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

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NMED Hazardous Waste B
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MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT
Attn: Mr. James Bearzi
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FROM: 49 CES/CD
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Subject: Response to Notice of Deficiency for the, RCRA Facility Assessment, Confirmatory Sampling Work Plan, Multiple Sites, January 2007, Holloman AFB, EPA ID# NM6572124422 HWB-HAFB-07-002

1. The following are enclosed to complete the NOD response to the Notice of Deficiency for the RCRA Facility Assessment, Confirmatory Sampling Work Plan, Multiple Sites.

a. A copy of the NOD letter dated June 11, 2007.
b. An itemized response to each NOD comment,
c. Changed text from the report with "track changes" feature enabled
d. Changed Figures from the report.
e. Changed Tables from the report.

2. 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.

3. If you have any questions, please contact Ms Deborah Hartell or Mr. Will Desmare at (505) 572-3931.

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cc (w/o Encl):

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RCRA FACILITY ASSESSMENT

CONFIRMATORY SAMPLING WORK PLAN MULTIPLE SITES HOLLOMAN AFB, NEW MEXICO

Holloman Air Force Base
New Mexico

July 2007

Contract No.: DACA87-02-D-0003
Delivery/Task Order: DK01
Bhate Project No.: 9050360.01

Headquarters, Air Combat Command
Langley Air Force Base, Virginia

49 CES/CEV
Holloman Air Force Base, New Mexico

RCRA FACILITY ASSESSMENT

CONFIRMATORY SAMPLING WORK PLAN
MULTIPLE SITES
HOLLOMAN AFB, NEW MEXICO

Prepared for:

49 CES/CEV
Holloman Air Force Base
New Mexico

Under Contract To:

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

Contract No. DACA87-02-D0003
Task Order No. DK01

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Bhate Project No. 9050360.01

July 2007

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RCRA FACILITY ASSESSMENT

CONFIRMATORY SAMPLING WORK PLAN

MULTIPLE SITES

HOLLOMAN AFB, NEW MEXICO

REVIEW SHEET

This Work Plan has been reviewed and approved by:

		7/12/07
John Hymer Site Manager	Signature	Date
		7/12/07
Jim Moore, P.G. Project Manager	Signature	Date
		7/12/07
Frank Gardner, P.G. Program Manager	Signature	Date

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RCRA FACILITY ASSESSMENT
CONFIRMATORY SAMPLING WORK PLAN
MULTIPLE SITES
HOLLOMAN AFB, NEW MEXICO
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C Analytical Results Corresponding to Locations WCC-1, WR-TH-12 and -13 at SS-72
D Analytical Results for Soil and Groundwater Sampling at SS-73 in May and June 2006
E Site-Specific Addendum to the Basewide Health and Safety Plan
F Quality Assurance Project Plan Addendum

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ACRONYMS AND ABBREVIATIONS

AAF	Army Air Field
AF Fm	Air Force Form
amsl	Above mean sea level
ANSI	American National Standards Institute
AOC	Area of Concern
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BEAR	Basic Expeditionary Airfield Resources
bgs	Below ground surface
Bhate	Bhate Environmental Associates, Inc.
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES/CEV	Civil Engineering Squadron/Combat Engineer Vehicle
COC	Chain-of-custody
DCA	Dichloroethane
DPT	Direct push technology
DRO	Diesel range organics
ERP	Environmental Restoration Program
ERPIMS	Environmental Restoration Program Information Management System
°F	Degrees Fahrenheit
FID	Flame ionization detector
FWENC	Foster Wheeler Environmental Corporation
GPS	Global positioning system
GRO	Gasoline range organics
GTI	Groundwater Technology, Inc.
HAFB	Holloman Air Force Base
HASP	Health and Safety Plan
IDW	Investigation-Derived Waste
LTM	Long Term Monitoring
µg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MCL	Maximum Contaminant Level
MS	Matrix spike
MSD	Matrix spike duplicate
NAD	North American Datum
NFA	No Further Action
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
ORO	Oil range organics
OSHA	Occupational Safety and Health Administration

ACRONYMS AND ABBREVIATIONS (CONTINUED)

OVA	Organic vapor analyzer
PA	Preliminary Assessment
PCB	Polychlorinated Bi-phenyl
P.G.	Professional Geologist
PID	Photoionization detector
PPE	Personal protective equipment
ppm	Parts per million
PVC	Polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SOP	Standard Operating Procedure
SSL	Soil screening level
SVOC	Semi-volatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCE	Trichloroethylene
TDS	Total dissolved solids
TNT	Trinitrotoluene
TPH	Total petroleum hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
USAF	United States Air Force
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile organic compound
WRCC	Western Regional Climate Center
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

Bhate Environmental Associates, Inc., (Bhate) has been retained by the U.S. Army Corps of Engineers (USACE), under contract DACA87-02-D0003, Task Order No. DK01, to conduct a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Preliminary Assessment (PA) at nine of the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at Holloman Air Force Base (HAFB), New Mexico. A copy of the Scope of Services issued by the Omaha District of the USACE dated November 8, 2005, for the nine sites (SS-65, SS-66, SS-67, SS-68, SS-69, SS-72, SS-73, RW-70, and TU-71) is included in Appendix A of this Work Plan.

In 1988, under the Resource Conservation Recovery Act (RCRA), a RCRA Facility Assessment (RFA) was performed at HAFB and included sites SS-65, SS-66, SS-67, SS-68, SS-69, RW-70, and TU-71 (A.T. Kearney, 1988). The RFA recommended that these sites be investigated further to confirm the presence of contamination. The purpose of this document, therefore, is to describe the scope of the field investigation at these locations as well as Sites SS-72 and SS-73 which are discussed below.

During the review of the RFA and other site-related documents, it was noted that SWMUs AOC-B (SS-65) and AOC-S (TU-71) appeared to be co-located and therefore their investigations will be combined so that the investigation of site SS-65 will serve to characterize both sites. This proposal was discussed with personnel from the New Mexico Environment Department (NMED) during a conference call held on November 2, 2006, and was met with approval.

During this call, the remediation work at site SWMU AOC-Q (SS-17) was discussed as it relates to site SWMU AOC-M (RW-70). The excavation and removal of contaminated soil at SWMU AOC-Q (SS-17) over the past two years has removed all contaminated soil and structures in the location of site RW-70. Therefore, NMED agreed to accept the confirmation soil sampling results for SS-17 as evidence that contamination at site RW-70 was also removed, and in addition, the NMED recommended that site RW-70 be removed from the HAFB Hazardous Waste Facility Permit via a Class III Permit Modification.

Sites SS-72 and SS-73 were discovered between 2003 and 2004 and were not part of the original 1988 RFA. These sites were created to investigate newly discovered contamination at already existing sites. In the case of SS-72, potential trichloroethylene (TCE) contamination was found in groundwater upgradient from site LF-21 and site SS-73 was identified to assess the source of upgradient TCE contamination associated with well MW02 at Site SS-61. During the November 2, 2006, conference call, NMED recommended that both sites be added to the HAFB Hazardous Waste Facility Permit.

This Work Plan will serve as the primary working document to conduct the field investigations at these sites and collect the data that is necessary to fulfill the requirements identified by NMED to achieve site closure. This document is organized into seven sections. Section 1 describes the history of HAFB and the geologic, hydrogeologic, physiographic settings, and the climatological

setting of the Base. Section 2 presents the known information for each of the sites and the work plan for performing confirmatory sampling at each location. Pre-investigative requirements and investigative requirements necessary to execute tasks for the field work are presented in Section 3. Project quality assurance and health and safety requirements are described in Sections 4 and 5, and the references are in Section 7.

It should be that this version of the document replaces the January 2007 version based on NMED correspondence, dated June 11, 2007. These comments along with the corresponding responses are summarized in Attachment 1 and the necessary revisions are reflected in this version of the document.

1.1 Base Description

HAFB is situated in south central New Mexico, in the northwest central part of Otero County, approximately 75 miles north-north-east of El Paso, Texas (Figure 1-1). HAFB has a population of 6,000 and occupies about 50,000 acres in the northeast quarter of Section 1, Township 17 South, Range 8 East. The White Sands Missile Range testing facilities occupy additional land extending northward from the Base. Private and public owned lands border the remainder of HAFB. The major highway servicing HAFB is Highway 70, which runs southwest from the town of Alamogordo and separates HAFB from publicly owned lands to the south. Alamogordo which has a population of approximately 35,000 is located approximately 7 miles east of the base.

HAFB was first established in 1942 as Alamogordo Army Air Field (AAF). From 1942 through 1945, Alamogordo AAF served as the training grounds for over 20 different flight groups, flying primarily B-17s, B-24s, and B-29s. After World War II, most operations had ceased at the base. In 1947, Air Material Command announced the air field would be its primary site for the testing and development of un-manned aircraft, guided missiles, and other research programs. On January 13, 1948, the Alamogordo installation was renamed Holloman Air Force Base, in honor of the late Col. George V. Holloman; a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at HAFB and has remained since. Today, HAFB also serves as the training center for the German Air Force's Tactical Training Center.

1.2 Physiography and Topography

Holloman AFB is located within the Sacramento Mountains Physiographic Province on the western edge of the Sacramento Mountains. HAFB is approximately 59,600 acres in area, and is located at a mean elevation of 4,093 feet above mean sea level (amsl). The region is characterized by high tablelands with rolling summit plains; cuesta-formed mountains dipping eastward and of west-facing escarpments with the wide bracketed basin forming the basin and range complex. The Base is located in the Tularosa Sub-basin which is part of the Central Closed Basins. The bordering mountains rise abruptly to altitudes of 7,000 to 12,000 feet amsl. The San Andres Mountains bound the basin to the west (about 30 miles) with the Sacramento

Mountains approximately 10 miles to the east (Figure 1-1). At its widest, the basin is about 60 miles east to west and stretches approximately 150 miles north to south.

1.3 Surface Water and Hydrology

The Tularosa Basin contains all of the surface flow in its boundaries. The nearest inflow of surface waters to the Base comes from the Lost River, located in the north-central region of the Base. The upper reaches of the Three Rivers and the Sacramento River are perennial in the basin. HAFB is dissected by several southwest trending arroyos that control the surface drainage. Hay Draw arroyo is located in the far north. Malone and Rita's Draw, which drain into the Lost River and Dillard Draw arroyos, are located along the eastern perimeter of the Base. Approximately 10,000 years ago, indications are of a much wetter climate. The present day Lake Otero encompassed a much larger area, possibly upwards of several hundred square miles. Its remains are the Alkali Flat and Lake Lucero. Lake Lucero is a temporary feature of merely a few inches in depth during the rainy season.

Ancient lakes and streams deposited water bearing deposits over the older bedrock basement material. Fractures, cracks, and fissures in the Permian and Pennsylvanian bedrock yield small quantities of relatively good quality water in the deeper peripheral. Potable water is only found from a handful of wells near the edges of the basin with more saline water towards the center. Two of the principal sources of potable water are a long narrow area on the upslope sides of Tularosa and Alamogordo with the other in the far southwestern part of the basin. Alamogordo's water, as well as the Base's, is supplied from Lake Bonito (which is in the Pecos River Basin).

1.4 Regional Geology

The sedimentary rocks which make up the adjacent mountain ranges are between 500 and 250 million years old (White Sands Missile Range (WSMR), 2003). During the period when the area was submerged under the shallow intra-continental sea, the layers of limestone, shale, gypsum, and sandstone were deposited. In time, these layers were pushed upward through various tectonic forces forming a large bulge on the surface. Approximately 10 million years ago the center began to subside resulting in a vertical drop of thousands of feet leaving the edges still standing (the present day Sacramento and San Andres mountain ranges). In the millions of years following, rainfall, snowmelt, and wind eroded the mountain sediments depositing them in the valley (i.e. Tularosa Basin). Water carrying eroded gypsum, limestone, dolomite, gravel, and other alluvial matter continues to flow into the basin with no route of exit.

The Tularosa Sub-basin is geologically described as a bolson, which is an extensive flat alluvium-floored depression, into which drainage from the surrounding mountains flows toward a central playa. The overlying alluvium generally consists of unconsolidated gravels (limestone, dolomite, and gypsum), sands, and clays. A fining sequence from the San Andreas and Sacramento Ranges towards the basin's center characterizes the area with the near surface soils as alluvial, eolian, and lacustrine deposits. The alluvial fan deposits are laterally discontinuous units of interbedded sand, silt, and clay while the eolian deposits consist primarily of gypsum

sands. The eolian and alluvial deposits are usually indistinguishable due to the reworking of the alluvial sediment by eolian processes. The playa, or lacustrine deposits, consist of silty clay containing gypsum and are contiguous with the alluvial fan and eolian deposits.

Mesozoic rocks in the northwest mark the Colorado Plateau, topped by younger Tertiary strata. Quaternary age sediments have washed off the Southern Rockies into the open basins and the Rio Grande Rift, a failed spreading center or aulacogen. This would-be ocean basin runs up the center of the state with the Rio Grande flowing down its middle, exposing the Paleozoic and Precambrian rocks on its uplifted flanks. Later Cenozoic volcanic intrusions of Quaternary and Tertiary age are also associated with the rifting.

The great Permian Basin of Texas continues into the state from the southeast with younger Quaternary-Tertiary sediments of the Great Plains cover the whole eastern edge. Basin-and-range terrain of Tertiary sediments and volcanics appear in the extreme southwest coupled with wide dry basins choked with Quaternary coarse sediments eroded from the blocks of uplifted older rocks.

1.5 Regional Hydrogeology

The predominance of the groundwater occurs as an unconfined aquifer in the unconsolidated deposits of the central basin, with the primary source of recharge as rainfall percolation and minor amounts of stream run-off along the western edge of the Sacramento Mountains. Surface water/rainfall migrates downward into the alluvial sediments at the edge of the shallow aquifer near the ranges, and flows downgradient through progressively finer-grained sediments towards the central basin. Because the Tularosa Basin is a closed system, water that enters the area only leaves either through evaporation or percolation. This elevated amount of percolation results in a fairly high water table. Beneath HAFB, groundwater ranges from 5 to 50 feet. Flow for the Base is generally towards the southwest with localized influences from the variations in the topography of the Base. Near the arroyos, groundwater flows directly toward the surface drainage feature.

Groundwater quality in the Tularosa Basin is of potable quality at the recharge areas in close proximity to the Sacramento Mountains and becomes increasingly mineralized toward the central portion of the basin and discharge areas (Radian, 1993). The majority (over 70%) of the Environmental Restoration Program (ERP) Sites / SWMUs / AOCs located across HAFB, have groundwater monitoring wells containing water with an average total dissolved solids (TDS) concentration greater than 10,000 milligrams per liter (mg/L). This TDS data supports the hypothesis that TDS concentrations below 10,000 mg/L at HAFB are caused by dilution of natural groundwater from leaking water lines and surface irrigation from the domestic water supply. TDS concentrations greater than 10,000 mg/L exceed the New Mexico Water Quality Control Commission (NMWQCC) limit as potable water and thus, the groundwater beneath HAFB has been designated as unfit for human consumption. Likewise, U.S. Environmental

Protection Agency (USEPA) guidelines have identified the groundwater as a Class IIIB water source, characterized by TDS concentrations exceeding 10,000 mg/L.

In addition, there are no potable water wells on HAFB. Potable water for the base and the city of Alamogordo is derived from the nearby Sacramento Mountains. The only production water well, used for livestock irrigation, is located approximately 7 miles southwest of HAFB.

1.6 Climate

As a whole, New Mexico has a mild, arid to semi-arid continental climate characterized by light precipitation totals; abundant sunshine, relatively low humidity and relatively large annual and diurnal temperature range (Western Regional Climate Center [WRCC], 2003). The climate of the Central Closed Basins varies with elevation. The Base is found in the low areas and is characterized by warm temperatures and dry air. Daytime temperatures often exceed 100 degrees Fahrenheit (°F) in the summer months and middle 50s in the winter. A preponderance of clear skies and relatively low humidity permits rapid night time cooling resulting in average diurnal temperature ranges of 25 to 35°F.

Potential evapotranspiration, at 67 inches per year, significantly exceeds annual precipitation, usually less than 10 inches. The very low rainfall amounts resulting in the arid conditions, which with the topographically induced wind patterns combining with the sparse vegetation, tend to cause localized "dust devils". Much of the precipitation falls during the mid-summer monsoonal period (July and August) as brief, yet frequent, intense thunderstorms culminating to 30 – 40% of the annual total rainfall.

1.7 Water Use

HAFB is located in the Tularosa Sub-basin. Potable water is available from municipal wells along the margins of the basin with more saline water towards the center. The principle sources of potable water are located in a long narrow north-south trending area east of Alamogordo and Tularosa and in the far southern part of the basin. HAFB is supplied potable water from Lake Bonito, which is in the Pecos River Basin.

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2 CONFIRMATORY SAMPLING WORK PLAN

The purpose of this section is to describe the findings from conducting a site visit to each location and performing a search of available records, and thereafter using this information to guide the confirmatory sampling at each site. This section is structured so that it describes each site, the records searched, past and current operational practices and dates of operations, release history, past investigations (only for SS-72 and SS-73), and the rationale and scope of the confirmatory sampling. The locations of these sites with respect to HAFB and each other can be seen on Figure 2-1. It should be noted that these sites, except for SS-72 and SS-73, were qualitatively evaluated as part of an RFA that was conducted in 1988.

