker NMED SSLs. Tetrachloroethene (PCE) was detected in the soil sample collected from 10 to 12 feet bgs in boring SB-39-02 at a concentration of 95 mg/kg, above all NMED SSLs. 1,1,1-Trichloroethane (TCA) was also detected in the 10 to 12 feet bgs sample from borings SB-39-01 and SB-39-02 at concentrations of 430 mg/kg and 87 mg/kg, respectively.

Petroleum hydrocarbons were detected in all of the soil samples submitted for TPH analysis. The highest petroleum hydrocarbons concentrations were detected in boring HA-39-04 (20,700 mg/kg) and from 10 to 12 feet bgs in boring SB-39-02 (2,620 mg/kg). Figure 3-3 presents the concentration of chemicals detected in soil that exceeded the NMED SSL's.

As part of the Phase I RI, the four installed wells (MW-39-01 through MW-39-04) were sampled and analyzed for VOCs, total metals, total dissolved solids (TDS), and anions. The Phase I RI groundwater sampling analytical results are presented in Table 3-2. Metals were not detected in the groundwater samples at concentrations above background and standards. VOCs were detected in the groundwater samples at elevated concentrations in the vicinity of Building 1176 (MW-39-02), indicating that these contaminants have migrated from the sumps to the underlying groundwater. 1,1,1-TCA was detected in MW-39-02 at a detection of 240 microgram per liter (µg/L), which exceeds both the U.S. EPA MCL and the NMWQCC standard for 1,1,1-TCA. 1,1-DCE was detected in MW-39-02 at a concentration of 9.6 µg/L, also above the U.S. EPA MCL and the NMWQCC standard. TCE and carbon tetrachloride were detected at MW-39-02 at concentrations of 59 µg/L and 5.8 µg/L, above the U.S. EPA MCL but below NMWQCC standards. MCLs and NMWQCC standards are provided for reference only, as TDS in the area of the plume exceeds 10,000 milligram per liter (mg/L). VOCs were mostly not detected or present at concentrations below the detection limit in wells downgradient of the sump east of Building 1176 and the drainage outfalls from the Alpha Pad.

Based on Phase I RI results, it was concluded that additional field investigation was warranted.

3.3.2 Phase II RCRA Facility Investigation

A Phase II RFI was performed at SS-39 to further delineate the contamination previously identified at the site (Radian, 1994). For the investigation, soil samples were collected from eight borings located along the drainage ditches below the oxidizer and propellant outfalls, two borings at Building 1176 sumps, and five hand auger borings. The locations of the soil borings are presented in Figure 3-2. The collected samples were analyzed for semi-volatile organic compounds (SVOCs) and metals. The results of sampling are provided in Tables 3-3 and 3-4. As per the results, the analytes were not unusually elevated and did not exceed SSLs (Radian, 1994).

Groundwater samples were collected from 15 temporary sampling locations using DPT methods, and screened in the field for chlorinated compounds. Eight groundwater samples were submitted to an off-site laboratory for confirmatory analysis. The results of these analyses are presented in Table 3-5. The data shows that TCE was present above the NMWQCC standard and EPA MCL at four locations and above the EPA MCL at an additional two locations. PCE was not detected above standards. 1,1,1-TCA and 1,1-dichloroethane was also detected above standards at one location. The concentrations of chemicals detected in groundwater that exceeds the standards are presented in Figure 3-4.

Additionally, surface soil samples, vegetation samples, and jackrabbit tissue, blood and urine samples were collected in the area, and surface water samples were collected from the Lost River drainage basin to support an ecological risk assessment. The assessment concluded that there was no unacceptable risk to ecological receptors (Radian, 1994).

The October 1994 Phase II RFI report for Table 2 SWMUs presented the results for SS-39. This report proposed NFA for the site and a Decision Document (Radian, 1994) was submitted in September 1995, but was not signed by NMED. The site was added to the LTM program in 1997 and LTM has been conducted since 1997 in conjunction with LTM at the other subject sites.

3.3.3 Supplemental Groundwater Investigation

In response to an NMED request, a supplemental groundwater investigation was performed using DPT methods in May and June 1998. The purpose of the additional investigation was to delineate the extent of TCE previously detected during the Phase II RFI. Sixteen DPT or hand-augered borings were installed three feet below the water table (encountered between 1 to 18 feet bgs). The groundwater samples were collected and analyzed for VOCs. The locations of the borings are shown in Figure 3-2. Soil samples were collected for lithologic logging and visual inspection.

Based on the boring logs, depth to water in the DPT locations closest to the Lost River drainage basin is very shallow. Depth to water was 2.5 feet bgs at SS3916 and SS3915, 0.8 feet bgs in SS3902, 1.5 feet bgs in SS39024, 1.8 feet bgs in SS3905, and 2.7 feet bgs in SS3912. Results of this investigation are summarized in Table 3-6.

TCE was detected above the reporting limit in groundwater samples from eight of the sixteen borings (SS3901, SS3902, SS3904, SS3907, SS3908, SS3912, SS3913, and SS3914), at concentrations ranging from 1.1 µg/L (SS39-12) to 280 µg/L (SS39-7). Maximum TCE concentrations (27 µg/L to 280 µg/L) were detected in DPT sampling points located 300 to 500 feet south-southwest of Building 1176. With the exception of benzene in groundwater obtained from SS3909 at a concentration of 1.0 µg/L, no other VOCs were detected above reporting limits in the groundwater samples.

The supplemental groundwater investigation report recommended NFA for the site based on the data (GTI, 1998). The lateral extent of TCE had been determined and contaminant concentrations were below those detected during the RI investigations, where the risk was already determined to be acceptable due to

the lack of the potable exposure pathway and the absence of adverse effects to terrestrial and aquatic species in the risk assessment.

3.3.4 Groundwater Long Term Monitoring

LTM began in 1997 and continued on a biennial basis until December 2005. After submittal of the Supplemental RFI work plan (HGL, 2005a) and the response to Notice of Deficiency (NOD) (HGL, 2006a), NMED required groundwater LTM activities be conducted on a semi-annual basis (NMED, 2006b). The SS-39 LTM data through December 2005 is provided in Table 3-7. The data shows that TCE, carbon tetrachloride, and chloroform have been consistently detected in the monitoring well closest to the sump, MW-39-02, although at decreasing concentrations since 1999. During the December 2005 LTM event, TCE was also detected in well MW-39-03.

Only TCE has been detected above standards during the period of the LTM. TCE has been above the U.S. EPA MCL (5 µg/L) but below the NMWQCC standard (100 µg/L) in 1997, 1999, and 2001. TCE was detected below both standards in 2003. The 2003 LTM report recommended continued sampling since only 4 rounds of monitoring have been conducted. During the 2005 LTM event, the target analyte list was expanded to include TDS. TDS concentrations were reported at concentrations ranging from 5,670 mg/L in the upgradient well MW-39-01, furthest from the basin, to 17,200 mg/L in MW-39-02.

Following review of the 2003 LTM report and previous site investigation reports, NMED determined that additional investigation was required at SS-39. These requirements are described in NMED correspondence of February 9, 2005 and are summarized below:

- An in-depth review of previous investigations;
- Installation of monitoring wells in the area of highest contaminant concentrations and at downgradient locations. The downgradient extent of the plume shall be defined where the concentration of TCE in the groundwater is less than 5 mg/L (likely should be 5 µg/L, the U.S. EPA MCL);
- A vertical extent well shall be installed in the area of highest contaminant concentrations;
- Compliance LTM for VOCs, perchlorate, and TDS conducted on a semi-annual basis over a two-year period.

In addition, NMED requested additional subsurface soil sampling to be conducted to address a lack of UDMH and aniline analytical data during previous investigations (NMED, 2006b). Also, during the

February 2006 NMED site visit, NMED requested the collection and analysis of sediment from the test track concrete collection basin (SWMU 167) located at the southern end of the test track (HGL, 2006d).

3.4 SUPPLEMENTAL RFI ACTIVITIES

Supplemental RFI activities were conducted at SS-39 between May and July 2006. All field sampling activities were conducted in general accordance with the NMED approved work plan (HGL, 2005a) as modified in the response to NOD (HGL, 2006a) and during the February 2006 NMED site visit (HGL, 2006d).

Detailed descriptions of the Supplemental RFI field activities conducted at SS-39 are discussed below. An analytical sample summary table is included as Table 3-8. Supplemental RFI sampling locations are depicted on Figure 3-2.

3.4.1 Sediment Sampling

A sediment grab sample was collected from the Concrete Collection Basin (SWMU 167) using a disposable polyethylene sample trowel. The collected sample was submitted for SVOCs, UDMH, and RCRA metals. No staining, unusual odors, or photo-ionization detector (PID) readings were noted in the sediment. The sediment analytical results are presented in Table 3-9.

Of the SVOCs and metals detected, only lead was detected at a concentration exceeding SSLs. Lead was detected at 1,438 mg/kg, exceeding the NMED residential (400 mg/kg), industrial (800 mg/kg), and construction worker (800 mg/kg) SSLs. Aniline and UDMH were not detected in the sediment sample.

3.4.2 Subsurface Soil Sampling

A subsurface soil investigation using a DPT drill rig was conducted to address the UDMH and aniline soil quality data gap identified by NMED in the supplemental work plan NOD (NMED, 2006a). As discussed in the Response to NOD (HGL, 2006a), supplemental RFI soil borings were located immediately adjacent to former borings SB3901, SB3902, HA3901 and HA3902 and advanced to a maximum depth of 10 feet bgs. In addition, a separate boring, designated SB39-17, was installed immediately downgradient of the western drainage trough (SWMU 181). The locations of the supplemental RFI borings are depicted on Figure 3-2.