2.1 SS-72, TCE Groundwater Contamination Upgradient of LF-21

This site is identified in the ERP as SS-72 and is named "TCE Groundwater Contamination Upgradient of LF-21". Although this site is not currently a documented SWMU and is not listed on Table A of the HAFB RCRA Permit (No. NM6572124422), it is expected to become one in the very near future.

2.1.1 Site Location

The location of site SS-72 is identified as the area just north of groundwater monitoring well MW21-01. This is the upgradient well for an already existing site known as the West Area Landfill # 2, or LF-21, or SWMU 116. There are three monitoring wells down gradient of LF-21 designated as MW21-02, -03, and -04. A detailed layout of this site and its surroundings is included as Figure 2-2.

2.1.2 Records Searched

The records that were searched to obtain information on this potential source area include:

- Aerial photographs over several years (1945, 1972, 1979, 1984, 1996, and 2004)
- *2005 Long Term Groundwater Monitoring Report* (Bhate, 2006)
- *Environmental Restoration Program Management Action Plan* (Holloman, 2004)
- *Draft Preliminary Investigation and Site Characterization West Ramp Fuel Contamination* (Woodward-Clyde, 1991)

2.1.3 Dates of Operation and Description of Past and Current Practices

Aerial photos taken in 1945, 1972, 1979, 1984, 1996, and 2004 from the area upgradient of monitoring well MW-21-01 were reviewed for signs of spills or maintenance facilities that

operated in earlier periods. This review only indicated that the area stretching approximately 800 feet north of this well has remained cleared and undeveloped since 1945. A site visit was made on August 14, 2006. It was noted that the nearest buildings (800, 806, 816, and 817) where maintenance activities occurred that likely used TCE as a degreaser are near the flight line about 900 feet to the northeast. No records exist documenting a release of TCE in the area of SS-72.

2.1.4 Previous Investigations and Historical Data

The TCE groundwater contamination was discovered during the sampling of monitoring wells MW-21-01, -02, -03, and -04 that were installed as part of the 10 year LTM Program for 11 RCRA sites that began in 1995 and performed monitoring of these wells every 2 years (Bhate, 2006a). These four wells were installed to meet the monitoring commitments for LF-21. The solvent TCE has only been detected in the upgradient well MW-21-01 and was measured at levels of 5.4, 11.0, 13.0, 15.0, and 13.3 micrograms per liter (µg/L) during the monitoring events that took place in 1997, 1999, 2001, 2003, and 2005, respectively. The Maximum Contaminant Level (MCL) for TCE in drinking water established by the USEPA is 5.0 µg/L. The monitoring results for TCE are summarized on Figure 2-2 and the analytical results from the LTM Program are summarized and presented in Appendix B.

In 1991, as part of an investigation of soil contamination in the West Ramp Area of the F-117 flight line, 6 monitoring wells and 14 boreholes were installed. Only monitoring well WCC-1 and borehole locations WR-TH-12 and WR-TH-13 are shown on Figure 2-2 because these are the closest to the area of interest for investigating the TCE contamination at SS-72. The soil and groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), total recoverable petroleum hydrocarbons (TRPH), and metals. The analytical results corresponding to these locations are included in Appendix C. Mercury was the only analyte detected in the groundwater sample from WCC-1 at a concentration of 1.97 µg/L. This value is below the MCL of 2.0 µg/L for mercury in drinking water set by the USEPA.

Two soil samples were collected from each location, one from 2 feet and the second from 3.5 feet below ground surface (bgs). At location WR-TH-12, ethylbenzene and benzene were measured at concentrations of 7.3 and 0.8 µg/kg, respectively in the sample collected from a depth of 2 feet bgs, and the sample collected at 3.5 feet bgs contained chromium and zinc at levels of 1.2 and 4.0 milligrams per kilogram (mg/kg), respectively. At location WR-TH-13, chromium, lead, and zinc were measured at concentrations of 1.9, 6.7, and 10 mg/kg, respectively in the sample collected from a depth of 2 feet bgs, and the sample collected from 3.5 feet bgs showed chromium and zinc at levels of 2.0 and 6.6 mg/kg, respectively. In comparison, these levels are well below the health-based Soil Screening Levels (SSLs) for a future on-site resident published by the NMED (NMED, 2006).

2.1.5 Rationale and Scope of Confirmatory Sampling

TCE has consistently been measured in monitoring well MW-21-01 at levels above the MCL since 1997. The source has not been identified because there are no industrial facilities

immediately north of MW-21-01. The nearest building is about 200 yards to the north and is a small 15 x 15 foot building (Building 878) used for communications. Further upgradient about 400 yards from MW-21-01 are a cluster of buildings (800, 806, 816, and 817) that are used for maintenance and these could be the source of the TCE.

To help confirm the presence of TCE contamination, three boreholes will be placed northeast of MW-21-01 but south of buildings 816 and 817 in the locations shown on Figure 2-2. Direct push technology (DPT) sampling equipment will be used to install the boreholes to a depth of approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled and field-screened (head space analysis) to identify the single discrete sample from each borehole location that will be submitted for laboratory analysis. Staining and/or odor may also be used to select the samples for analysis. If the screening techniques do not indicate a clear selection for analysis the sample will be collected at the capillary fringe. The soil samples will be analyzed for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs). A temporary monitoring well (hereinafter referred to as a temporary groundwater sampling point) will be installed in each completed boring. A groundwater sample from each point or well will be collected and analyzed for VOCs and TDS.

2.2 SS-73, TCE in Groundwater Adjacent to SS-61

This site is identified in the ERP as SS-73 and is named "TCE in Groundwater Adjacent to SS-61". Although this site is not currently a documented SWMU and is not listed on Table A of the HAFB RCRA Permit (No. NM6572124422), it is expected to become one in the very near future.

2.2.1 Location

The location of site SS-73 is generally known to be an open area located about 150 feet east of the concrete pad that is part of site SS-61. The exact limits of the site are unknown. Presently, a source for the TCE detected in groundwater is not known. A detailed lay-out of the site and its surroundings is included as Figure 2-3.

2.2.2 Records Searched

The records that were searched to obtain information on this potential source area include:

- Aerial photographs over several years (1945, 1972, 1979, and 2004)
- *Final Voluntary Corrective Measures Work Plan Site SS-61 Soil Remediation* (Bhate, 2006)
- *Final Remedial Investigation Report for Spill Site 61* (Foster Wheeler Environmental Corporation, 1999)
- *Memorandum Scope of Work for Soil and Groundwater Sampling* (Bhate, 2006b)
- *Sample Summary and Report of Analysis* (Accutest, 2006)

2.2.3 Dates of Operation and Description of Past and Current Practices

This site is related to the aviation gasoline fueling operation for squadrons of bombers that were temporarily stationed at HAFB from the end of WWII until the late 1940s. Past operational practices in this area have been primarily re-fueling and maintenance of aircraft. The fuel was stored in two aboveground storage tanks (ASTs) that have been since removed (see Figure 2-3). No practice or operation has been linked to the presence of TCE in groundwater at site SS-73. A building or operation has not been directly linked to SS-73. However, TCE was a common solvent and routinely used for maintenance procedures on all aircraft. Currently, no operations are conducted in this area related to air operations at the Base. A site visit was made on August 14, 2006. The nearest buildings are to the south about 300 feet away and are occupied by the 49th Testing Squadron.

2.2.4 Previous Investigations and Historical Data

As previously discussed, the origin of site SS-73 results from the occurrence of TCE that has been measured in well SS-61-MW02 on several occasions. Site SS-61 resulted from the occurrence of VOCs in well MW-29-05 which is part of site LF-29 (the Old Army Landfill) located downgradient of SS-61. Several environmental investigations have been conducted in this area to determine the source of VOC contamination originally detected in groundwater monitoring well MW-29-05.

Contamination was initially detected in the vicinity of SS-61 during the Phase II RCRA Facility Investigation (RFI) Table 1 Investigation that was conducted at nearby SWMU 104, the Former Army Landfill (also known as LF-29) in 1995 (Radian, 1995). Four additional groundwater monitoring wells (MW-29-05 through MW-29-08) were installed in 1997 and a complete round of groundwater sampling and analysis was conducted (8 groundwater monitoring wells). The results showed that MW-29-05 contained benzene at 3,100 µg/L, 1,2-dichloroethane (1,2-DCA) at 350 µg/L, 2,4,6-trinitrotoluene (TNT) at 0.23 µg/L, and 1,3,5-trinitrobenzene at 2.6 µg/L. Since the source of groundwater contamination was expected to be to the southeast of MW-29-05 and to the east of Building 1001, SS-61 was identified and subsequent Phase I and II RFIs were conducted in 1996 and 1997 (Foster Wheeler Environmental Corporation [FWENC] and Groundwater Technology, Inc. [GTI], 1997). During these investigations, TCE was measured in well SS61-MW02 in concentrations of 13.6 and 45.0 µg/L, respectively, and, TCE was measured at 14.0 µg/L in the DPT groundwater sampling point DP-20 (see Figure 2-3 for selected results and sampling locations).

During the Remedial Investigation of SS-61 in 1999, TCE was reported at 34 µg/L in well SS61-MW-02 (it should be noted that this value is not shown on Figure 2-3). Because there is no known or obvious source for the TCE, it was separated from site SS-61 and designated as site SS-73 to be investigated separately.

In 2006, an abbreviated sampling plan was prepared by Bhate to collect preliminary data that would be useful for preparing an RFI work plan for this site. The scope of this effort was to resample monitoring well SS61-MW-02 for VOCs, collect two groundwater samples at locations upgradient of monitoring well SS61-MW-02, to resample the old DPT point DP-20 (now called DP03), and collect a soil sample from each DPT boring. All samples were analyzed for VOCs and the groundwater samples were also analyzed for TDS. The VOCs were reported below detection levels in all soil samples. TCE and benzene were reported in the groundwater from SS61-MW02 and DP03 (old DP-20) at 13.6 and 13.1 µg/L and 2.4 and 11.0 µg/L, respectively. The TDS levels measured at locations SS61-MW02, DP01, DP02, and DP03 were 12,500; 11,500; 8,970; and 21,600 mg/L, respectively (see Figure 2-3). The analytical results for these May and June 2006 sampling events are included in Appendix D.

The chronology of previous investigations from 1996 through 2005 at this site, based on reports reviewed is outlined below:

- *Draft Final Workplans – Field Sampling and Analysis Plan and Quality Assurance Project Plan for Characterization of AOC-1001 Holloman AFB, NM (*Foster Wheeler and GTI, 1996)
- *Draft Final Phase I and II RCRA Facility Investigation Report Site AOC 1001, Holloman AFB, NM* (Foster Wheeler and GTI, 1997)
- *Final Phase I Remedial Investigation for Spill Site 61, Holloman AFB, NM* (Foster Wheeler Environmental Corporation, 1999)
- *Final Phase II Remedial Investigation for SS- 61 – Spill Site 61, Holloman AFB, NM* (Foster Wheeler Environmental Corporation, 2000)
- *Monitored Natural Attenuation Report for SS-61 (AOC-100) Holloman AFB, New Mexico* (Bhate, 2005)
- *Memorandum Scope of Work for Soil and Groundwater Sampling, Holloman AFB, New Mexico* (Bhate, 2006b)

2.2.5 Rationale and Scope of Confirmatory Sampling

Previous investigations over the last 10 years have determined the extent of TCE contamination to the south, west, and north of monitoring well SS61-MW-02. The current subsurface conditions northeast of this area have not been determined and will be documented by installing three boreholes in this area and analyzing three soil samples.

DPT sampling equipment will be used to install five boreholes in the locations shown on Figure 2-3 to a depth of approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled and field-screened (head space analysis) to identify the single discrete sample from each borehole location that will be submitted for laboratory analysis. Staining and/or odor may also be used to select the samples for analysis. If the screening techniques do not indicate a clear selection for analysis the samples will be collected at the capillary fringe. Soil samples collected from SS73-DP04, SS73-DP05, and SS73-DP06 will be analyzed for VOCs and SVOCs. Soil samples will be analyzed for VOCs, SVOCs, and total

petroleum hydrocarbons (TPH) for both GRO and DRO from borings SS73-DP07 and SS73-DP08, which will be located around buildings 1085 and 1088.

Temporary groundwater sampling points will be installed in the completed borings. A groundwater sample will be collected from each point or well and analyzed for VOCs, TPH (GRO and DRO), and TDS.

2.3 SS-65, Building 807 Test Cell Surface Spill

SWMU AOC-B is identified in the ERP as SS-65, the Building 807 Test Cell Surface Spill Area. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.3.1 Location

The 1988 RFA identifies the location of this site as the "Area next to Building 807 Test Cell". Another document entitled *HAFB Environmental Restoration Program Site Status Summaries* prepared in December 2005 identifies the location of this site as 25 feet north of Building 807 (Holloman, 2005).

Aerial photographs of HAFB dated 1972, 1979, 1996, and 2004 were viewed and Building 807 could not be located. The Real Property Office at the base was contacted and it was learned that Building 807 is listed in their inventory as a cinder block building that was constructed in 1977 that measures 10 feet wide by 15 feet long. A detailed layout of this site and its surroundings is included as Figure 2-4.

The site which is in the sensitive F-117 area was visited on July 12, 2006. A cinder block building measuring 10 x 15 feet was found 40 feet southeast of Building 801. However, the building was not numbered as Building 807. The building is locked and stenciled with the number 1166. The building has no windows and is not occupied.

Even though oil and grease staining next to Building 807 was observed during the 1988 RFA, there were no visible signs of staining or spills of any kind noted during the site visit. Three soil piles were observed outside the northwest wall of the building. However the soil appears to be excess overburden removed during the repair of a nearby water line.

2.3.2 Records Searched

The records searched for this site included:

- Aerial photographs over several years (1972, 1979, 1996, and 2004)
- HAFB Real Property Records
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

- *Construction Trim Pads W/Support (Phase I and II), Drawing Number HO 285A-6, Sheet 2.I of 10* (Holloman, 1980)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.3.3 Dates of Operation and Description of Past and Current Practices

Building 807 was built in 1977 but does not appear to be in use currently. Because of its small size, it is believed to have been a bathroom facility for test personnel to use during the period that this particular engine test area was active. According to personnel from the HAFB 49th Civil Engineering Squadron/ Combat Engineer Vehicle (CES/CEV) Environmental Flight, this test cell area consisted of two trim pads and one engine test stand, and spills of jet fuel were known to occur especially after the engine was shut down following a test. The site was used to test engines from F-15 and F-4 fighter aircraft during the 1970s and 1980s. During the phase-in of the F-117s in the 1990s, this test cell area was abandoned and replaced with testing facilities suitable for the F-117 which are located approximately 300 yards southeast of the site. This test cell area is currently not operational because these aircraft are not part of air operations at HAFB.

2.3.4 Rationale and Scope of Confirmatory Sampling

This site has not been investigated in the past beyond the level of effort taken during the 1988 RFA. Beyond anecdotal information, there is no evidence of any kind of spill occurring at the site. The area surrounding this site has been disturbed during the construction of the adjacent F-117 bed down facilities. However, to provide documentation of current subsurface conditions at the site, three soil borings will be installed at the locations shown on Figure 2-4 and sampled to determine if conditions in the vicinity of the 1988 surface staining are still present.

The soil borings will be installed using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. The samples will be field-screened (head space analysis) and one discrete sample from each boring exhibiting characteristics of potential contamination will be submitted for laboratory analysis. Staining and/or odor may also be used to select the sample for analysis. If the screening techniques do not indicate a clear selection for analysis the samples will be collected at the capillary fringe. The soil samples will be analyzed for target analyte list (TAL) metals, TPH, SVOCs, polychlorinated biphenyls (PCBs), and VOCs. A temporary groundwater sampling point will be installed in each of the completed borings. A groundwater sample will be collected and submitted for laboratory analysis from the point or well with the highest apparent contamination and from SS65-DP01. The groundwater samples will be analyzed for TAL metals, TPH, VOCs, PCBs, SVOCs, and TDS.

2.4 SS-66, Building 835 Spills

SWMU AOC-C is identified in the ERP as SS-66, Building 835 Spills. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.4.1 Location

The 1988 RFA identifies the location of this site as the "North side of Building 835". The HAFB Environmental Restoration Program Site Status Summaries Report (HAFB, 2005) identifies the location of this site as 65 feet west of Building 835. Building 835 was not located on a 2004 aerial photo of HAFB. The HAFB Real Property Office documented the demolition of Building 835 in 2001. Today the area where Building 835 stood is an open and vacant area located on the north end of the F-117 flight line and about 60 feet southwest of Building 809. The 1988 RFA identifies the site as an oil and rust stained area approximately 20 x 30 feet in size, located on the north side of Building 835. Detailed layouts of this site and its surroundings are included as Figures 2-5 (1996 aerial photograph) and 2-6 (2004 aerial photograph).

2.4.2 Records Searched

The records that were searched for this site included:

- Aerial photographs taken in 1996 and 2004
- *Real Property Form 300 Facility Disposal, Vacate Inspection/Environmental Clearance* (Holloman, 2000)
- *Memorandum Notifying of Facility Disposal* (Moya, 2001)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.4.3 Dates of Operation and Description of Past and Current Practices

According to HAFB records, Building 835 was built in 1954 and was demolished in 2001. The building consisted of a concrete foundation and floor with sheet metal walls and roof and was 3,600 square feet in size. This building was used as a heat treating facility for jet engine parts, although it was used for furniture and equipment storage by the German Air Force during the last two years before demolition.