As requested by NMED (NMED, 2006a), specific soil intervals in each boring were collected and analyzed for UDMH, aniline, and RCRA metals. Subsurface soil samples were collected from 2 to 4 feet bgs and 8 to 10 feet bgs from all of the borings except in borings HA3901R and HA3902R, where borehole collapse resulted in the deeper samples being collected from a shallower soil interval (i.e., 8 to

8.5 feet bgs in HA39-01R and 8 to 9 feet bgs in HA39-02R). Subsurface soil samples collected from 2 to 4 feet bgs and 8 to 10 feet bgs were also collected from boring SB39-17. Soil analytical results are presented in Table 3-10. Constituents that exceeded SSLs are shown in Figure 2-3.

UDMH and aniline were not detected in the soil samples. Of the seven metals detected, four (arsenic, cadmium, chromium, and lead) were detected above NMED residential SSLs but below industrial and construction worker SSLs.

3.4.3 Monitoring Well Installation

3.4.3.1 Permanent Monitoring Wells

Four permanent monitoring wells, designated as MW-39-05, MW-39-06, MW-39-06D, and MW-39-07 were installed near the edge of the Lost River drainage basin in accordance with the work plan (HGL, 2005a). The four wells were installed in June 2006 using a DPT drill rig fitted with 4 ¼ HSAs. Monitoring wells MW-39-05 through MW-39-07 were drilled to maximum depths raging between 13 and 14 feet bgs, allowing for the screened portions of the wells to be positioned straddling the SS-39 water table. Monitoring well MW-39-06D was drilled to a maximum depth corresponding to 11 feet below the bottom of the MW-39-06 well (i.e., 25 feet bgs). The screened portion of MW-39-06D was positioned below MW-39-06 to evaluate the potential downward vertical migration of the TCE directly downgradient of the potential source area. The locations of the four monitoring wells are depicted on Figure 3-2. All four wells were constructed of 2-inch diameter, 10-foot long, 0.010-slotted, Schedule 40 polyvinyl chloride (PVC) well screen, Schedule 40 PVC riser pipe.

3.4.3.2 Pre-Pack Temporary Wells

In addition to the newly installed permanent monitoring wells, NMED required the installation of several monitoring wells within the Lost River drainage basin to define the southern extent of the TCE plume (NMED, 2006a). The Lost River drainage basin is subject to periodic flooding after large rain events. Repeated flooding most likely compromises the long term structural integrity of monitoring wells installed within the basin. Additionally, the United States Air Force (USAF) and the United States Army Corps of Engineers (USACE) do not allow any permanent structures to be constructed within the Lost River drainage basin (Livingston, 2006). Consequently, as discussed and agreed to by NMED during the February 2006 site visit, five pre-pack monitoring wells, designated MW-39-08 through MW-39-12, were utilized to collect groundwater samples from within the Lost River drainage basin during the Supplemental RFI and January 2007 groundwater compliance LTM event. The use of pre-pack wells allowed for the collection of groundwater samples from designated locations within the drainage basin

while providing a temporary sampling location that helped minimize groundwater sample turbidity. The locations of the pre-pack monitoring wells are depicted on Figure 3-2.

The pre-pack monitoring wells were constructed of a 2-inch diameter, 5-foot long, 0.010-slotted Schedule 40 PVC well screen wrapped with a stainless steel wire mesh containing a 0.25-inch thick filter pack. The screen is capped with a flush-jointed well cap and attached to a 2-inch diameter, 5-foot long Schedule 40 PVC riser pipe. The pre-pack wells were installed through an open borehole drilled using a 3-inch, decontaminated stainless steel hand auger. The hand auger borings were completed to maximum depths ranging between 5 to 10 feet bgs during the supplemental RFI and January 2007 LTM event. Once groundwater sampling activities were completed, the pre-pack wells were removed from the subsurface, decontaminated, and placed in dedicated storage containers. The abandoned boreholes were backfilled with the sediment removed during borehole advancement.

3.4.4 Groundwater Sampling

Groundwater sampling was conducted in July 2006 as part of the Supplemental RFI in accordance with the work plan. Additionally, a semi-annual groundwater compliance monitoring was also conducted in January 2007 as agreed upon in the response to the NOD (HGL, 2006a and NMED, 2007). As specified in the work plan and the response to the NOD, the SS-39 TCE plume monitoring well network consisted of existing wells MW-39-02 and MW-39-03, newly installed permanent wells MW-39-05, MW-39-06, MW-39-06D, and MW-39-07; and pre-pack wells MW-39-08 through MW-39-12. Groundwater samples were collected and analyzed by an off-site laboratory for VOCs, RCRA metals (total and dissolved), perchlorate, and TDS. During the July 2006 Supplemental RFI groundwater sampling event, groundwater samples were also analyzed for UDMH and aniline. Since UDMH and aniline were not detected in the July 2006 groundwater samples, NMED agreed to suspend UDMH and aniline analyses for the January 2007 sampling event (HGL, 2006e).