Mr. Bill Ford of the 49 CES/CEV Environmental Flight was interviewed on July 12, 2006, regarding operational practices at Building 835 and he discussed visiting Building 835 in the 1960s during his rounds to maintain boilers at several facilities within HAFB including this building. He confirmed the practice of heating and quenching metal parts in oil for the purpose of hardening or softening the metals. He recalls seeing recently quenched parts resting over

metal horses to dry. The quenching oil would drip onto the concrete both inside and outside the building. These oil stains on the concrete pads outside the north side of the building are visible in the aerial photograph taken in 1996 (see Figure 2-5).

A visit to this location was made on July 12, 2006, which confirmed that Building 835 was demolished and in its place is a vacant lot. A smaller building (compressor house), identified in the 1996 aerial photograph near the northeast corner of Building 835, remains today. This building is not occupied and is of sheet metal construction and can serve as a reference to direct any field characterization activities as needed.

The search for operational history and practices from the heat treating operation that took place in the past at Building 835 did not reveal any releases other than those of quenching oil that were noticed in aerial photographs on the exterior concrete pads that were located on the north end of Building 835.

No visible signs of hydrocarbon staining, stressed vegetation or rust were observed in the area surrounding the former building during the July 12, 2006, visual examination of the site. The area is noted as stained in the 1988 RFA and appears to be stained in the 1996 aerial photograph. Most likely the area was disturbed during the demolition of the building in 2001.

2.4.4 Rationale and Scope for Confirmatory Sampling

This site has not been investigated in the past beyond the level of effort taken during the 1988 RFA. Institutional knowledge of the practices at Building 835 and possible staining observed in aerial photographs suggest the potential for impact to the subsurface at the site. However, no evidence of a release exists at the site. The area surrounding this site has been disturbed during the demolition of Building 835. In order to provide documentation of current subsurface conditions at the site, a soil boring will be installed and sampled to determine if conditions in the vicinity of the 1988 staining impacted the subsurface at the site.

Four soil borings will be installed in the locations shown on Figure 2-6 using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. The samples will be field screened and one discrete sample from each boring exhibiting characteristics of potential contamination will be submitted for laboratory analysis. Staining and/or odor may also be used to select the samples for analysis. If the screening techniques do not indicate a clear selection for analysis the samples will be collected at the capillary fringe. The soil samples will be analyzed for TAL metals, TPH, SVOCs, PCBs, VOCs, and cyanide (except SS66-DP01). A temporary groundwater sampling point will be installed in each of the completed borings. Groundwater samples will be collected and submitted for laboratory analysis from the point or well with the highest apparent contamination and from SS66-DP01. The groundwater samples will be analyzed for TAL metals, TDS, PCBs, VOCs, SVOCs, and cyanide.

2.5 SS-67, Building 903-909 Sandblast Residue

SWMU AOC-E is identified in the ERP as site SS-67, Buildings 903-909 Sand Blast Residues. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.5.1 Location

The 1988 RFA identifies this site as an area 50 x 50 feet in size of surface soil contaminated with sand blast residue that is located "100 feet east of Building 903". Building 903 is located in the south end of the 49th Materiel Maintenance Group complex at HAFB, also known as the BEAR (Basic Expeditionary Airfield Resources) Base.

It should be noted that during the 1988 RFA, Building 909 was included in the name of this site, thereby implying that it was part of the site. This is believed to be an error because Building 909 is located on the far north side of BEAR Base, approximately 2,000 feet away from Building 903. A detailed layout of this site and its surroundings is included as Figure 2-7.

2.5.2 Records Searched

The records that were searched for this site included:

- Aerial photographs taken in 1996 and 2004
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)

2.5.3 Dates of Operation and Description of Past and Current Practices

At the time of the 1988 RFA, metal surface preparation and painting operations took place at buildings 903 and 905 as part of a corrosion control operation that served HAFB. The corrosion shop began operation in 1978. Sand blasting of metal parts (aluminum and steel) took place in Building 905 and was performed as a surface preparation step prior to painting which was done in Building 903. Residue which is a mixture of materials including the silica shot, metal, and old paint was staged outside of Buildings 903 and 905. Mounds of material can be seen staged on the south end of Buildings 903 and 905 in the 1996 aerial photograph of the area. However, personnel from that period that are familiar with the sand blasting operation could not be located to confirm that these mounds or piles were in fact residue from the sand blasting operation and were present during the site visit made as part of the RFA in 1988. Aerial photos of this area for the years 1987, 1988, and 1989 could not be located to confirm the presence of these piles during these earlier years.

Sandblasting residue containing paint chips and heavy metals may have been placed directly on the ground adjacent to the buildings. Aerial photographs, institutional knowledge, and the presence of a small remaining area of staining (near the telephone pole) indicate that stockpiling of this material may have occurred. Piles of this debris no longer exist at the site. The exact volume of material that was generated and perhaps placed in piles on the ground is unknown.

Surface cleaning (Building 905) and painting operations (Building 903) for corrosion control continue today in these buildings, although process improvements have been made with regard to the sand blasting operation and residue management. For instance, the abrasive material currently in use is plastic beads instead of silica. The beads are separated from the abraded sediments allowing reuse of the beads and collection of the sediments for proper disposal as hazardous waste.

This site was visited on July 12, 2006. The residue from the sandblasting is currently drummed and labeled as hazardous waste. The exterior of both buildings were examined and it was noted that the sand piles that appeared in the 1996 aerial photo were removed and replaced with ornamental cobble stone. An area just south of Building 905, near a telephone pole, was observed to have black colored grit over a surface area of approximately 6 x 6 feet. This black material is similar to the description of the sandblasting debris described in the 1988 RFA. However, it should be noted that biological soil crusts (which may appear similar to the material described above) exist naturally in the area and are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials. These crusts play an important role in the increase of soil stability and water infiltration, and appear to have a positive effect on plant germination and growth.

Based on recent field observations (April 2007), this area appears to have been graded and gravel has been laid in the area. No sandblasting residue was visibly apparent. Soil removal activities do not appear to be warranted at this time.

2.5.4 Rationale and Scope for Confirmatory Sampling

Institutional knowledge over past practices in these buildings, combined with the observation of dark sand-like material on the ground during the site visit and the review of aerial photographs suggest the potential for impact to the subsurface at this site. Most of the area surrounding both buildings has been landscaped with cobble stone which most likely required the excavation/scraping of the area. The confirmatory sampling will target two areas. One near a telephone pole south of Building 905 where a dark stained gritty area on the ground was observed and may represent the conditions identified in the 1988 RFA, and a second area south of Building 903 where piles of silica were observed staged in an aerial photograph dated 1996. These areas are shown on Figure 2-7.

Four soil borings will be installed in the locations shown on Figure 2-7 using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. One discrete sample from each boring (0-2.5-foot interval) will be submitted for laboratory analysis. Staining and/or odor may also be

used to select the samples for analysis. The soil samples will be analyzed for TAL metals, TPH, SVOCs, and VOCs. A temporary groundwater sampling point will be installed in the completed borings at each location. A groundwater sample will be collected from each of the points or wells and submitted for laboratory analysis. The groundwater samples will be analyzed for TAL metals, TPH, VOCs, SVOCs, and TDS.

2.6 SS-68, Asphalt Tank Spill Area

SWMU AOC-F is identified in the ERP as site SS-68, Asphalt Tank Spill Area. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.6.1 Location

The 1988 RFA states that aboveground and below ground tanks that were previously removed were located to the northwest of Building 121. The December HAFB Environmental Restoration Program Site Status Summaries Report places the location as 200 feet northeast of Creosote Avenue, which is different from the location identified in the 1988 RFA. This location coincides with the current piles of asphalt that are gathered from road work across the Base and recycled. While the exact location is unknown, the most likely location of these tanks (if they ever existed) would have been at the location used to stockpile and recycle asphalt pavement. Detailed layouts of this site and its surroundings are included as Figures 2-8 (1996 aerial photograph) and 2-9 (2004 aerial photograph).

There was no evidence or signs of any kind of tank in this area noted during the site visit on July 10, 2006.

2.6.2 Records Searched

The records searched to obtain information on this spill include:

- Aerial photographs taken in 1984, 1996, and 2004
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report.* (Kearney, 1988)

2.6.3 Dates of Operation and Description of Past and Current Practices

Weathered asphalt removed from road improvement projects at HAFB has been crushed and reused since the 1980s. Typically, after it has been removed, the asphalt has been staged in an undeveloped area east of Creosote Avenue and north of the base enlisted personnel housing area. Normally the asphalt is staged in piles until it is reused. This has been standard practice since the early 1980s. An aboveground tank has not been observed in the aerial photographs of the area taken in 1984, 1996, and 2004. Further, asphalt tanks are typically heated to keep the

material warm and flowable for use and that would make underground tanks unlikely for this kind of operation at HAFB. An interview with Mr. Darvin St. John of the 49th CES/CEV was conducted on July 13, 2006. Mr. St. John was responsible for documenting the removal of many USTs at HAFB in the 1990s and did not recall the presence of any kind of underground storage tank (UST) or AST in this particular area.

Despite that previously removed ASTs and USTs are mentioned in the 1988 RFA in connection with this site, no ASTs or USTs are identified within this area in Base records. Currently, 6 piles of asphalt are located approximately 700 feet south of Building 121. Aerial photographs from years 1996 and 2004 confirm the storage of asphalt in this area but do not confirm the presence of any tanks. No releases of hazardous constituents have been documented related to this site.

2.6.4 Rationale for Justification for No Further Action (NFA)

A source of contamination cannot be tied to this location. After contacting personnel familiar with the presence and removal of USTs at HAFB, and searching the records at the HAFB Office of Real Property, there remains no evidence of USTs or ASTs at this site and there is no documentation of releases to the environment. Storage of asphalt for reuse is not considered a hazardous waste practice. If a tank was present at the site during the 1988 RFA, it could have been a portable tank for fueling equipment or some other type of portable unit for processing the asphalt. Therefore, there are no plans to conduct confirmatory sampling at this site and a petition for No Further Action will be pursued.

2.7 SS-69, Fighter Wing Flight Line Spill

SWMU AOC-I is identified in the ERP as site SS-69, Fighter Wing Flight Line Spill. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.7.1 Location

The 1988 RFA identifies the site as the location of a surface spill of approximately of 275 gallons of trichloroethylene and 200 gallons of carbon tetrachloride that occurred generally in the area of the 49th Tactical Air Command Flight Line. The HAFB Environmental Restoration Program Site Status Summaries Report (HAFB, 2005) states that the spill occurred approximately 200 feet southwest of Building 868. The source of this information could not be verified. Both documents identify the same general area as the location of the spill.

2.7.2 Records Searched

The records that were searched to obtain information on this spill include:

- Aerial photographs of the F-117 flight line taken in 1984, 1996, and 2003
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)

- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.7.3 Dates of Operation and Description of Past and Current Practices

Building 868 has been in existence for approximately 25 years and has served as a maintenance hangar for both F-117s and F-15s. There have been upgrades over the years, primarily during the early 1990s which is when the transition to the F-117s from the F-15s occurred. The aerial photographs of this period show a considerable addition to Building 868 and it tripled in length in approximately 1991. This can be seen in Figure 2-10.

A site visit was made on August 1, 2006. The flight line was examined with particular attention given to the suspected location of the spills (ie. 200 feet SW of Building 868). The entire area is covered with reinforced concrete since it serves as a taxi-way for heavy aircraft. There was no evidence of spills such as staining on concrete.

Presently, the use of solvents by the United States Air Force (USAF) is limited to parts cleaning (if at all) and for the most part the use of halogenated (i.e. TCE) and non-halogenated (i.e. acetone, toluene) solvents have been replaced with alternative chemicals as part of their pollution prevention programs.

The reported releases of trichloroethylene and carbon tetrachloride occurred over a hardened concrete surface (i.e. a flight line) approximately 12 inches thick that has low permeability. Visits were made to the HAFB Fire Department and to the Bio-Environmental organization to obtain any kind of record that would confirm the solvent spills but none was found, nor was there any personnel that recalled any spill in that area in the 1980s.

2.7.4 Rationale and Scope for Confirmatory Sampling

A spill of solvents onto the flight line was identified in the 1988 RFA. However, no visible evidence currently exists (such as staining, stressed vegetation, or discolored soil) at the site. Regardless, to provide documentation of current subsurface conditions at the site, three soil borings will be installed and sampled to determine conditions in the vicinity of the reported solvent spills.

The three borings will be placed in the locations shown on Figure 2-10 using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. The samples will be field screened and one discrete sample from each boring exhibiting characteristics of potential contamination will be submitted for laboratory analysis. Staining and/or odor may also be used to select the samples for analysis. If the screening techniques do not indicate a clear selection for analysis the samples will be collected at the capillary fringe. The soil samples will be analyzed for TAL metals, TPH, SVOCs, and VOCs. A temporary groundwater sampling point will be installed in each of the completed borings and a groundwater sample will be collected from each point or well and

submitted for laboratory analysis. The three samples will be analyzed for TAL metals, TPH, VOCs, SVOCs, and TDS.

2.8 RW-70, Building 18, Product Storage Tank

SWMU AOC-M is identified in the ERP as site RW-70, Building 18 Product Storage Tank. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.8.1 Location

This UST has been included in the remediation activities conducted at ERP Site SS-17, SWMU AOC-Q (The Old BX Service Station). The RFA identifies this site as a gasoline leak from an underground gasoline storage tank that was located 50 feet northwest of Building 18. Building 18, along with the associated aboveground structures were demolished in 2003 and the contaminated soil in the vicinity of the SWMU AOC-M has been excavated (approximately 31,000 cubic yards) and removed. The extent of excavations in the area of SWMU AOC-M is shown on Figure 2-11.

2.8.2 Records Searched

The records that were searched to obtain information on this site include:

- Aerial photographs of the area taken in 1996 and 2004
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.8.3 Dates of Operation and Description of Past and Current Practices

The BX Service Station featured a gas station, convenience store, and a car wash and operated since the early 1950s. In 1981, gas leaks from the underground storage tanks were discovered and an investigation was initiated that led to the removal of five underground tanks in 1992 which were replaced with three aboveground tanks that were installed so that the BX Station could continue to operate. A new BX Station was built further north on First Street in 2000 and the original BX Station was taken out of service that same year so that the entire area could be remediated by excavating and removing for disposal the petroleum-contaminated soil underneath.

There are no operations at this location other than the ongoing soil excavation and removal activities associated with remediation of the petroleum-contaminated soil. All structures, tanks, and ancillary equipment associated with the former operation of the BX Station have been removed. This was confirmed during the site visit on July 10, 2006.

2.8.4 Justification for NFA

The soil, structures, and product storage tanks that make-up site RW-70 were completely removed during the excavation and removal activities that have taken place in the past two years to remediate the much larger SS-17 site. Site RW-70 was co-located within the larger SS-17 site. Because the source of contamination at site RW-70 has been completely removed, a petition of No Further Action will be pursued with the NMED. Documentation of the remediation of this site will be provided in the AOC-Q (SS-17) closure report.

2.9 TU-71, Leaking Underground Storage Tank

SWMU AOC-S is identified in the ERP as site TU-71, Leaking Underground Storage Tank. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.9.1 Location

The 1988 RFA does not provide an exact location for the site. However, the HAFB Environmental Restoration Program Site Status Summaries Report (2005) locates the UST just north of Building 807. This site is located at the same facility as SWMU AOC-B (the Building 807 Test Cell Spill). Based upon the available information, both sites appear to be co-located. The site visit conducted on July 12, 2006, did not reveal any signs of an underground storage tank in this area.

2.9.2 Records Searched

The records that were searched to obtain information on this site include:

- Aerial photographs over several years (1972, 1979, 1996, and 2004)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)
- *Construction Engine Test Stand (Phase I) Drawings HO 283B-6 Sheet 2 out of 5* (1980)
- HAFB Real Property Records

2.9.3 Dates of Operation and Description of Past and Current Practices

The site was used to test engines from F-15 and F-4 fighter aircraft during the 1970s and 1980s. During the phase-in of the F-117s in the 1990s, this test cell area was abandoned and replaced with testing facilities suitable for the F-117 which are located approximately 300 yards southeast of the site. There is no available information regarding the presence of a UST at this site. The information reviewed during the records search for SS-65, that included construction drawings

and records from the HAFB Real Property office, was useful during the records search of this site and confirmed that a leaking UST does not exist at the site.

2.9.4 Rationale and Scope for Confirmation Sampling

Based on the descriptions in the 1988 RFA Report for this site and site SS-65, it appears that these are very near to each other and possibly even co-located. Therefore, the confirmatory investigation for both sites will be combined. The records search was also combined. The review of construction drawings for the trim pads and Building 807, as well as the search of records at the HAFB Real Property office did not indicate that a UST ever existed at this site.

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3 ADDITIONAL INVESTIGATION ACTIVITIES

The previous sections have summarized what little background information has been found on these sites based on the efforts undertaken to date to search HAFB records. After comparing the information that was recorded during the 1988 RFA with the newly obtained information, it was evident that a source of contamination does not exist at some of the sites and as a result, the proper justification will be made to petition the NMED for an NFA determination on SWMUs AOC-F and AOC-M (ERP sites SS-68 and RW-70). Additional investigations are necessary to confirm the presumed source areas for sites SS-65, SS-66, SS-67, SS-69, and TU-71. It should be noted that the investigation of TU-71 will be combined with the investigation of SS-65.

The purpose of this section is to describe the pre-investigation requirements (Section 3.1) as well as the requirements necessary to conduct and successfully conclude the scope of the confirmatory sampling at each site (Section 3.2).

3.1 Pre-investigation Requirements

Before site-specific activities can begin, there are several pre-investigation documents and approval requirements to be met, including Air Force Form (AF Fm) 332 approval, Base dig permit(s) with utility clearances, site security measures, and facility manager notification of the intended operations. Bhate will coordinate project requests for Base installation support services through the 49th CES/CEV. Pertinent to the start of activities, a pre-construction meeting and site walk-through will be conducted with the USACE Resident Engineer, HAFB personnel, and Bhate Site Manager, to inspect site-specific conditions for equipment access, equipment staging, and decontamination area(s), potential site hazards, and emergency evacuation routes. Also reviewed at this time will be project procedures in accordance with the schedule and planned activities.

3.1.1 AF Form 332

Prior to initiating the confirmatory sampling activities, a completed and approved AF Fm 332 will be obtained. This form authorizes construction work at HAFB and is required for the initiation of any construction work. This work order describes what activities will take place at the location.

3.1.2 Dig Permit/Utility Clearances

Prior to the submittal of the dig permit(s) (AF Fm 103), the drilling locations will be clearly delineated with marker flags, stakes, or paint, as appropriate to the surface material. Utility clearance approvals will be completed by the appropriate HAFB utility office (e.g., telephone, sewer, water, natural gas etc.). Upon receipt of the approved dig permit (AF Form 103) with the utility clearances, the Bhate Site Manager or other authorized project personnel will complete a site walk-through confirming the dig permit authorizations and make any required changes.

3.1.3 Site Security

Site security is concerned with safety at the site(s) during all drilling and sampling activities and will be addressed as outlined in the *Basewide Health and Safety Plan* (HASP) (Bhate, 2003b). At a minimum the exclusion zone at each site will be secured with caution tape, and traffic cones surrounding the perimeter of the site. The size of each exclusion zone will be determined by the size of the drilling and support equipment, and the prevailing site conditions. Open boreholes will not be left unattended without first securing the immediate area surrounding the borehole, and covering the opening so that it does not become a hazard.

3.2 Investigation Requirements

Field activities will be performed in accordance with the *Site-Specific Addendum to the Basewide Health and Safety Plan* (see Appendix E of this Work Plan), the *Quality Assurance Project Plan (QAPP) Addendum* (see Appendix F of this Work Plan), as well as other USACE mandated procedures for laboratories. The field work for these confirmatory sampling activities will be conducted in accordance with HAFB Standard Operating Procedures (SOPs) provided in the *Basewide Quality Assurance Project Plan* (Bhate, 2003a) and the *Bhate Standard Operating Procedures* (Bhate, 2002). These SOPs outline methodologies for soil boring advancement, soil sampling, soil sample description, groundwater well development and sampling, field screening, sample management, equipment decontamination, and chain-of-custody procedures. Sample nomenclature will follow the Environmental Restoration Program Information Management System (ERPIMS) format. The specific HAFB SOPs for this sampling event are listed below:

- HAFB SOP-1, Documentation, Sample Handling, Chain-of Custody, and Shipping
- HAFB SOP-2, Sampling Equipment Documentation
- HAFB SOP-3, Staking, Utility Clearance, and Permitting
- HAFB SOP-4, Direct Push Sampling for Soil and Groundwater
- HAFB SOP-5, Soil Sampling for Chemical Analysis
- HAFB SOP-6, Procedure for Field Screening of Volatile Organics
- HAFB SOP-7, Lithologic Description and Geotechnical Sampling
- HAFB SOP-8, Groundwater Sampling for Chemical Analysis
- HAFB SOP-9, Field Management of Investigation-Derived Waste
- HAFB SOP-10, Borehole Abandonment and Site Restoration

The following sections describe the procedures for DPT subsurface soil sampling, DPT groundwater sampling, and the analyses to be performed at the sites requiring confirmatory sampling.

3.2.1 Laboratory Analytical Methods

The analysis of soil and groundwater samples collected for this confirmatory sampling will follow the USEPA SW-846 protocol. The site-specific analytical requirements for soil and groundwater samples are summarized in Table 3-1. The soil and groundwater samples will be analyzed as follows:

- VOCs by USEPA Method 8260B (Soil and Groundwater)
- SVOCs by USEPA Method 8270C (Soil and Groundwater)
- TPH (Gasoline Range Organics [GRO], Diesel Range Organics [DRO], Oil Range Organics [ORO]) by modified USEPA Method 8015M (Soil and Groundwater)
- TAL Metals by USEPA Method 6010B/7470A/7471A (Soil and Groundwater)
- PCBs by USEPA Method 8082 (Soil and Groundwater)
- TDS by USEPA Method 160.1 (Groundwater only)

Samples selected for laboratory analysis will be labeled, handled, and prepared for shipment in accordance with HAFB SOP-1. The detection reporting limits for all analytical parameters and the quality assurance sampling requirements (trip blanks, duplicates, and matrix spike/matrix spike duplicates [MS/MSD]) are summarized in the QAPP Addendum. All samples for VOC analysis will require a trip blank. The samples will be placed on ice and shipped under strict chain-of-custody to Accutest Laboratories in Orlando, Florida. Residual soil from the soil sampling will be discarded in accordance with the waste management procedures established in Section 3.4 of this Work Plan, Investigation-Derived Waste (IDW) Management.

3.2.2 DPT Soil Sampling

Soil samples will be collected continuously from soil borings using DPT methodology in accordance with HAFB SOP No. 4. Each boring will be visually classified and lithology described in the field according to HAFB SOP No. 7 and the Unified Soil Classification System (USCS) (American Society for Testing and Materials [ASTM] D 2487-92 and ASTM D 2488-90). The specific locations of the borings may be modified based on site-specific (access, any observed or underground utilities, etc.) field conditions.

Soils will be field screened in accordance with HAFB SOP No. 6 using an organic vapor analyzer (OVA) with soil-headspace screening techniques at two foot intervals. Notation will also be made of any visual (discoloration) and/or aromatic observations that are indicative of potential contamination. The site-specific analytical requirements for subsurface discrete soil samples are summarized in Table 3-1.

A qualified surveyor will locate the DPT boreholes using a global positioning system (GPS). All horizontal coordinates will be referenced to the State Plane Coordinate System, New Mexico Central and surveyed to an accuracy of +/- 1.0 foot. Vertical elevations will be reference to North American Datum (NAD) 1983 coordinates.

3.2.3 DPT Groundwater Sampling

Each DPT soil borehole will be converted to a temporary groundwater sampling point by extending the probe to at least three feet below the water table. Groundwater will be collected for laboratory analysis directly from the aquifer after releasing the drive point and partially retracting the rods. Either a bailer or a peristaltic pump and Teflon tubing will be inserted through the drive rods and used to retrieve the sample. Low flow or low stress techniques will be used during purging activities for sampling to minimize the disturbance of the water column and generation of IDW. Procedures for DPT groundwater sampling are outlined in HAFB SOP-4. A single volume of the sampling device will be purged prior to sample collection (i.e., one volume of Teflon tubing or one bailer volume).

Due to the fine-grained, low permeability soil, the aquifer may not produce sufficient flow to immediately sample the groundwater. In the event that a DPT borehole location exhibits a very slow recharge or an insufficient volume of water for sampling, a temporary polyvinyl chloride (PVC) well will be left in place while additional borings at the site are completed. The temporary groundwater sampling point will be developed and sampled after sufficient recharge has occurred in accordance with Bhate SOP No. 10 (*Subsurface Water Investigation*) Subsections 3 and 4. If necessary, the turbidity of the water sample will be lowered by filtering the sample through a 0.45 micron filter. Following sampling, the well will be completely removed from the ground and the borehole will be sealed in accordance with HAFB SOP-10.

A total of 13 soil and 13 groundwater samples including one duplicate sample and one MS/MSD sample will be collected from the 13 DPT boreholes and will analyzed by an offsite laboratory as specified in Table 3-1. Every shipment of samples to the laboratory will include at least 1 trip blank for the VOC analysis only. On a daily basis, only 1 trip blank would be needed provided all samples analyzed for VOCs are packaged in the same sample cooler. Samples selected for laboratory analysis will be labeled, handled, and prepared for shipment in accordance with HAFB SOP-1.

3.3 Sample Identification System

Each environmental sample collected will be identified on the sample label and chain-of-custody (COC) records, regardless of type. Sample documentation, handling, and shipping will be in accordance with HAFB SOP-1. Sample collection information inclusive of the container type and quantity for the soil samples collected during the confirmatory sampling will be performed according to the QAPP Addendum. The field duplicate samples will appear in sequence with the regular samples. An example of the sample identification nomenclature for soil samples collected from DPT boreholes will be as follows:

SS65-DP01-5-a

Site alpha-numeric identifier: SS65 = Building 807 Test Cell Surface Spill

Sample type identifier: DP = direct push boring

Sequential direct push boring number: 01, 02, etc.

Ending depth of sample interval: 5

Reserved for quality assurance (QA) sample identifiers: a = field duplicate, TB = trip blank, MS = matrix spike, MSD = matrix spike duplicate

3.4 Investigation-Derived Waste Management

IDW will be managed and characterized according to HAFB SOP-9. Whenever possible, waste minimization techniques will be used to reduce the amount of IDW. The DPT drilling technique does not generate cuttings. Left over soil from the sample tubes will be placed in 55-gallon drums and will be transported and placed in the FT-31 Landfarm at HAFB. Liquid wastes will also be containerized in either a 55-gallon drum or holding tank until receipt of the groundwater sampling results. If results indicate the waste is non-hazardous, it will be transported and disposed of through the HAFB Wastewater Treatment Plant (WWTP). Personal protective equipment (PPE) and other site non-hazardous debris/waste shall be disposed of in standard trash receptacles.

3.4.1 General Decontamination Procedures

Small equipment, such as sampling tools, will be decontaminated in accordance with HAFB SOP-2. Heavy equipment such as the DPT rig will be decontaminated by steam cleaning at a temporary decontamination pad set up at the site. The containers and decontamination pad will be managed in a secure area and the decontamination water will be allowed to evaporate or discharged to the HAFB WWTP. Sediment remaining in the decontamination pad area after the water has either evaporated or been discharged to the WWTP, will be spread on the ground.

3.4.2 Personal Protective Equipment

Prior to disposal, used PPE, disposable items, and the decontamination pad liner will be rinsed clean with tap water and diluted detergent solution. Cleaned PPE and presumed clean, based upon non-contact with contaminated soils, water, or equipment, and other disposable clean items will be contained in trash bags and disposed of at the applicable onsite sanitary waste receptacle.

3.5 Site Restoration

Upon completion of the confirmatory sampling activities, the sites will be restored to their original condition. Sampling locations will have been backfilled or grouted to the surface. The sites will be canvassed for trash, debris, etc.

3.6 Decontamination Procedures

A dry decontamination method will be used for small equipment, such as sampling tools, in order to remove large particles prior to wet decontamination in accordance with the *Basewide Quality Assurance Project Plan.* (Bhate, 2003a). Heavy equipment, such as the DPT rig, etc., will be decontaminated at a temporary decontamination pad set up at the site.

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4 PROJECT QUALITY ASSURANCE

The laboratory performing the chemical sample analysis will follow the *Basewide Quality Assurance Project Plan* (Bhate, 2003a) and the QAPP Addendum.

4.1 Standard Operating Procedures

Applicable SOPs for completing the confirmatory sampling activities are located in Appendix A of the *Basewide QAPP* (Bhate, 2003a).

4.2 Sample Identification

Each environmental sample will be identified on the sample label and COC records for each sample collected, regardless of type. Field duplicates will be paired with another field sample and will be classified as blind samples. The duplicate samples will appear in sequence with the regular samples. The identifier nomenclature will adhere to the procedures and guidelines established in the *Basewide QAPP*. Sample labeling will adhere to the format provided in the *Basewide QAPP*.

4.3 Project Documentation

The field operations documentation will provide consistent procedures and formats for documentation and management of field records and collected samples.

4.3.1 Sample Documentation

Sample documentation, identification, and tracking will adhere to the prescribed methods found in the *Basewide QAPP*. All sampling activities will include documentation of significant activities, potential environmental influences during sampling, field variances, and sample identification information. At a minimum, field logbooks will be utilized to record dates and times, sampling protocols, project numbers, and sampler's name. Daily Quality Assurance Reports will be completed and submitted weekly to the HAFB Project Manager. Other pertinent information will include COC numbers and air-bill tracking number. Chain-of-custody forms will be completed and included with each sample shipment; one COC per cooler.

At a minimum, the following sample collection information will be logged in the field book:

- Date and time
- Sample identification number
- Project number
- Sampler name
- Preservative (if any)

- Analysis
- Map or schematic of sampling location

If no map of sampling locations is available prior to sampling, a drawing of the site will be sketched on the left page of the field logbook to provide an illustration of all sampling points. Measured distances from sampling points to a fixed reference point will be recorded.

4.3.2 Field Logbook

Personnel will use only bound field logbooks for the maintenance of field records. The Project Manager will ensure that all field notes can be efficiently traced, filed, and retrieved. All entries will be recorded in indelible, waterproof ink. If errors are made, corrections will be made by crossing a single line through the error, correcting the information, and initialing and dating the correction. Entries will be made in the following format:

Documentation and reporting of events and activities will be made in chronological order on the right page of an open logbook. All entries will be dated and time of entry recorded. At the beginning of each day, the first two entries will be "personnel/contractors on site" and "weather". At the end of each day's entry, the personnel will draw a diagonal line originating from the bottom left corner of the page to the conclusion of the entry and sign along the line indicating the conclusion of the entry or the day's activity. Once completed, the field logbooks become accountable documents and will be maintained as part of the project files.

The following general requirements apply to field logbooks:

- The left page of the logbook will be used for auxiliary reporting such as sketches, tables, etc.
- The date will be recorded at the top of every page in the left-hand corner of the right page.
- The time of entry recordings will be in columnar form down the left-hand side of the right page.

4.3.3 Field Analytical Data

The field analytical data collected at the sites will include the field screening readings for selection of PPE, as well as field screening for headspace analysis. The breathing zone of the site will be screened for VOCs in the field at the time of sample collection utilizing an OVA. If a high humidity condition exists at the time of sample collecting, a flame-ionization detector (FID) is recommended since a photoionization detector (PID) is not a completely reliable screening instrument under these conditions. The field screening data will be recorded in the field logbook.

4.3.4 Data Reporting

Data obtained during confirmation sampling or field screening samples, will be reported according to the *Basewide QAPP*. In accordance with USACE EM200-1-6, the investigative

data is classified as definitive data. The data will be generated using rigorous, analyte-specific analytical methods where analyte identifiers and quantitations are confirmed and QA/Quality Control (QC) requirements have been satisfied. For this project, regular, field duplicate, and MS/MSD samples are to be collected concurrently. The data will meet the objectives of the project for level of accuracy and precision required, intended use of the data, analytical methods, time constraints, and allowable decision errors. An ERPIMS submittal will be required for this project.

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5 HEALTH AND SAFETY REQUIREMENTS

Project Health and Safety practices will adhere to the *Basewide Health and Safety Plan* (Bhate, December 2003b) and the Site Specific Addendum to the *Basewide HASP*, as included in Appendix E of this Work Plan. It is anticipated that no greater than modified level D PPE will be required to complete the confirmatory sampling activities. This includes: Occupational Safety and Health Administration (OSHA) approved safety shoes, American National Standards Institute (ANSI) approved safety glasses (Z87.1) and hard hat (Z89.1-1997: Type I), sleeved shirt and long pants, and as required, hearing protection, leather work gloves, and/or nitrile gloves during sampling.

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6 ORGANIZATION AND SCHEDULE

Mr. Jim Moore, Professional Geologist (P.G.), will serve as the Bhate Field Manager during the additional investigations and will also ensure that required project documents, permits, contractual agreements, and other program tasks are completed. Mr. John Hymer will provide on-site management of any sub-contractors for the project. The additional investigation activities are anticipated to begin in the Spring 2007 and will last approximately 2 weeks.

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Personal interview with Mr. Amos Jones of the HAFB Real Property Office on July 12, 2006.