Supplemental RFI and January 2007 compliance LTM groundwater analytical results are presented on Table 3-11. UDMH and aniline were not detected in the groundwater samples collected during the Supplemental RFI groundwater sampling event. Fourteen VOCs, 7 metals, and perchlorate were detected in the SS-39 monitoring wells (including pre-pack wells). Of the 14 VOCs detected, only TCE was detected above MCLs and NMWQC standards. The concentrations of chemicals exceeding the standards are presented in Figure 3-4.

At the request of NMED, groundwater samples from SS-39 were analyzed for perchlorate and TDS. In July 2006, perchlorate concentrations ranged from 12 µg/L in MW-39-02 to 130 µg/L in several of the pre-pack wells within the Lost River drainage basin. The perchlorate concentrations within the basin ranged from 110 µg/L to 130 µg/L and decrease further away from the basin boundary and towards the site. During the January 2007 LTM event, TDS concentrations in the groundwater samples were very high and resulted in high perchlorate method detection limits (i.e., 75 µg/L to 600 µg/L). Perchlorate was not detected above these elevated detection limits during the January 2007 LTM event.

TDS concentrations ranged from 15,700 mg/kg in MW-39-02 to 141,000 mg/kg in MW-39-11, above the 10,000 mg/L TDS threshold for applicability of groundwater standards. These standards are therefore provided for reference only.

3.4.5 Supplemental RFI Data Assessment

A summary of analytes detected at concentrations exceeding screening criteria segregated by media is included as Table 3-12.

3.4.5.1 Soil and Sediment Contamination

Soil and sediment analyte exceedances detected at SS-39 are depicted on Figure 3-3. As shown on the figure, three sources of soil/sediment contamination have been identified. Based on contaminant distribution, it appears that material within the concrete catch basin (SWMU 167) has affected soils at SWMU 179, the outfall of SWMU 167. Elevated lead concentrations (1,430 mg/kg) were detected in the sediment of the catch basin and within or in the immediate vicinity of SWMU 179 (1,300 mg/kg and 1,100 mg/kg). T otal recoverable petroleum hydrocarbons (TRPH), although not detected within the SWMU 167 catch basin, were detected within or adjacent to SWMU 179 at concentrations above SSLs. Besides lead and TRPH, arsenic was also detected above NMED SSLs in the same samples obtained from within or adjacent to SWMU 179. Shallow soil samples collected downgradient of the two impacted soil samples within the drainage swale do not contain metals at concentrations above SSLs; no analysis of TRPH was conducted on these samples.

The second soil contamination area appears to be highly localized in a drainage swale emanating from the Building 1176 parking lot. TRPH appears to be the sole contaminant and the likely source is runoff from the parking lot and not a RCRA-related release. None of the samples collected in the vicinity of the elevated TRPH detection were analyzed for TRPH. The third source area is attributable to SWMU 177, the drainage sumps. Elevated concentrations of TCE, PCE, and TRPH were detected in the soils from

7 feet bgs to the top of the water table, at 12 feet bgs. The TCE contamination is delineated vertically to the water table. Based on the distribution of TCE in the groundwater, SWMU 177 is the likely source of the identified TCE groundwater plume. Cadmium, chromium, and lead were also above residential SSLs in the unsaturated zone. SWMU 177 is no longer active.

3.4.5.2 Groundwater Contamination

Halogenated VOCs (i.e., TCE, PCE, vinyl chloride, 1,1-DCE, 1,1,1-trichloroethane, and carbon tetrachloride), non-halogenated VOCs, several metals, and perchlorate have been detected in the groundwater south of Building 1176. None of the non-halogenated VOCs have been detected above groundwater standards. Metals contamination is not evident, given that all dissolved metals concentrations are below standards.

As stated in the previous section, the source of the halogenated VOCs can be associated with SWMU 177 (Building 1176 drainage sumps). The majority of the halogenated VOCs have historically been detected immediately downgradient of this area. TCE concentrations within MW-39-02 have continued to decrease from 59 µg/L to 19.8 µg/L. During the January 2007 LTM event, TCE concentrations ranged between 2.01 µg/L in MW-39-12 to 464 µg/L in MW- 39-06D. Based on the TCE concentrations detected (Figure 4.11), the current permanent and pre-pack monitoring well network delineates the TCE groundwater plume to below 5 µg/L (U.S. EPA MCL), with the exception of wells MW-39-05, MW-39-08 and MW-39-11.