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ATTACHMENT 1

RESPONSE TO COMMENTS

NMED CORRESPONDENCE DATED JUNE 11, 2007

Response to Comments RCRA Facility Assessment Confirmatory Sampling Work Plan, Multiple Sites, January 2007 Holloman AFB, NM				
Comment No.	**Section**	**Page**	**Comment**	**Response**
Author	**James P. Bearzi**		**Date of Comments: June 11, 2007, Notice of Deficiency HWB-HAFB-07-002**	**Date of Response: July 2, 2007**
1	General		The Permittee must seek to modify its RCRA permit to add ERP Sites SS-72 and SS-73 to Table A of the permit which lists sites requiring corrective action. The Permittee must submit a request for a Class 1 permit modification within 60 days of receipt of this letter. In the request, the Permittee must include all of the necessary information to support a Class 1 permit modification in accordance with 40 C.F.R. § 270.42 (a).	Concur. A request for a Class I permit modification will be submitted.
2	2.1.5	2-3	At Site SS-72, the Permittee proposes to install three groundwater sampling points to collect groundwater samples. The Permittee should discuss in this Work Plan the option to install permanent monitoring wells if contamination is detected.	No contamination was detected in either the soil or the groundwater samples; therefore no permanent monitoring wells are required.
3	2.2.5	2-5	According to Figure 9-2 in the *Final 2005 Long-Term Groundwater Monitoring Report*, localized groundwater at Site SS-73 may flow in a more northerly direction. To investigate a possible source of contamination to SS61-MW02, the Permittee must locate two additional soil borings/groundwater sampling points at Site SS-73. One will be located south of buildings 1085 and 1088 and one will be located north of buildings 1085 and 1088. Soil and groundwater samples shall be analyzed as proposed in the Work Plan.	Concur. Two additional soil borings/groundwater sampling points will be installed north and south of Buildings 1085 and 1088. Section 2.2.5 of the text, Figure 2-3, and Table 3-1 will reflect the change.
4	2.2.5	2-5	At Site SS-73, spills may have occurred during former gasoline fueling operations. It possible that total petroleum hydrocarbons may have been released and were a source of contamination. In addition to volatile and semi-volatile organics, the Permittee must analyze all proposed soil and groundwater samples for total petroleum hydrocarbons that include gasoline range organics (GRO) and diesel range organics (DRO).	Concur, however, Holloman AFB requests that no soil TPH samples be collected from the originally proposed three soil borings (SS73-DP04, SS73-DP05, and SS73-DP06) and only groundwater TPH samples will be collected. However, soil and groundwater TPH samples will be collected from the two additional borings requested by NMED. Section 2.2.5 and Table 3-1 will reflect the changes.

Response to Comments RCRA Facility Assessment Confirmatory Sampling Work Plan, Multiple Sites, January 2007 Holloman AFB, NM				
Comment No.	**Section**	**Page**	**Comment**	**Response**
Author	**James P. Bearzi**		**Date of Comments: June 11, 2007, Notice of Deficiency HWB-HAFB-07-002**	**Date of Response: July 2, 2007**
5	2.3.4	2-7	At Site SS-65, there is little information concerning the type, size, location, and extent of the surface spill. From the description provided, the adjacent building may have been a storage facility, instead of a bathroom as stated in the Work Plan. The observed oil and grease staining may be a result of leaks during storage. The proposed borehole is not sufficient to determine the presence of contaminants in this area because there are many uncertainties associated with this site, such as location and extent of supposed surface spill and past operational practices. The Permittee must install a total of three borings to the depth of groundwater and collect samples as proposed in this Work Plan. The borings should be located within 25 feet of the building and to the north of the building. If contamination is detected in the soil, the Permittee must install one groundwater sampling point in the boring with the highest apparent contamination and collect groundwater sample for analysis as proposed in this Work Plan.	Concur. Two additional borings will be installed north of Building 807 within 25 feet of the building. Based on soil sampling results, a groundwater sample will be collected from the boring with the highest contamination, as well as one groundwater sample from SS65-DP01. Section 2.3.4, Figure 2-4, and Table 3-1 will reflect the changes.
6	2.4.4	2-9	Site SS-66 is titled *Building 835 Spills*. The 1996 aerial photo depicts two distinct concrete pad areas with oil stains approximately 25 feet apart. One borehole will not serve to reduce the uncertainty of a release from both of these locations. The Permittee must install one boring at each of these identified spill areas. Because surface runoff from any release that occurred on these concrete pads had the potential to contaminate the surrounding soil, the Permittee must install one boring north of these areas as well. All borings will be drilled to the depth proposed in this Work Plan. If contamination is detected in the soil, the Permittee must install one groundwater sampling point in the boring with the highest apparent contamination and	Concur. Three additional borings will be installed (one north of the former Building 835 and two located at the spill site). Based on soil sampling results a groundwater sample will be collected from the boring with the highest contamination, as well as one groundwater sample from SS66-DP01. Section 2.4.4, Figure 2-6, and Table 3-1 will reflect the changes.

Response to Comments RCRA Facility Assessment Confirmatory Sampling Work Plan, Multiple Sites, January 2007 Holloman AFB, NM				
Comment No.	**Section**	**Page**	**Comment**	**Response**
Author	**James P. Bearzi**		**Date of Comments: June 11, 2007, Notice of Deficiency HWB-HAFB-07-002**	**Date of Response: July 2, 2007**
			collect a groundwater sample for analysis as proposed in this Work Plan.	
7	2.4.4	2-9	The Permittee must provide information on the contents of the quenching bath oils at Site SS-66. Specifically, NMED is concerned that cyanide may have been used in the process. If so, the Permittee must also sample the soil and groundwater for cyanide.	Concur. Soil and groundwater samples for cyanide analysis will be collected from the additional soil borings requested by NMED from the previous comment. Section 2.4.4 and Table 3-1 will reflect the changes.
8	2.5.4	2-11	The Work Plan states that, at Site SS-67, "an area just south of Building 905, near a telephone pole, was observed to have black colored grit over a surface area of approximately 6 x 6 feet. This black material is similar to the description of the sandblasting debris described in the 1988 RFA." This recent (July 12, 2006) observation indicates the waste piles were not completely removed as reported. The Permittee must remove the remaining sandblasting debris from the ground surface and collect surface and subsurface soil samples in this area to determine the extent of contamination. Soil samples must be analyzed for Target Analyte List metals. If contamination remains above NMED soil screening levels (SSLs), the soil must be removed until SSLs are achieved.	Based on field observations, this area appears to have been graded and gravel has been laid down in the areas of the soil borings. No waste piles or sandblasting residue remains at the site. However, it should be noted that biological soil crusts (which may appear similar to black grit associated with sandblasting as described in the Work Plan) exist naturally in the area and are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials. These crusts play an important role in the increase of soil stability and water infiltration, and appear to have a positive effect on plant germination and growth. Section 2.5.3 will include this information. Holloman AFB concludes that additional investigative and/or removal activities are not warranted at this time.
9	2.5.4	2-11	At Site SS-67, the Work Plan indicates that field screening will be performed on the soil samples. Given the history of operations at this site, the potential contaminants of concern are metals and other constituents found in paints. NMED recommends the Permittee not use field screening to determine sample locations. Following removal of the sandblasting debris, the Permittee must collect soils samples from the 0-6 inch interval and from the two-foot depth. The Permittee must also install two boreholes outside of each building (903 and 905). The Permittee	Concur. However, during the most recent field activities in April 2007, a soil sample from the 0-2.5 foot interval (from a 0-5 foot sampling sleeve) was collected from each of the soil borings located at Site SS-67. Due to shallow groundwater, field screening techniques were not useful at this site. Please see the previous comment in response to the removal of the sandblasting debris. Two additional borings will be installed outside of each building (903 and 905) as previously submitted. Section 2.5.4, Table 3-1, and Figure 2-7 will reflect the changes.

Response to Comments RCRA Facility Assessment Confirmatory Sampling Work Plan, Multiple Sites, January 2007 Holloman AFB, NM				
Comment No.	**Section**	**Page**	**Comment**	**Response**
Author	**James P. Bearzi**		**Date of Comments: June 11, 2007, Notice of Deficiency HWB-HAFB-07-002**	**Date of Response: July 2, 2007**
			must analyze the samples as proposed in this Work Plan.	
10	3.4	3-5	As part of its investigation-derived waste management, the Permittee proposes to spread sediment remaining in the decontamination pad area on the ground. NMED requires that the Permittee containerize the investigation-derived waste (sediment) from the decontamination area and manage it accordingly based on analytical data.	Concur, Holloman AFB will containerize all soil IDW and place it in the land farm located on Holloman AFB. The text in Section 3.4 will reflect the change.
11	3.4 & 3.6	3-5	As part of its general decontamination procedures, the Permittee proposes to allow decontamination water to evaporate or to dispose of it at the HAFB wastewater treatment plant. NMED requires that all liquid waste, including decontamination water and purge water, be containerized until characterization is performed and proper disposal is arranged. The waste may be characterized based on known or suspected contaminants. NMED recommends a dry decontamination method be used prior to wet decontamination. In this method, equipment is brushed with a wire or other suitable brush, if practicable and necessary, to remove large particles.	Concur, Holloman AFB will containerize all IDW and transport it to the HAFB wastewater treatment plant. Sampling results from the investigation will be used to characterize the water, prior to disposal. The text in Sections 3.4 and 3.6 will reflect the changes.
12	Table 3-1		The Permittee must revise Table 3-1 (Analytical Methods and Number of Samples by Site) to reflect the number of samples required in the aforementioned comments.	Concur. Table 3-1 will reflect the changes.
13	Appendix A		The Permittee has included the scope of services as an appendix to this Work Plan. This appendix is intended to provide guidance to the contractors performing the work. As such, it should not be an appendix to a work plan that is subject to approval by a regulatory authority and should be removed.	Concur. This appendix will be removed from the Work Plan.

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone (505) 476-6000
Fax (505) 476-6030
www.nmenv.state.nm.us

BILL RICHARDSON
GOVERNOR

RON CURRY
SECRETARY

CINDY PADILLA
SECRETARY

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

June 11, 2007

REC'D JUN 25 A.M.

Debbie Hartell, Chief
Environmental Flight
49th CES/CEV
550 Tabosa Avenue
Holloman AFB, NM 88330-8458

RE: NOTICE OF DEFICIENCY: RCRA FACILITY ASSESSMENT, CONFIRMATORY SAMPLING WORK PLAN, MULTIPLE SITES JANUARY 2007
HOLLOMAN AIR FORCE BASE (HAFB), EPA ID# NM6572124422
HWB-HAFB-07-002

Dear Ms. Hartell:

The New Mexico Environment Department (NMED) has reviewed the Holloman Air Force Base's (the Permittees) document entitled *RCRA Facility Assessment Confirmatory Sampling Work Plan, Multiple Sites*, dated January 2007 (Work Plan). The Work Plan addresses the following Areas of Concern (AOCs): AOC-B (SS-65), AOC-C (SS-66), AOC-E (SS-67), AOC-F (SS-68), AOC-I (SS-69), AOC-M (RW-70) and AOC-S (TU-71). It also addresses Environmental Restoration Project (ERP) Sites SS-72 and SS-73. The Permittee must address the following deficiencies before NMED can make a final determination regarding approval of the Work Plan.

1. The Permittee must seek to modify its RCRA permit to add ERP Sites SS-72 and SS-73 to Table A of the permit which lists sites requiring corrective action. The Permittee must submit a request for a Class 1 permit modification within 60 days of receipt of this letter. In the request, the Permittee must include all of the necessary information to support a Class 1 permit modification in accordance with 40 C.F.R. § 270.42(a).

2. At Site SS-72, the Permittee proposes to install three groundwater sampling points to collect groundwater samples. The Permittee should discuss in this Work Plan the option to install permanent monitoring wells if contamination is detected.

3. According to Figure 9-2 in the *Final 2005 Long-Term Groundwater Monitoring Report*, localized groundwater at Site SS-73 may flow in a more northerly direction. To investigate a possible source of contamination to SS61-MW02, the Permittee must locate two additional soil borings/groundwater sampling points at Site SS-73. One will be located south of buildings 1085 and 1088 and one will be located north of buildings 1085 and 1088. Soil and groundwater samples shall be analyzed as proposed in the Work Plan.

4. At Site SS-73, spills may have occurred during former gasoline fueling operations. It is possible that total petroleum hydrocarbons may have been released and were a source of contamination. In addition to volatile and semi-volatile organics, the Permittee must analyze all proposed soil and groundwater samples for total petroleum hydrocarbons that include gasoline range organics (GRO) and diesel range organics (DRO).

5. At Site SS-65, there is little information concerning the type, size, location, and extent of the surface spill. From the description provided, the adjacent building may have been a storage facility, instead of a bathroom as stated in the Work Plan. The observed oil and grease staining may be a result of leaks during storage. The proposed borehole is not sufficient to determine the presence of contaminants in this area because there are many uncertainties associated with this site, such as location and extent of supposed surface spill and past operational pratices. The Permittee must install a total of three borings to the depth of groundwater and collect samples as proposed in this Work Plan. The borings should be located within 25 feet of the building and to the north of the building. If contamination is detected in the soil, the Permittee must install one groundwater sampling point in the boring with the highest apparent contamination and collect a groundwater sample for analysis as proposed in this Work Plan.

6. Site SS-66 is titled *Building 835 Spills*. The 1996 aerial photo depicts two distinct concrete pad areas with oil stains approximately 25 feet apart. One borehole will not serve to reduce the uncertainty of a release from both of these locations. The Permittee must install one boring at each of these identified spill areas. Because surface runoff from any release that occurred on these concrete pads had the potential to contaminate the surrounding soil, the Permittee must install one boring north of these areas as well. All borings will be drilled to the depth proposed in this Work Plan. If contamination is detected in the soil, the Permittee must install one groundwater sampling point in the boring with the highest apparent contamination and collect a groundwater sample for analysis as proposed in this Work Plan.

7. The Permittee must provide information on the contents of the quenching bath oils at Site SS-66. Specifically, NMED is concerned that cyanide may have been used in the process. If so, the Permittee must also sample the soil and groundwater for cyanide.

8. The Work Plan states that, at Site SS-67, "an area just south of Building 905, near a telephone pole, was observed to have black colored grit over a surface area of approximately 6 x 6 feet. This black material is similar to the description of the sandblasting debris described in the 1988 RFA." This recent (July 12, 2006) observation indicates the waste piles were not completely removed as reported. The Permittee must remove the remaining sandblasting debris from the ground surface and collect surface and subsurface soil samples in this area to determine the extent of contamination. Soil samples must be analyzed for Target Analyte List metals. If contamination remains above NMED soil screening levels (SSLs), the soil must be removed until SSLs are achieved.

9. At Site SS-67, the Work Plan indicates that field screening will be performed on the soil samples. Given the history of operations at this site, the potential contaminants of concern are metals and other constituents found in paints. NMED recommends the Permittee not use field screening to determine sample locations. Following removal of the sandblasting debris, the Permittee must collect soils samples from the 0-6 inch interval and from the two-foot depth. The Permittee must also install two boreholes outside of each building (903 and 905). The Permittee must analyze the samples as proposed in this Work Plan.

10. As part of its investigation-derived waste management, the Permittee proposes to spread sediment remaining in the decontamination pad area on the ground. NMED requires that the Permittee containerize its investigation-derived waste (sediment) from the decontamination area and manage it accordingly based on analytical data.

11. As part of its general decontamination procedures, the Permittee proposes to allow decontamination water to evaporate or to dispose of it at the HAFB wastewater treatment plant. NMED requires that all liquid waste, including decontamination water and purge water, be containerized until characterization is performed and proper disposal is arranged. The waste may be characterized based on known or suspected contaminants. NMED recommends a dry decontamination method be used prior to wet decontamination. In this method, equipment is brushed with a wire or other suitable brush, if practicable and necessary, to remove large particles.

12. The Permittee must revise Table 3-1 (Analytical Methods and Number of Samples by Site) to reflect the number of samples required in the aforementioned comments.

13. The Permittee has included the scope of services as an appendix to this Work Plan. This appendix is intended to provide guidance to the contractors performing the work. As such, it should not be an appendix to a work plan that is subject to approval by a regulatory authority and should be removed.

The Permittee must respond to this Notice of Deficiency within thirty (30) calendar days of receipt of this letter. If you have any questions regarding this matter or if you would like to discuss the comments prior to your response, please contact Darlene Goering of my staff at (505) 222-9504 or (505) 476-6042.

Sincerely,

James P. Bearzi
Chief
Hazardous Waste Bureau

cc: J. Kieling, NMED HWB
W. Moats, NMED HWB
C. Amindyas, NMED HWB
D. Strasser, NMED HWB
D. Goering, NMED HWB
D. Tellez, EPA Region 6 (6PD-F)
File: HAFB 2007 and Reading
HWB-HAFB-07-002

TABLE

Table 3-1.
Analytical Methods and Number of Samples by Site
Confirmatory Sampling Work Plan
Multiple Sites
Holloman Air Force Base, New Mexico

Site	Number of Boreholes/ Temporary MWs	Matrix	Analysis	Number of Field Samples
SS-72	3	Soil	VOCs by EPA Method 8260B	3
			SVOCs by EPA Method 8270C	3
		Water	VOCs by EPA Method 8260B	3
			TDS by EPA Method 160.1	3
SS-73	5	Soil	VOCs by EPA Method 8260B	5
			SVOCs by EPA Method 8270C	5
			TPH by EPA Method 8015M	2
		Water	VOCs by EPA Method 8260B	5
			TPH by EPA Method 8015M	5
			TDS by EPA Method 160.1	5
SS-65 and TU-71	3	Soil	VOCs by EPA Method 8260B	3
			SVOCs by EPA Method 8270C	3
			TAL Metals by EPA Method 6010B/7471A	3
			TPH by EPA Method 8015M	3
			PCBs by EPA Method 8082	3
		Water	VOCs by EPA Method 8260B	2
			SVOCs by EPA Method 8270C	2
			TAL Metals by EPA Method 6010B/7470A	2
			TPH by EPA Method 8015M	2
			PCBs by EPA Method 8082	2
			TDS by EPA Method 160.1	2
SS-66	4	Soil	VOCs by EPA Method 8260B	4
			SVOCs by EPA Method 8270C	4
			TAL Metals by EPA Method 6010B/7471A	4
			Cyanide by EPA Method 9010C	3
			TPH by EPA Method 8015M	4
			PCBs by EPA Method 8082	4
		Water	VOCs by EPA Method 8260B	2
			SVOCs by EPA Method 8270C	2
			TAL Metals by EPA Method 6010B/7470A	2
			Cyanide by EPA Method 9010C	2
			TPH by EPA Method 8015M	2
			PCBs by EPA Method 8082	2
			TDS by EPA Method 160.1	2
SS-67	4	Soil	VOCs by EPA Method 8260B	4
			SVOCs by EPA Method 8270C	4
			TAL Metals by EPA Method 6010B/7471A	4
			TPH by EPA Method 8015M	4
		Water	VOCs by EPA Method 8260B	4
			SVOCs by EPA Method 8270C	4
			TAL Metals by EPA Method 6010B/7470A	4
			TPH by EPA Method 8015M	4
			TDS by EPA Method 160.1	4

Table 3-1.
Analytical Methods and Number of Samples by Site
Confirmatory Sampling Work Plan
Multiple Sites
Holloman Air Force Base, New Mexico

Site	Number of Boreholes/ Temporary MWs	Matrix	Analysis	Number of Field Samples
SS-69	3	Soil	VOCs by EPA Method 8260B	3
			SVOCs by EPA Method 8270C	3
			TAL Metals by EPA Method 6010B/7471A	3
			TPH by EPA Method 8015M	3
		Water	VOCs by EPA Method 8260B	3
			SVOCs by EPA Method 8270C	3
			TAL Metals by EPA Method 6010B/7470A	3
			TPH by EPA Method 8015M	3
			TDS by EPA Method 160.1	3
Field Duplicate	NA	Soil and Water	Per each analyte	One per 10 samples collected
MS/MSD	NA	Soil and Water	Per each analyte	A minimum of one or one per 20 samples collected
Trip Blanks	NA	Water	VOCs by EPA Method 8260B	1 per cooler containing VOC samples

Notes:
MWs = Monitoring wells
MS/MSD = Matrix Spike/Matrix Spike Duplicate
VOCs = Volatile organic compounds
SVOCs = Semi-volatile organic compounds
EPA = Environmental Protection Agency
TDS = Total Dissolved Solids
TPH = Total Petroleum Hydrocarbons
PCBs = Polychlorinated biphenyls

FIGURES

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SWMU LOCATION MAP

(Aerial photography taken in 2004)

PROJECT NO	SCALE	DATE	DRAWN BY:
9050360	AS SHOWN	11/20/06	MRM/CM
			DRAWING NO Figure 2-1

Confirmatory Sampling
Work Plan
Holloman AFB, New Mexico

Figure 2-1

MW-21-01

Year	TCE (µg/L)
1995	ND
1997	5.4
1999	11
2001	13
2003	15
2005	13.3

MW-21-04

Year	TCE (µg/L)
1995	ND
1997	ND
1999	ND
2001	ND
2003	ND
2005	ND

MW-21-03

Year	TCE (µg/L)
1995	ND
1997	ND
1999	ND
2001	ND
2003	ND
2005	ND

MW-21-02

Year	TCE (µg/L)
1995	ND
1997	ND
1999	ND
2001	ND
2003	ND
2005	ND

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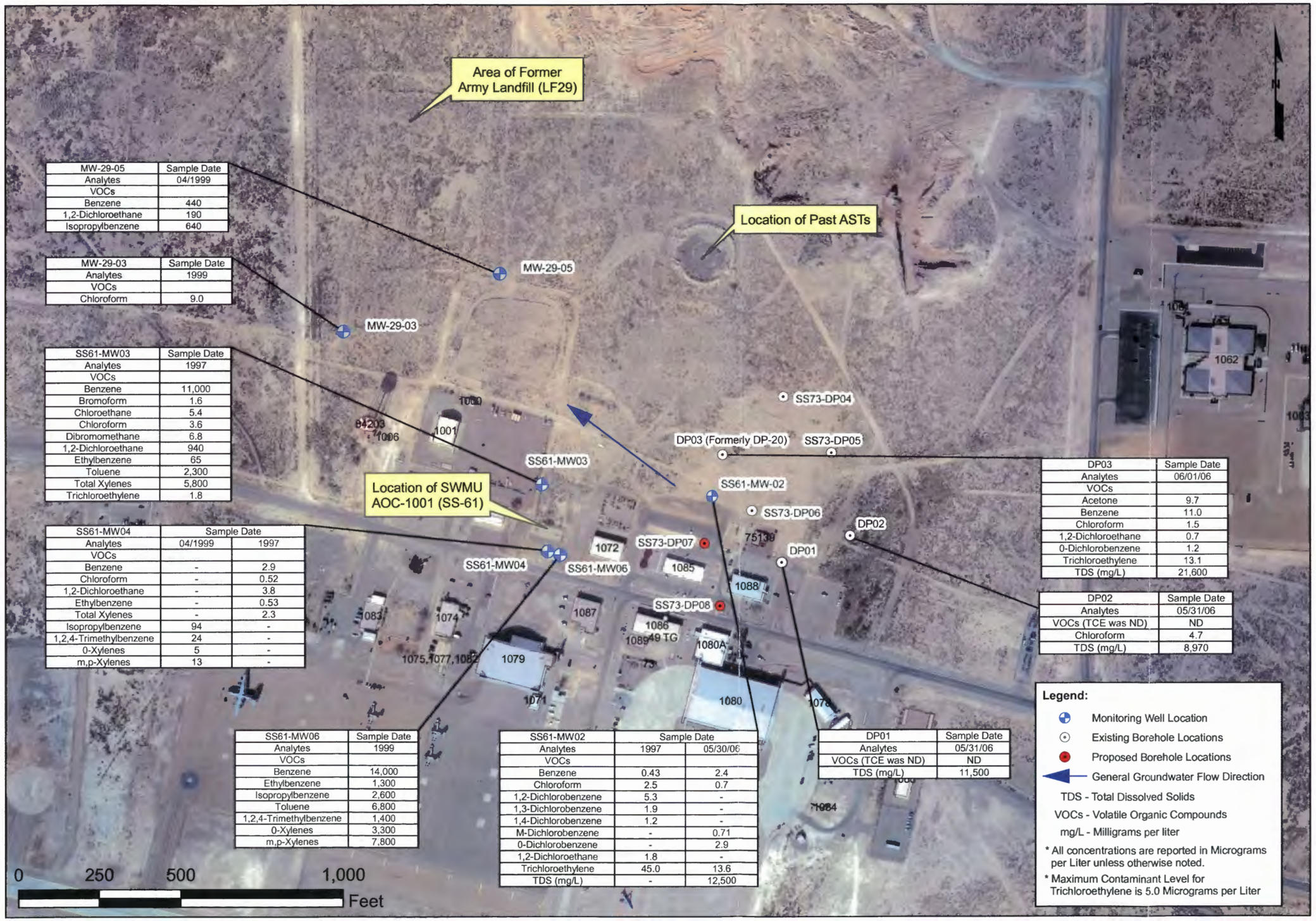
SS-72 Site Layout & Groundwater Concentration Map

(Aerial photography taken in 2004)

9050360	AS SHOWN	11/20/06	MRM/CM
			Figure 2-2

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-2



MW-29-05	Sample Date
Analytes	04/1999
VOCs	
Benzene	440
1,2-Dichloroethane	190
Isopropylbenzene	640

MW-29-03	Sample Date
Analytes	1999
VOCs	
Chloroform	9.0

SS61-MW03	Sample Date
Analytes	1997
VOCs	
Benzene	11,000
Bromoform	1.6
Chloroethane	5.4
Chloroform	3.6
Dibromomethane	6.8
1,2-Dichloroethane	940
Ethylbenzene	65
Toluene	2,300
Total Xylenes	5,800
Trichloroethylene	1.8

SS61-MW04	Sample Date	
Analytes	04/1999	1997
VOCs		
Benzene	-	2.9
Chloroform	-	0.52
1,2-Dichloroethane	-	3.8
Ethylbenzene	-	0.53
Total Xylenes	-	2.3
Isopropylbenzene	94	-
1,2,4-Trimethylbenzene	24	-
0-Xylenes	5	-
m,p-Xylenes	13	-

SS61-MW06	Sample Date
Analytes	1999
VOCs	
Benzene	14,000
Ethylbenzene	1,300
Isopropylbenzene	2,600
Toluene	6,800
1,2,4-Trimethylbenzene	1,400
0-Xylenes	3,300
m,p-Xylenes	7,800

SS61-MW02	Sample Date	
Analytes	1997	05/30/06
VOCs		
Benzene	0.43	2.4
Chloroform	2.5	0.7
1,2-Dichlorobenzene	5.3	-
1,3-Dichlorobenzene	1.9	-
1,4-Dichlorobenzene	1.2	-
M-Dichlorobenzene	-	0.71
0-Dichlorobenzene	-	2.9
1,2-Dichloroethane	1.8	-
Trichloroethylene	45.0	13.6
TDS (mg/L)	-	12,500

DP01	Sample Date
Analytes	05/31/06
VOCs (TCE was ND)	ND
TDS (mg/L)	11,500

DP03	Sample Date
Analytes	06/01/06
VOCs	
Acetone	9.7
Benzene	11.0
Chloroform	1.5
1,2-Dichloroethane	0.7
0-Dichlorobenzene	1.2
Trichloroethylene	13.1
TDS (mg/L)	21,600

DP02	Sample Date
Analytes	05/31/06
VOCs (TCE was ND)	ND
Chloroform	4.7
TDS (mg/L)	8,970

Legend:

- Monitoring Well Location
- Existing Borehole Locations
- Proposed Borehole Locations
- General Groundwater Flow Direction

TDS - Total Dissolved Solids

VOCs - Volatile Organic Compounds

mg/L - Milligrams per liter

* All concentrations are reported in Micrograms per Liter unless otherwise noted.

* Maximum Contaminant Level for Trichloroethylene is 5.0 Micrograms per Liter

Confirmatory Sampling
Work Plan
Holloman AFB, New Mexico

Figure 2-3

SWMU (SS-73) Site Layout & Groundwater Concentration Map

(Aerial photography taken in 2004)

PROJECT NO.	SCALE	DATE	DRAWN BY:	DRAWING NO:
9050360	AS SHOWN	7/12/07	MRM/CM	Figure 2-3

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0 25 50 100 Feet

Legend:

- Existing Borehole Location
- Proposed Borehole Location
- General Groundwater Flow Direction

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SWMU AOC-B (SS-65), SWMU AOC-S (TU-71) and Building 807 Layout

(Aerial photography taken in 2004)

PROJECT NO	SCALE	DATE	DRAWN BY
9050360	AS SHOWN	7/12/07	MRM/CM
			DRAWING NO: Figure 2-4

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-4

0 12.5 25 50 Feet

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SWMU AOC-C (SS-66) and Building 835 Layout-1996

(Aerial photography taken in 1996)

PROJECT NO.	SCALE	DATE	DRAWN BY:
9050360	AS SHOWN	08/10/06	MRM/CM
			DRAWING NO.: Figure 2-5

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-5

Legend:

- Existing Borehole Location
- Proposed Borehole Location
- General Groundwater Flow Direction

0 25 50 100 Feet

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SWMU AOC-F (SS-66)
Building 835 Layout
(Aerial photography taken in 2004)

PROJECT NO	SCALE	DATE	DRAWN BY
9050360	AS SHOWN	7/12/07	MRM
			DRAWING NO Figure 2-6

RFA Phase II
PR/VSI and Sampling Visit
Work Plan
Holloman AFB, New Mexico

Figure 2-6

0 50 100 200 Feet

Legend:

- Existing Borehole Location
- Proposed Borehole Location
- General Groundwater Flow Direction

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SWMU AOC-E (SS-67) Layout and Proposed Sampling Locations
(Aerial photography taken in 2004)

PROJECT NO	SCALE	DATE	DRAWN BY
9050360	AS SHOWN	7/12/07	MRM/CM
			DRAWING NO Figure 2-7

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-7

0 125 250 500 Feet

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SWMU AOC-F (SS-68) and Area Layout-1996
(Aerial photography taken in 1996)

PROJECT NO.	SCALE	DATE	DRAWN BY:
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			DRAWING NO: Figure 2-8

Confirmatory Sampling
Work Plan
Holloman AFB, New Mexico

Figure 2-8

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SWMU AOC-F (SS-68) and Area Layout-2004

(Aerial photography taken in 2004)

PROJECT NO.	SCALE	DATE	DRAWN BY:
9050360	AS SHOWN	08/10/06	MRM/CM
			DRAWING NO: Figure 2-9

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-9

1984 Aerial Photography

1996 Aerial Photography

0 130 260 520 Feet

Legend

Proposed Borehole Location

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SWMU AOC-I (SS-69) and Building 868 Layout

PROJECT NO.	SCALE	DATE	DRAWN BY:
9050360	AS SHOWN	11/20/06	MRM
			DRAWING NO: Figure 2-10

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-10

0 75 150 300 Feet

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SWMU AOC-M (RW-70) Excavated Areas Around Building 18

(Aerial photography taken in 2004)

PROJECT NO.	SCALE	DATE	DRAWN BY: MRM/CM
9050360	AS SHOWN	11/20/06	DRAWING NO: Figure 2-11

Confirmatory Sampling
Work Plan
Holloman AFB, New Mexico

Figure 2-11

RCRA FACILITY ASSESSMENT

CONFIRMATORY SAMPLING WORK PLAN
MULTIPLE SITES
HOLLOMAN AFB, NEW MEXICO

Prepared for:

49 CES/CEV
Holloman Air Force Base
New Mexico

Under Contract To:

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

Contract No. DACA87-02-D0003
Task Order No. DK01

Prepared by:

Bhate Environmental Associates, Inc.
1608 13th Avenue South, Suite 300
Birmingham, Alabama 35205

Bhate Project No. 9050360.01

July 2007

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RCRA FACILITY ASSESSMENT

CONFIRMATORY SAMPLING WORK PLAN

MULTIPLE SITES

HOLLOMAN AFB, NEW MEXICO

REVIEW SHEET

This Work Plan has been reviewed and approved by:

John Hymer Site Manager	Signature	Date
Jim Moore, P.G. Project Manager	Signature	Date
Frank Gardner, P.G. Program Manager	Signature	Date

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RCRA FACILITY ASSESSMENT
CONFIRMATORY SAMPLING WORK PLAN
MULTIPLE SITES
HOLLOMAN AFB, NEW MEXICO
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Deleted: January

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ACRONYMS AND ABBREVIATIONS

AAF	Army Air Field
AF Fm	Air Force Form
amsl	Above mean sea level
ANSI	American National Standards Institute
AOC	Area of Concern
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BEAR	Basic Expeditionary Airfield Resources
bgs	Below ground surface
Bhate	Bhate Environmental Associates, Inc.
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES/CEV	Civil Engineering Squadron/Combat Engineer Vehicle
COC	Chain-of-custody
DCA	Dichloroethane
DPT	Direct push technology
DRO	Diesel range organics
ERP	Environmental Restoration Program
ERPIMS	Environmental Restoration Program Information Management System
°F	Degrees Fahrenheit
FID	Flame ionization detector
FWENC	Foster Wheeler Environmental Corporation
GPS	Global positioning system
GRO	Gasoline range organics
GTI	Groundwater Technology, Inc.
HAFB	Holloman Air Force Base
HASP	Health and Safety Plan
IDW	Investigation-Derived Waste
LTM	Long Term Monitoring
µg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MCL	Maximum Contaminant Level
MS	Matrix spike
MSD	Matrix spike duplicate
NAD	North American Datum
NFA	No Further Action
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
ORO	Oil range organics
OSHA	Occupational Safety and Health Administration

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ACRONYMS AND ABBREVIATIONS (CONTINUED)

OVA	Organic vapor analyzer
PA	Preliminary Assessment
PCB	Polychlorinated Bi-phenyl
P.G.	Professional Geologist
PID	Photoionization detector
PPE	Personal protective equipment
ppm	Parts per million
PVC	Polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SOP	Standard Operating Procedure
SSL	Soil screening level
SVOC	Semi-volatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCE	Trichloroethylene
TDS	Total dissolved solids
TNT	Trinitrotoluene
TPH	Total petroleum hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
USAF	United States Air Force
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile organic compound
WRCC	Western Regional Climate Center
WWTP	Wastewater Treatment Plant

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1 INTRODUCTION

Bhate Environmental Associates, Inc., (Bhate) has been retained by the U.S. Army Corps of Engineers (USACE), under contract DACA87-02-D0003, Task Order No. DK01, to conduct a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Preliminary Assessment (PA) at nine of the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at Holloman Air Force Base (HAFB), New Mexico. A copy of the Scope of Services issued by the Omaha District of the USACE dated November 8, 2005, for the nine sites (SS-65, SS-66, SS-67, SS-68, SS-69, SS-72, SS-73, RW-70, and TU-71) is included in Appendix A of this Work Plan.

In 1988, under the Resource Conservation Recovery Act (RCRA), a RCRA Facility Assessment (RFA) was performed at HAFB and included sites SS-65, SS-66, SS-67, SS-68, SS-69, RW-70, and TU-71 (A.T. Kearney, 1988). The RFA recommended that these sites be investigated further to confirm the presence of contamination. The purpose of this document, therefore, is to describe the scope of the field investigation at these locations as well as Sites SS-72 and SS-73 which are discussed below.