Samples obtained via DPT methods in 1998 delineated the plume to levels below the MCL downgradient of these wells. During the July 2006 sampling event, perchlorate concentrations ranged from 12 µg/L to 130 µg/L, with the highest concentrations detected within the Lost River drainage basin. Based on the perchlorate distribution, the source of the perchlorate in this area appears to be the Lost River drainage basin and not SS-39.

TDS concentrations within the vicinity of the TCE groundwater plume range from 15,700 mg/L to 141,000 mg/L. Groundwater standards are therefore provided for reference only and do not apply.

3.4.6 Supplemental RFI Conclusions and Recommendations

Sediment/soil and groundwater contamination has been identified in the media collected from the vicinity of Building 1176. Metals contamination associated with test track activities have been well investigated and determined not to be migrating to the Lost River drainage basin.

TRPH contamination within the drainage swale that receives discharges from the test track concrete collection basin has not been delineated downgradient of the upper swale reaches. TRPH adjacent to the Building 1176 parking lot can be attributed to parking lot runoff and not a RCRA release.

Subsurface soil contamination has been detected only adjacent to SWMU 177 (the drainage sump) and in contact with the underlying groundwater, as evident from groundwater contamination detected downgradient of SWMU 177. Groundwater in this area is impacted with VOCs and perchlorate; however, only TCE can be attributed to the site. Based on current TCE concentrations, a TCE groundwater plume is migrating to the west-southwest along the northern edge of the Lost River drainage basin.

TDS concentrations in the basin and beneath Building 1176 exceed the 10,000 mg/L threshold where groundwater standards would apply.

Following are the recommendations presented in the Supplemental RFI report:

- Improved operations and maintenance (O&M) of the concrete catch basin (SWMU 167) and drainage box (SWMU 179) will need to be adopted to prohibit future releases of hazardous materials to the downgradient media.
- The lead-impacted soils present in the Concrete Catch Basin (SWMU 167) should be removed to prevent further migration/discharge. The catch basin appears to be approximately 3 feet wide, 15 feet long and 0.5 feet deep. Assuming the entire depth is full, approximately 0.8 yd^3 of sediment will require removal and disposal.
- Further investigation and subsequent removal of the TRPH in the shallow soil should be conducted within the drainage swale downgradient of the discharge box. No action is warranted for the TRPH associated with parking lot runoff.
- No additional delineation of TCE in groundwater is warranted. The source of the groundwater contamination has been confirmed to be soils associated with SWMU 177, the drainage sumps. It is recommended that contaminated soils in the area of the two drainage sumps be removed to the top of the water table to eliminate the source of VOCs to the groundwater. Until the removal action, it is recommended that LTM be suspended.

- Following the removal action, it is recommended that the six remaining semi-annual rounds of groundwater monitoring be performed for TCE only to assess the removal action and confirm plume stabilization.
- Perchlorate monitoring is not warranted, as it cannot be attributed to the site. Provided that the TCE plume stabilizes and removal actions are performed, NFA under NMED criterion 5 will be appropriate in the future.

3.5 LONG TERM MONITORING

Groundwater was sampled from 10 monitoring wells as a part of LTM at the site in July 2007, January 2008, and July 2008. The first two LTM events were conducted during Supplemental RFI in July 2006 and January 2007. The samples were analyzed for VOCs, total and dissolved RCRA metals, perchlorate, UDMH, aniline, and TDS. Vegetation was observed within MW-39-03 and due to its compromised condition was not sampled.

SS-39 groundwater analytical results from the July 2007, January 2008, and July 2008 events, along with the groundwater analytical data from the previous two semi-annual events conducted in July 2006 and January 2007, are summarized in Table 3-11. U.S. EPA MCLs and NMGWQ standards are also included in Table 3-13 for comparison purposes. The concentrations of chemicals exceeding the standards are presented in Figure 3-4.

3.5.1 July 2007 and January 2008 Sampling Results

During the July 2007 and January 2008 sampling events, TCE, perchlorate, arsenic, and selenium were detected at concentrations exceeding screening criteria. TCE, arsenic, and selenium exceeded NMWQCC standards and/or U.S. EPA MCLs. In July 2007, TCE exceeded the NMWQCC standard (100 µg/L) and/or the U.S. EPA MCL (5 µg/L) in MW-39-02 (29 µg/L), MW-39-05 (26 µg/L), MW-39-06 (440 µg/L), MW-39-06D (470 µg/L), MW-39-08 (30 µg/L), and MW-39-11 (25 µg/L). In January 2008, TCE NMWQCC and/or U.S. EPA MCL exceedances occurred in MW-39-02 (17 µg/L), MW-39-05 (17 µg/L), MW-39-06 (120 µg/L), MW-39-06D (92 J µg/L), MW-39-08 (26 µg/L), and MW-39-12 (12 µg/L). A slight increase in TCE concentrations was observed during the July 2007 semi-annual event; however, the January 2008 TCE distribution is similar to that observed in July 2006 and January 2007 but at slightly lower concentrations.

Dissolved arsenic and selenium were detected in several of the monitoring wells at concentrations exceeding NMWQCC standard (selenium, 50 µg/L) and/or U.S. EPA MCL (arsenic, 10 µg/L, and selenium, 50 µg/L). The distribution of the metals exceedances suggest the presence of arsenic and selenium at concentrations greater than the screening criteria is associated with the naturally occurring high TDS concentrations and not site related.

Aniline was not detected in the groundwater samples during the July 2007 and January 2008 semi-annual events. Due to severe matrix interference, the UDMH results for July 2007 were rejected. UDMH was not detected in the January 2008 groundwater samples. The lack of aniline and UDMH in the site groundwater during the two sampling events is consistent with the historic results.

Perchlorate was detected above the U.S. EPA Region VI 2007 HHMSSL (24.5 µg/L). In July 2007, perchlorate concentrations exceeded the screening value in MW-39-05 (31 µg/L), MW-39-06 (38 µg/L), MW-39-06D (34 µg/L), MW-39-07 (91 µg/L), MW-39-08 (99 µg/L), MW-39-09 (160 µg/L), MW-39-10 (86 µg/L), MW-39-11 (120 µg/L), and MW-39-12 (230 µg/L). In January 2008, perchlorate exceedances were detected in MW-39-06 (27 µg/L), MW-39-06D (32 µg/L), MW-39-07 (741 µg/L), MW-39-08 (84 µg/L), MW-39-09 (180 µg/L), MW-39-10 (220 µg/L), MW-39-11 (100 µg/L), and MW-39-12 (80 µg/L). July 2007 and January 2008 perchlorate analytical concentrations are similar to historic results.

3.5.2 July 2008 Sampling Results

During the July 2008 sampling event, TCE, perchlorate, arsenic, cadmium, lead, and selenium were detected at concentrations exceeding screening criteria. TCE, perchlorate, arsenic, cadmium, lead, and selenium exceeded NMWQCC standards and/or U.S. EPA MCLs (Table 3-11). In July 2008, TCE exceeded the NMWQCC standard (100 µg/L) and/or the U.S. EPA MCL (5 µg/L) in MW-39-02 (13.3 µg/L), MW-39-05 (9.5 µg/L), MW-39-06 (94.4 µg/L), MW-39-06D (355 µg/L), MW-39-08 (20.4 µg/L), and MW-39-11 (10.3 µg/L). A slight decrease in TCE concentrations was observed during the July 2008 semi-annual event as compared to January 2008 sampling event.

Arsenic, cadmium, lead, and selenium were detected in several of the monitoring wells at concentrations exceeding NMWQCC standard and/or U.S. EPA MCL (Table 3-11). The distribution of the metals exceedances suggest that it is associated with the naturally occurring high TDS concentrations and not site related. The TDS concentrations in each monitoring well were greater than 10,000 mg/L.

NMED agreed to suspend aniline and UDMH analyses at SS-39 (HGL, 2008).

Perchlorate was detected above the U.S. EPA Region VI 2007 HHMSSL (24.5 µg/L). In July 2008, perchlorate concentrations exceeded the screening value in MW-39-06 (29 µg/L), MW-39-06D (31 µg/L), MW-39-07 (66 µg/L), MW-39-08 (83 µg/L), MW-39-09 (1500 µg/L), MW-39-10 (150 µg/L), MW-39-11 (110 µg/L), and MW-39-12 (78 µg/L). July 2008 perchlorate analytical concentrations are slightly lower that January 2008 sampling event.

Six out of eight semi-annual groundwater monitoring events have been completed in accordance with NMED's comments of the RFI work plan.

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4.0 ACCELERATED CORRECTIVE MEASURES

This section presents the recommended accelerated corrective measures based on the results of the previous investigations. Submittal of an AF 813 form, Request for Environmental Impact Analysis, is required by the NEPA department of the 49CES/CEAO prior to beginning field work at SS-39.

4.1 SOIL REMOVAL/ADDITIONAL INVESTIGATION

4.1.1 Concrete Collection Basin (SWMU 167)

A sediment sample collected and analyzed during the Supplemental RFI in 2006 from the Concrete Collection Basin (SWMU 167) indicate that lead was detected at concentration of 1,438 mg/kg, exceeding the NMED residential (400 mg/kg), industrial (800 mg/kg), and construction worker (800 mg/kg) SSLs. During collection, the sediment was visually inspected and field screened with a PID. No staining, unusual odors, or PID readings were noted in the sediment.