During the review of the RFA and other site-related documents, it was noted that SWMUs AOC-B (SS-65) and AOC-S (TU-71) appeared to be co-located and therefore their investigations will be combined so that the investigation of site SS-65 will serve to characterize both sites. This proposal was discussed with personnel from the New Mexico Environment Department (NMED) during a conference call held on November 2, 2006, and was met with approval.

During this call, the remediation work at site SWMU AOC-Q (SS-17) was discussed as it relates to site SWMU AOC-M (RW-70). The excavation and removal of contaminated soil at SWMU AOC-Q (SS-17) over the past two years has removed all contaminated soil and structures in the location of site RW-70. Therefore, NMED agreed to accept the confirmation soil sampling results for SS-17 as evidence that contamination at site RW-70 was also removed, and in addition, the NMED recommended that site RW-70 be removed from the HAFB Hazardous Waste Facility Permit via a Class III Permit Modification.

Sites SS-72 and SS-73 were discovered between 2003 and 2004 and were not part of the original 1988 RFA. These sites were created to investigate newly discovered contamination at already existing sites. In the case of SS-72, potential trichloroethylene (TCE) contamination was found in groundwater upgradient from site LF-21 and site SS-73 was identified to assess the source of upgradient TCE contamination associated with well MW02 at Site SS-61. During the November 2, 2006, conference call, NMED recommended that both sites be added to the HAFB Hazardous Waste Facility Permit.

This Work Plan will serve as the primary working document to conduct the field investigations at these sites and collect the data that is necessary to fulfill the requirements identified by NMED to achieve site closure. This document is organized into seven sections. Section 1 describes the history of HAFB and the geologic, hydrogeologic, physiographic settings, and the climatological

setting of the Base. Section 2 presents the known information for each of the sites and the work plan for performing confirmatory sampling at each location. Pre-investigative requirements and investigative requirements necessary to execute tasks for the field work are presented in Section 3. Project quality assurance and health and safety requirements are described in Sections 4 and 5, and the references are in Section 7.

1.1 Base Description

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HAFB is situated in south central New Mexico, in the northwest central part of Otero County, approximately 75 miles north-north-east of El Paso, Texas (Figure 1-1). HAFB has a population of 6,000 and occupies about 50,000 acres in the northeast quarter of Section 1, Township 17 South, Range 8 East. The White Sands Missile Range testing facilities occupy additional land extending northward from the Base. Private and public owned lands border the remainder of HAFB. The major highway servicing HAFB is Highway 70, which runs southwest from the town of Alamogordo and separates HAFB from publicly owned lands to the south. Alamogordo which has a population of approximately 35,000 is located approximately 7 miles east of the base.

HAFB was first established in 1942 as Alamogordo Army Air Field (AAF). From 1942 through 1945, Alamogordo AAF served as the training grounds for over 20 different flight groups, flying primarily B-17s, B-24s, and B-29s. After World War II, most operations had ceased at the base. In 1947, Air Material Command announced the air field would be its primary site for the testing and development of un-manned aircraft, guided missiles, and other research programs. On January 13, 1948, the Alamogordo installation was renamed Holloman Air Force Base, in honor of the late Col. George V. Holloman; a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at HAFB and has remained since. Today, HAFB also serves as the training center for the German Air Force's Tactical Training Center.

1.2 Physiography and Topography

Holloman AFB is located within the Sacramento Mountains Physiographic Province on the western edge of the Sacramento Mountains. HAFB is approximately 59,600 acres in area, and is located at a mean elevation of 4,093 feet above mean sea level (amsl). The region is characterized by high tablelands with rolling summit plains; cuesta-formed mountains dipping eastward and of west-facing escarpments with the wide bracketed basin forming the basin and range complex. The Base is located in the Tularosa Sub-basin which is part of the Central Closed Basins. The bordering mountains rise abruptly to altitudes of 7,000 to 12,000 feet amsl. The San Andres Mountains bound the basin to the west (about 30 miles) with the Sacramento Mountains approximately 10 miles to the east (Figure 1-1). At its widest, the basin is about 60 miles east to west and stretches approximately 150 miles north to south.

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1.3 Surface Water and Hydrology

The Tularosa Basin contains all of the surface flow in its boundaries. The nearest inflow of surface waters to the Base comes from the Lost River, located in the north-central region of the Base. The upper reaches of the Three Rivers and the Sacramento River are perennial in the basin. HAFB is dissected by several southwest trending arroyos that control the surface drainage. Hay Draw arroyo is located in the far north. Malone and Rita's Draw, which drain into the Lost River and Dillard Draw arroyos, are located along the eastern perimeter of the Base. Approximately 10,000 years ago, indications are of a much wetter climate. The present day Lake Otero encompassed a much larger area, possibly upwards of several hundred square miles. Its remains are the Alkali Flat and Lake Lucero. Lake Lucero is a temporary feature of merely a few inches in depth during the rainy season.

Ancient lakes and streams deposited water bearing deposits over the older bedrock basement material. Fractures, cracks, and fissures in the Permian and Pennsylvanian bedrock yield small quantities of relatively good quality water in the deeper peripheral. Potable water is only found from a handful of wells near the edges of the basin with more saline water towards the center. Two of the principal sources of potable water are a long narrow area on the upslope sides of Tularosa and Alamogordo with the other in the far southwestern part of the basin. Alamogordo's water, as well as the Base's, is supplied from Lake Bonito (which is in the Pecos River Basin).

1.4 Regional Geology

The sedimentary rocks which make up the adjacent mountain ranges are between 500 and 250 million years old (White Sands Missile Range (WSMR), 2003). During the period when the area was submerged under the shallow intra-continental sea, the layers of limestone, shale, gypsum, and sandstone were deposited. In time, these layers were pushed upward through various tectonic forces forming a large bulge on the surface. Approximately 10 million years ago the center began to subside resulting in a vertical drop of thousands of feet leaving the edges still standing (the present day Sacramento and San Andres mountain ranges). In the millions of years following, rainfall, snowmelt, and wind eroded the mountain sediments depositing them in the valley (i.e. Tularosa Basin). Water carrying eroded gypsum, limestone, dolomite, gravel, and other alluvial matter continues to flow into the basin with no route of exit.

The Tularosa Sub-basin is geologically described as a bolson, which is an extensive flat alluvium-floored depression, into which drainage from the surrounding mountains flows toward a central playa. The overlying alluvium generally consists of unconsolidated gravels (limestone, dolomite, and gypsum), sands, and clays. A fining sequence from the San Andreas and Sacramento Ranges towards the basin's center characterizes the area with the near surface soils as alluvial, eolian, and lacustrine deposits. The alluvial fan deposits are laterally discontinuous units of interbedded sand, silt, and clay while the eolian deposits consist primarily of gypsum sands. The eolian and alluvial deposits are usually indistinguishable due to the reworking of the alluvial sediment by eolian processes. The playa, or lacustrine deposits, consist of silty clay containing gypsum and are contiguous with the alluvial fan and eolian deposits.

Mesozoic rocks in the northwest mark the Colorado Plateau, topped by younger Tertiary strata. Quaternary age sediments have washed off the Southern Rockies into the open basins and the Rio Grande Rift, a failed spreading center or aulacogen. This would-be ocean basin runs up the center of the state with the Rio Grande flowing down its middle, exposing the Paleozoic and Precambrian rocks on its uplifted flanks. Later Cenozoic volcanic intrusions of Quaternary and Tertiary age are also associated with the rifting.

The great Permian Basin of Texas continues into the state from the southeast with younger Quaternary-Tertiary sediments of the Great Plains cover the whole eastern edge. Basin-and-range terrain of Tertiary sediments and volcanics appear in the extreme southwest coupled with wide dry basins choked with Quaternary coarse sediments eroded from the blocks of uplifted older rocks.

1.5 Regional Hydrogeology

The predominance of the groundwater occurs as an unconfined aquifer in the unconsolidated deposits of the central basin, with the primary source of recharge as rainfall percolation and minor amounts of stream run-off along the western edge of the Sacramento Mountains. Surface water/rainfall migrates downward into the alluvial sediments at the edge of the shallow aquifer near the ranges, and flows downgradient through progressively finer-grained sediments towards the central basin. Because the Tularosa Basin is a closed system, water that enters the area only leaves either through evaporation or percolation. This elevated amount of percolation results in a fairly high water table. Beneath HAFB, groundwater ranges from 5 to 50 feet. Flow for the Base is generally towards the southwest with localized influences from the variations in the topography of the Base. Near the arroyos, groundwater flows directly toward the surface drainage feature.

Groundwater quality in the Tularosa Basin is of potable quality at the recharge areas in close proximity to the Sacramento Mountains and becomes increasingly mineralized toward the central portion of the basin and discharge areas (Radian, 1993). The majority (over 70%) of the Environmental Restoration Program (ERP) Sites / SWMUs / AOCs located across HAFB, have groundwater monitoring wells containing water with an average total dissolved solids (TDS) concentration greater than 10,000 milligrams per liter (mg/L). This TDS data supports the hypothesis that TDS concentrations below 10,000 mg/L at HAFB are caused by dilution of natural groundwater from leaking water lines and surface irrigation from the domestic water supply. TDS concentrations greater than 10,000 mg/L exceed the New Mexico Water Quality Control Commission (NMWQCC) limit as potable water and thus, the groundwater beneath HAFB has been designated as unfit for human consumption. Likewise, U.S. Environmental Protection Agency (USEPA) guidelines have identified the groundwater as a Class IIIB water source, characterized by TDS concentrations exceeding 10,000 mg/L.

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In addition, there are no potable water wells on HAFB. Potable water for the base and the city of Alamogordo is derived from the nearby Sacramento Mountains. The only production water well, used for livestock irrigation, is located approximately 7 miles southwest of HAFB.

1.6 Climate

As a whole, New Mexico has a mild, arid to semi-arid continental climate characterized by light precipitation totals; abundant sunshine, relatively low humidity and relatively large annual and diurnal temperature range (Western Regional Climate Center [WRCC], 2003). The climate of the Central Closed Basins varies with elevation. The Base is found in the low areas and is characterized by warm temperatures and dry air. Daytime temperatures often exceed 100 degrees Fahrenheit (°F) in the summer months and middle 50s in the winter. A preponderance of clear skies and relatively low humidity permits rapid night time cooling resulting in average diurnal temperature ranges of 25 to 35°F.

Potential evapotranspiration, at 67 inches per year, significantly exceeds annual precipitation, usually less than 10 inches. The very low rainfall amounts resulting in the arid conditions, which with the topographically induced wind patterns combining with the sparse vegetation, tend to cause localized "dust devils". Much of the precipitation falls during the mid-summer monsoonal period (July and August) as brief, yet frequent, intense thunderstorms culminating to 30 – 40% of the annual total rainfall.

1.7 Water Use

HAFB is located in the Tularosa Sub-basin. Potable water is available from municipal wells along the margins of the basin with more saline water towards the center. The principle sources of potable water are located in a long narrow north-south trending area east of Alamogordo and Tularosa and in the far southern part of the basin. HAFB is supplied potable water from Lake Bonito, which is in the Pecos River Basin.

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2 CONFIRMATORY SAMPLING WORK PLAN

The purpose of this section is to describe the findings from conducting a site visit to each location and performing a search of available records, and thereafter using this information to guide the confirmatory sampling at each site. This section is structured so that it describes each site, the records searched, past and current operational practices and dates of operations, release history, past investigations (only for SS-72 and SS-73), and the rationale and scope of the confirmatory sampling. The locations of these sites with respect to HAFB and each other can be seen on Figure 2-1. It should be noted that these sites, except for SS-72 and SS-73, were qualitatively evaluated as part of an RFA that was conducted in 1988.

2.1 SS-72, TCE Groundwater Contamination Upgradient of LF-21

This site is identified in the ERP as SS-72 and is named "TCE Groundwater Contamination Upgradient of LF-21". Although this site is not currently a documented SWMU and is not listed on Table A of the HAFB RCRA Permit (No. NM6572124422), it is expected to become one in the very near future.

2.1.1 Site Location

The location of site SS-72 is identified as the area just north of groundwater monitoring well MW21-01. This is the upgradient well for an already existing site known as the West Area Landfill # 2, or LF-21, or SWMU 116. There are three monitoring wells down gradient of LF-21 designated as MW21-02, -03, and -04. A detailed layout of this site and its surroundings is included as Figure 2-2.

2.1.2 Records Searched

The records that were searched to obtain information on this potential source area include:

- Aerial photographs over several years (1945, 1972, 1979, 1984, 1996, and 2004)
- *2005 Long Term Groundwater Monitoring Report* (Bhate, 2006)
- *Environmental Restoration Program Management Action Plan* (Holloman, 2004)
- *Draft Preliminary Investigation and Site Characterization West Ramp Fuel Contamination* (Woodward-Clyde, 1991)

2.1.3 Dates of Operation and Description of Past and Current Practices

Aerial photos taken in 1945, 1972, 1979, 1984, 1996, and 2004 from the area upgradient of monitoring well MW-21-01 were reviewed for signs of spills or maintenance facilities that

operated in earlier periods. This review only indicated that the area stretching approximately 800 feet north of this well has remained cleared and undeveloped since 1945. A site visit was made on August 14, 2006. It was noted that the nearest buildings (800, 806, 816, and 817) where maintenance activities occurred that likely used TCE as a degreaser are near the flight line about 900 feet to the northeast. No records exist documenting a release of TCE in the area of SS-72.

2.1.4 Previous Investigations and Historical Data

The TCE groundwater contamination was discovered during the sampling of monitoring wells MW-21-01, -02, -03, and -04 that were installed as part of the 10 year LTM Program for 11 RCRA sites that began in 1995 and performed monitoring of these wells every 2 years (Bhate, 2006a). These four wells were installed to meet the monitoring commitments for LF-21. The solvent TCE has only been detected in the upgradient well MW-21-01 and was measured at levels of 5.4, 11.0, 13.0, 15.0, and 13.3 micrograms per liter (µg/L) during the monitoring events that took place in 1997, 1999, 2001, 2003, and 2005, respectively. The Maximum Contaminant Level (MCL) for TCE in drinking water established by the USEPA is 5.0 µg/L. The monitoring results for TCE are summarized on Figure 2-2 and the analytical results from the LTM Program are summarized and presented in Appendix B.

In 1991, as part of an investigation of soil contamination in the West Ramp Area of the F-117 flight line, 6 monitoring wells and 14 boreholes were installed. Only monitoring well WCC-1 and borehole locations WR-TH-12 and WR-TH-13 are shown on Figure 2-2 because these are the closest to the area of interest for investigating the TCE contamination at SS-72. The soil and groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), total recoverable petroleum hydrocarbons (TRPH), and metals. The analytical results corresponding to these locations are included in Appendix C. Mercury was the only analyte detected in the groundwater sample from WCC-1 at a concentration of 1.97 µg/L. This value is below the MCL of 2.0 µg/L for mercury in drinking water set by the USEPA.

Two soil samples were collected from each location, one from 2 feet and the second from 3.5 feet below ground surface (bgs). At location WR-TH-12, ethylbenzene and benzene were measured at concentrations of 7.3 and 0.8 µg/kg, respectively in the sample collected from a depth of 2 feet bgs, and the sample collected at 3.5 feet bgs contained chromium and zinc at levels of 1.2 and 4.0 milligrams per kilogram (mg/kg), respectively. At location WR-TH-13, chromium, lead, and zinc were measured at concentrations of 1.9, 6.7, and 10 mg/kg, respectively in the sample collected from a depth of 2 feet bgs, and the sample collected from 3.5 feet bgs showed chromium and zinc at levels of 2.0 and 6.6 mg/kg, respectively. In comparison, these levels are well below the health-based Soil Screening Levels (SSLs) for a future on-site resident published by the NMED (NMED, 2006).

2.1.5 Rationale and Scope of Confirmatory Sampling

TCE has consistently been measured in monitoring well MW-21-01 at levels above the MCL since 1997. The source has not been identified because there are no industrial facilities

immediately north of MW-21-01. The nearest building is about 200 yards to the north and is a small 15 x 15 foot building (Building 878) used for communications. Further upgradient about 400 yards from MW-21-01 are a cluster of buildings (800, 806, 816, and 817) that are used for maintenance and these could be the source of the TCE.

To help confirm the presence of TCE contamination, three boreholes will be placed northeast of MW-21-01 but south of buildings 816 and 817 in the locations shown on Figure 2-2. Direct push technology (DPT) sampling equipment will be used to install the boreholes to a depth of approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled and field-screened (head space analysis) to identify the single discrete sample from each borehole location that will be submitted for laboratory analysis. Staining and/or odor may also be used to select the samples for analysis. If the screening techniques do not indicate a clear selection for analysis the sample will be collected at the capillary fringe. The soil samples will be analyzed for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs). A temporary monitoring well (hereinafter referred to as a temporary groundwater sampling point) will be installed in each completed boring. A groundwater sample from each point or well will be collected and analyzed for VOCs and TDS.

2.2 SS-73, TCE in Groundwater Adjacent to SS-61

This site is identified in the ERP as SS-73 and is named "TCE in Groundwater Adjacent to SS-61". Although this site is not currently a documented SWMU and is not listed on Table A of the HAFB RCRA Permit (No. NM6572124422), it is expected to become one in the very near future.