It is proposed to remove the lead-impacted sediments present in the Concrete Catch Basin (SWMU 167). The catch basin is approximately 3 feet wide, 15 feet long, and 0.5 feet deep. It is estimated that less than 1 yd^3 of the sediments will be removed and disposed of off-site at a permitted facility. A composite sample will be collected and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) RCRA 8 Metals by EPA Method 6000/7000. The location of the Concrete Catch Basin from which the sediment will be removed is presented in Figure 4-1.

4.1.2 Discharge Box (SWMU 179)

Based on samples collected between 0-2 feet and analyzed during Phase I RI (1991), it is anticipated that material within the concrete catch basin (SWMU 167) has affected soils at SWMU 179, the outfall of SWMU 167. Elevated lead concentrations were detected in the immediate vicinity of SWMU 179 (1,300 mg/kg and 1,100 mg/kg). TRPH, although not detected within the SWMU 167 catch basin, was detected within or adjacent to SWMU 179 at concentrations above SSLs. Besides lead and TRPH, arsenic was also detected above NMED SSLs in the same samples obtained from within or adjacent to SWMU 179.

Subsurface soil sample (HA39-02R) collected during supplemental RFI in 2006 between 8 to 9 feet bgs within Discharge Box did not show and exceedances above SSL's.

Therefore, it is proposed to remove the soil present in the Discharge Box up to 2 feet bgs. The Discharge box is approximately 8 feet wide by 8 feet long. It is estimated that approximately 5 yd^3 of the soil will be removed disposed of off-site at a permitted facility. A composite sample will be collected and analyzed for TCLP RCRA 8 Metals by EPA Method 6000/7000. The location of the Discharge Box from which the soil will be removed is presented in Figure 4-1.

4.1.3 Investigation near Drainage Swale

The soil samples collected (1991) from the Discharge Box (SWMU 179) indicated exceedances of metals and TRPH above SSL's. Therefore, to further delineate the contamination previously identified at the SS-39 site, soil samples were collected from borings located along the drainage ditches below the oxidizer and propellant outfalls during Phase II RFI. The samples were analyzed for SVOCs and metals only. VOCs and TRPH were not analyzed. According to the analysis, the detected analytes (metals and SVOC's) were not unusually elevated and did not exceed SSLs. This indicates that metal contaminants have not migrated downgradient within the swale. However, investigation related to TRPH concentrations further down the drainage swale has not been conducted.

It is proposed to install a total of 4 DPT soil borings in the drainage swale area as shown in Figure 4-2. Three samples will be collected from each boring at depths of 1, 3, and 7 feet bgs. This will represent the sampling depth range between 0-2, 2-4, and 6-8 feet bgs, respectively. The details of the DPT sampling including depth of sampling are presented in Table 4-1. The analytes and the analysis methods are presented in Table 4-2.

The DPT subsurface soil investigations will be performed in accordance with the HAFB Standard Operating Procedure (SOP)-4 (Direct Push Sampling for Soil and Groundwater) and SOP-10 (Borehole Abandonment and Site Restoration).

Based on the results obtained from the DPT soil borings, an excavation around the drainage swale will be performed. The extent of excavation and any additional confirmation sampling will be determined based on the exceedances using the criteria presented in Figure 3-1. The excavation will be backfilled with clean backfill from a local borrow source of a similar type and nature in order to not disturb the existing habitat of the Lost River Basin. In addition, the excavation will be stabilized to prevent erosion as appropriate.

4.1.4 Removal from Drainage Sumps (SWMU 177)

Based on the analysis during Supplemental RFI, elevated concentrations of TCE, PCE, and TRPH were detected in the soils from 7 feet bgs to the top of the water table at approximately 12 feet bgs. The TCE contamination is delineated vertically to the water table. Based on the distribution of TCE in the groundwater, SWMU 177 is the likely source of the identified TCE groundwater plume. Cadmium, chromium, and lead were also above residential SSLs in the unsaturated zone.

In order to fully delineate the horizontal extent of contamination at each drainage sump area before removal action, it is proposed to install a total of 12 DPT soil borings (six at each drainage sump area) outside of the drainage sumps estimated to be approximately 8 feet in diameter as shown in Figure 4-2. In each drainage sump, three DPT soil borings will be installed 2 feet outside the drainage sump perimeter as shown in Figure 4-3. The remaining three DPT soil boring will be installed 8 feet outside the drainage sump perimeter as shown in Figure 4-3. Three samples will be collected from each boring at depths of 4, 8, and 11 feet bgs. This will represent the sampling depth range between 3-5, 7-9, and 10-12 feet bgs, respectively. The details of the DPT sampling including depth of sampling is presented in Table 4-3. The analytes and the analysis methods are presented in Table 4-4.

The DPT subsurface soil investigations will be performed in accordance with the HAFB SOP-4 (Direct Push Sampling for Soil and Groundwater) and SOP-10 (Borehole Abandonment and Site Restoration).

Based on the results obtained from the DPT soil borings, the soil excavation will be performed within and outside the drainage sumps. The extent of excavation from the approximate center of the drainage sumps will be determined based on the exceedances using the criteria presented in Figure 3-1 and is evident that the source area has extended beyond and outside the drainage sumps. Any additional confirmation sampling will be determined based on the required extent of excavation. The excavation will be backfilled with clean backfill from a local borrow source of a similar type and nature in order to not disturb the existing habitat of the Lost River Basin. In addition, the excavation will be stabilized to prevent erosion as appropriate. The location and vicinity of the drainage sumps from which the soil will be removed is presented in Figure 4-3.

4.1.5 Waste Management

Excavation and Investigation-Derived Waste consisting of soil cuttings, decontamination water, mud and purge groundwater will be handled in accordance with HAFB SOP-9 (Field Management of Investigation-

Derived Waste, presented in Appendix B). Based on analytical results obtained from the DPT soil samples and any subsequent confirmation sampling, the excavated soils, if contaminated, will be removed for off-site disposal at a permitted facility.

4.2 WELL INSTALLATION AND LONG TERM MONITORING SAMPLING

4.2.1 Permanent Monitoring Well Installation

Four permanent monitoring wells will be installed at the location shown in Figure 4-4 to delineate the horizontal extent of groundwater contamination at the SS-39 site. The monitoring wells will consist of 2" diameter PVC riser with 0.010 slot screens. The details of the monitoring well are presented in Table 4-5. A typical 2" monitoring well is presented in Figure 4-5.

4.2.2 LTM Sampling

As recommended in the Supplemental RFI, the LTM shall be performed after the soil removal action at or around the drainage sump is completed (TCE source area is removed). The LTM will be performed using fourteen monitoring wells including five pre-pack monitoring wells within the Lost River drainage basin and four newly installed permanent monitoring wells. The LTM will be performed semi-annually for two events to access the source removal action and confirm plume stabilization. The details of the new proposed LTM wells are presented in Table 4-5. The chemicals to be analyzed and the analysis methods are presented in Table 4-6.

Pre-pack monitoring wells are installed within the Lost River drainage basin since they are subject to periodic flooding after large rain events. Repeated flooding would most likely compromise the long term structural integrity of any monitoring wells installed within the basin. In addition, the USAF and USACE do not allow permanent structures to be constructed within the Lost River drainage basin (Livingston, 2006). Consequently, as discussed and agreed to by NMED during a February 2006 site visit, five pre-pack monitoring wells, designated MW-39-08 through MW-39-12, are utilized to collect groundwater samples from within the Lost River drainage basin. Survey stakes and a global positioning system are used to locate the pre-pack well locations for repeated sampling events. The pre-pack monitoring wells are constructed of a 2-inch diameter, 5-foot long, 0.010-slotted Schedule 40 PVC well screen wrapped with a stainless steel wire mesh containing a 0.25 inch thick filter pack. The screen is capped with a flush-jointed well cap and attached to a 2-inch diameter, 5-foot long Schedule 40 PVC riser pipe. The pre-pack wells are installed through an open borehole drilled using a 3-inch, decontaminated stainless steel hand auger. The hand auger borings are completed to maximum depths ranging between 5 to 10 feet bgs.

After installation, the pre-pack wells are allowed to sit undisturbed for a minimum of 12 hours prior to groundwater sampling. Once groundwater sampling activities are completed, the pre-pack wells are removed from the subsurface, decontaminated, and placed in dedicated storage containers. The abandoned boreholes are backfilled with the sediment removed during borehole advancement.

A groundwater sample will be retrieved from the wells using disposable Teflon-lined polyethylene tubing fitted to a peristaltic pump. The tubing will be inserted into the well so that the tubing inlet will be positioned approximately between the bottom of the well and the top of the water table. The wells will then be purged and sampled using low flow purging and sampling techniques, in accordance with HAFB SOP-8 (Groundwater Sampling for Chemical Analysis). Three times the tubing volume of purge water would be pumped from the well prior to sampling. After purging the required tubing volume from the wells, the appropriate sample bottles would be filled using direct filling techniques.

Groundwater sample collection and management will be conducted in accordance with HAFB SOP-1 (Documentation, Sample Handling, Chain-of-Custody, and Shipping) and HAFB SOP-8 (Groundwater Sampling for Chemical Analysis) as presented in Appendix B.

4.3 REPORTING

The results of the additional site characterization, boring and well logs, and sampling data will be presented in an Accelerated Corrective Measures Completion Report.

4.4 CONCLUSIONS

The actions outlined in this ACM Work Plan, are designed to lead to a determination of Remedy in Place. Once completed, No Further Action (NFA) Site Closure with or without soil and groundwater land use controls (LUCs) which may include MNA can be achieved.

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