2.2.1 Location

The location of site SS-73 is generally known to be an open area located about 150 feet east of the concrete pad that is part of site SS-61. The exact limits of the site are unknown. Presently, a source for the TCE detected in groundwater is not known. A detailed lay-out of the site and its surroundings is included as Figure 2-3.

2.2.2 Records Searched

The records that were searched to obtain information on this potential source area include:

- Aerial photographs over several years (1945, 1972, 1979, and 2004)
- *Final Voluntary Corrective Measures Work Plan Site SS-61 Soil Remediation* (Bhate, 2006)
- *Final Remedial Investigation Report for Spill Site 61* (Foster Wheeler Environmental Corporation, 1999)
- *Memorandum Scope of Work for Soil and Groundwater Sampling* (Bhate, 2006b)
- *Sample Summary and Report of Analysis* (Accutest, 2006)

2.2.3 Dates of Operation and Description of Past and Current Practices

This site is related to the aviation gasoline fueling operation for squadrons of bombers that were temporarily stationed at HAFB from the end of WWII until the late 1940s. Past operational practices in this area have been primarily re-fueling and maintenance of aircraft. The fuel was stored in two aboveground storage tanks (ASTs) that have been since removed (see Figure 2-3). No practice or operation has been linked to the presence of TCE in groundwater at site SS-73. A building or operation has not been directly linked to SS-73. However, TCE was a common solvent and routinely used for maintenance procedures on all aircraft. Currently, no operations are conducted in this area related to air operations at the Base. A site visit was made on August 14, 2006. The nearest buildings are to the south about 300 feet away and are occupied by the 49th Testing Squadron.

2.2.4 Previous Investigations and Historical Data

As previously discussed, the origin of site SS-73 results from the occurrence of TCE that has been measured in well SS-61-MW02 on several occasions. Site SS-61 resulted from the occurrence of VOCs in well MW-29-05 which is part of site LF-29 (the Old Army Landfill) located downgradient of SS-61. Several environmental investigations have been conducted in this area to determine the source of VOC contamination originally detected in groundwater monitoring well MW-29-05.

Contamination was initially detected in the vicinity of SS-61 during the Phase II RCRA Facility Investigation (RFI) Table 1 Investigation that was conducted at nearby SWMU 104, the Former Army Landfill (also known as LF-29) in 1995 (Radian, 1995). Four additional groundwater monitoring wells (MW-29-05 through MW-29-08) were installed in 1997 and a complete round of groundwater sampling and analysis was conducted (8 groundwater monitoring wells). The results showed that MW-29-05 contained benzene at 3,100 µg/L, 1,2-dichloroethane (1,2-DCA) at 350 µg/L, 2,4,6-trinitrotoluene (TNT) at 0.23 µg/L, and 1,3,5-trinitrobenzene at 2.6 µg/L. Since the source of groundwater contamination was expected to be to the southeast of MW-29-05 and to the east of Building 1001, SS-61 was identified and subsequent Phase I and II RFIs were conducted in 1996 and 1997 (Foster Wheeler Environmental Corporation [FWENC] and Groundwater Technology, Inc. [GTI], 1997). During these investigations, TCE was measured in well SS61-MW02 in concentrations of 13.6 and 45.0 µg/L, respectively, and, TCE was measured at 14.0 µg/L in the DPT groundwater sampling point DP-20 (see Figure 2-3 for selected results and sampling locations).

During the Remedial Investigation of SS-61 in 1999, TCE was reported at 34 µg/L in well SS61-MW-02 (it should be noted that this value is not shown on Figure 2-3). Because there is no known or obvious source for the TCE, it was separated from site SS-61 and designated as site SS-73 to be investigated separately.

In 2006, an abbreviated sampling plan was prepared by Bhate to collect preliminary data that would be useful for preparing an RFI work plan for this site. The scope of this effort was to resample monitoring well SS61-MW-02 for VOCs, collect two groundwater samples at locations upgradient of monitoring well SS61-MW-02, to resample the old DPT point DP-20 (now called DP03), and collect a soil sample from each DPT boring. All samples were analyzed for VOCs and the groundwater samples were also analyzed for TDS. The VOCs were reported below detection levels in all soil samples. TCE and benzene were reported in the groundwater from SS61-MW02 and DP03 (old DP-20) at 13.6 and 13.1 µg/L and 2.4 and 11.0 µg/L, respectively. The TDS levels measured at locations SS61-MW02, DP01, DP02, and DP03 were 12,500; 11,500; 8,970; and 21,600 mg/L, respectively (see Figure 2-3). The analytical results for these May and June 2006 sampling events are included in Appendix D.

The chronology of previous investigations from 1996 through 2005 at this site, based on reports reviewed is outlined below:

- *Draft Final Workplans – Field Sampling and Analysis Plan and Quality Assurance Project Plan for Characterization of AOC-1001 Holloman AFB, NM (*Foster Wheeler and GTI, 1996)
- *Draft Final Phase I and II RCRA Facility Investigation Report Site AOC 1001, Holloman AFB, NM* (Foster Wheeler and GTI, 1997)
- *Final Phase I Remedial Investigation for Spill Site 61, Holloman AFB, NM* (Foster Wheeler Environmental Corporation, 1999)
- *Final Phase II Remedial Investigation for SS- 61 – Spill Site 61, Holloman AFB, NM* (Foster Wheeler Environmental Corporation, 2000)
- *Monitored Natural Attenuation Report for SS-61 (AOC-100) Holloman AFB, New Mexico* (Bhate, 2005)
- *Memorandum Scope of Work for Soil and Groundwater Sampling, Holloman AFB, New Mexico* (Bhate, 2006b)

2.2.5 Rationale and Scope of Confirmatory Sampling

Previous investigations over the last 10 years have determined the extent of TCE contamination to the south, west, and north of monitoring well SS61-MW-02. The current subsurface conditions northeast of this area have not been determined and will be documented by installing three boreholes in this area and analyzing three soil samples.

DPT sampling equipment will be used to install five boreholes in the locations shown on Figure 2-3 to a depth of approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled and field-screened (head space analysis) to identify the single discrete sample from each borehole location that will be submitted for laboratory analysis. Staining and/or odor may also be used to select the samples for analysis. If the screening techniques do not indicate a clear selection for analysis the samples will be collected at the capillary fringe. Soil samples collected from SS73-DP04, SS73-DP05, and SS73-DP06 will be analyzed for VOCs and SVOCs. Soil samples will be analyzed for VOCs, SVOCs, and TPH

(GRO and DRO) from borings SS73-DP07 and SS73-DP08, which are located around buildings 1085 and 1088.

Temporary groundwater sampling points will be installed in the completed borings. A groundwater sample will be collected from each point or well and analyzed for VOCs, TPH (GRO and DRO), and TDS.

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2.3 SS-65, Building 807 Test Cell Surface Spill

SWMU AOC-B is identified in the ERP as SS-65, the Building 807 Test Cell Surface Spill Area. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.3.1 Location

The 1988 RFA identifies the location of this site as the "Area next to Building 807 Test Cell". Another document entitled *HAFB Environmental Restoration Program Site Status Summaries* prepared in December 2005 identifies the location of this site as 25 feet north of Building 807 (Holloman, 2005).

Aerial photographs of HAFB dated 1972, 1979, 1996, and 2004 were viewed and Building 807 could not be located. The Real Property Office at the base was contacted and it was learned that Building 807 is listed in their inventory as a cinder block building that was constructed in 1977 that measures 10 feet wide by 15 feet long. A detailed layout of this site and its surroundings is included as Figure 2-4.

The site which is in the sensitive F-117 area was visited on July 12, 2006. A cinder block building measuring 10 x 15 feet was found 40 feet southeast of Building 801. However, the building was not numbered as Building 807. The building is locked and stenciled with the number 1166. The building has no windows and is not occupied.

Even though oil and grease staining next to Building 807 was observed during the 1988 RFA, there were no visible signs of staining or spills of any kind noted during the site visit. Three soil piles were observed outside the northwest wall of the building. However the soil appears to be excess overburden removed during the repair of a nearby water line.

2.3.2 Records Searched

The records searched for this site included:

- Aerial photographs over several years (1972, 1979, 1996, and 2004)
- HAFB Real Property Records
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

- *Construction Trim Pads W/Support (Phase I and II), Drawing Number HO 285A-6, Sheet 2.I of 10* (Holloman, 1980)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.3.3 Dates of Operation and Description of Past and Current Practices

Building 807 was built in 1977 but does not appear to be in use currently. Because of its small size, it is believed to have been a bathroom facility for test personnel to use during the period that this particular engine test area was active. According to personnel from the HAFB 49th Civil Engineering Squadron/ Combat Engineer Vehicle (CES/CEV) Environmental Flight, this test cell area consisted of two trim pads and one engine test stand, and spills of jet fuel were known to occur especially after the engine was shut down following a test. The site was used to test engines from F-15 and F-4 fighter aircraft during the 1970s and 1980s. During the phase-in of the F-117s in the 1990s, this test cell area was abandoned and replaced with testing facilities suitable for the F-117 which are located approximately 300 yards southeast of the site. This test cell area is currently not operational because these aircraft are not part of air operations at HAFB.

2.3.4 Rationale and Scope of Confirmatory Sampling

This site has not been investigated in the past beyond the level of effort taken during the 1988 RFA. Beyond anecdotal information, there is no evidence of any kind of spill occurring at the site. The area surrounding this site has been disturbed during the construction of the adjacent F-117 bed down facilities. However, to provide documentation of current subsurface conditions at the site, three soil borings will be installed at the locations shown on Figure 2-4 and sampled to determine if conditions in the vicinity of the 1988 surface staining are still present.

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The soil borings will be installed using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. The samples will be field-screened (head space analysis) and one discrete sample from each boring exhibiting characteristics of potential contamination will be submitted for laboratory analysis. Staining and/or odor may also be used to select the sample for analysis. If the screening techniques do not indicate a clear selection for analysis the sample will be collected at the capillary fringe. The soil samples will be analyzed for target analyte list (TAL) metals, total petroleum hydrocarbons (TPH), SVOCs, polychlorinated biphenyls (PCBs), and VOCs. A temporary groundwater sampling point will be installed in each of the completed boring. A groundwater sample will be collected and submitted for laboratory analysis from the point or well with the highest apparent contamination and from SS65-DP01. The groundwater samples will be analyzed for TAL metals, TPH, VOCs, PCBs, SVOCs, and TDS.

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2.4 SS-66, Building 835 Spills

SWMU AOC-C is identified in the ERP as SS-66, Building 835 Spills. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.4.1 Location

The 1988 RFA identifies the location of this site as the "North side of Building 835". The HAFB Environmental Restoration Program Site Status Summaries Report (HAFB, 2005) identifies the location of this site as 65 feet west of Building 835. Building 835 was not located on a 2004 aerial photo of HAFB. The HAFB Real Property Office documented the demolition of Building 835 in 2001. Today the area where Building 835 stood is an open and vacant area located on the north end of the F-117 flight line and about 60 feet southwest of Building 809. The 1988 RFA identifies the site as an oil and rust stained area approximately 20 x 30 feet in size, located on the north side of Building 835. Detailed layouts of this site and its surroundings are included as Figures 2-5 (1996 aerial photograph) and 2-6 (2004 aerial photograph).

2.4.2 Records Searched

The records that were searched for this site included:

- Aerial photographs taken in 1996 and 2004
- *Real Property Form 300 Facility Disposal, Vacate Inspection/Environmental Clearance* (Holloman, 2000)
- *Memorandum Notifying of Facility Disposal* (Moya, 2001)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.4.3 Dates of Operation and Description of Past and Current Practices

According to HAFB records, Building 835 was built in 1954 and was demolished in 2001. The building consisted of a concrete foundation and floor with sheet metal walls and roof and was 3,600 square feet in size. This building was used as a heat treating facility for jet engine parts, although it was used for furniture and equipment storage by the German Air Force during the last two years before demolition.

Mr. Bill Ford of the 49 CES/CEV Environmental Flight was interviewed on July 12, 2006, regarding operational practices at Building 835 and he discussed visiting Building 835 in the 1960s during his rounds to maintain boilers at several facilities within HAFB including this building. He confirmed the practice of heating and quenching metal parts in oil for the purpose of hardening or softening the metals. He recalls seeing recently quenched parts resting over

metal horses to dry. The quenching oil would drip onto the concrete both inside and outside the building. These oil stains on the concrete pads outside the north side of the building are visible in the aerial photograph taken in 1996 (see Figure 2-5).

A visit to this location was made on July 12, 2006, which confirmed that Building 835 was demolished and in its place is a vacant lot. A smaller building (compressor house), identified in the 1996 aerial photograph near the northeast corner of Building 835, remains today. This building is not occupied and is of sheet metal construction and can serve as a reference to direct any field characterization activities as needed.

The search for operational history and practices from the heat treating operation that took place in the past at Building 835 did not reveal any releases other than those of quenching oil that were noticed in aerial photographs on the exterior concrete pads that were located on the north end of Building 835.

No visible signs of hydrocarbon staining, stressed vegetation or rust were observed in the area surrounding the former building during the July 12, 2006, visual examination of the site. The area is noted as stained in the 1988 RFA and appears to be stained in the 1996 aerial photograph. Most likely the area was disturbed during the demolition of the building in 2001.

2.4.4 Rationale and Scope for Confirmatory Sampling

This site has not been investigated in the past beyond the level of effort taken during the 1988 RFA. Institutional knowledge of the practices at Building 835 and possible staining observed in aerial photographs suggest the potential for impact to the subsurface at the site. However, no evidence of a release exists at the site. The area surrounding this site has been disturbed during the demolition of Building 835. In order to provide documentation of current subsurface conditions at the site, a soil boring will be installed and sampled to determine if conditions in the vicinity of the 1988 staining impacted the subsurface at the site.

Four soil borings will be installed in the locations shown on Figure 2-6 using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. The samples will be field screened and one discrete sample from each boring exhibiting characteristics of potential contamination will be submitted for laboratory analysis. Staining and/or odor may also be used to select the sample for analysis. If the screening techniques do not indicate a clear selection for analysis the sample will be collected at the capillary fringe. The soil samples will be analyzed for TAL metals, TPH, SVOCs, PCBs, VOCs, and cyanide (except SS66-DP01). A temporary groundwater sampling point will be installed in each of the completed boring. Groundwater samples will be collected and submitted for laboratory analysis from the point or well with the highest apparent contamination and from SS66-DP01. The groundwater samples will be analyzed for TAL metals, TDS, PCBs, VOCs, SVOCs, and cyanide.

2.5 SS-67, Building 903-909 Sandblast Residue

SWMU AOC-E is identified in the ERP as site SS-67, Buildings 903-909 Sand Blast Residues. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.5.1 Location

The 1988 RFA identifies this site as an area 50 x 50 feet in size of surface soil contaminated with sand blast residue that is located "100 feet east of Building 903". Building 903 is located in the south end of the 49th Materiel Maintenance Group complex at HAFB, also known as the BEAR (Basic Expeditionary Airfield Resources) Base.

It should be noted that during the 1988 RFA, Building 909 was included in the name of this site, thereby implying that it was part of the site. This is believed to be an error because Building 909 is located on the far north side of BEAR Base, approximately 2,000 feet away from Building 903. A detailed layout of this site and its surroundings is included as Figure 2-7.

2.5.2 Records Searched

The records that were searched for this site included:

- Aerial photographs taken in 1996 and 2004
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)

2.5.3 Dates of Operation and Description of Past and Current Practices

At the time of the 1988 RFA, metal surface preparation and painting operations took place at buildings 903 and 905 as part of a corrosion control operation that served HAFB. The corrosion shop began operation in 1978. Sand blasting of metal parts (aluminum and steel) took place in Building 905 and was performed as a surface preparation step prior to painting which was done in Building 903. Residue which is a mixture of materials including the silica shot, metal, and old paint was staged outside of Buildings 903 and 905. Mounds of material can be seen staged on the south end of Buildings 903 and 905 in the 1996 aerial photograph of the area. However, personnel from that period that are familiar with the sand blasting operation could not be located to confirm that these mounds or piles were in fact residue from the sand blasting operation and were present during the site visit made as part of the RFA in 1988. Aerial photos of this area for the years 1987, 1988, and 1989 could not be located to confirm the presence of these piles during these earlier years.

Surface cleaning (Building 905) and painting operations (Building 903) for corrosion control continue today in these buildings, although process improvements have been made with regard to the sand blasting operation and residue management. For instance, the abrasive material currently in use is plastic beads instead of silica. The beads are separated from the abraded sediments allowing reuse of the beads and collection of the sediments for proper disposal as hazardous waste.

This site was visited on July 12, 2006. The residue from the sandblasting is currently drummed and labeled as hazardous waste. The exterior of both buildings were examined and it was noted that the sand piles that appeared in the 1996 aerial photo were removed and replaced with ornamental cobble stone. An area just south of Building 905, near a telephone pole, was observed to have black colored grit over a surface area of approximately 6 x 6 feet. This black material is similar to the description of the sandblasting debris described in the 1988 RFA. However, it should be noted that biological soil crusts (which may appear similar to the material described above) exist naturally in the area and are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials. These crusts play an important role in the increase of soil stability and water infiltration, and appear to have a positive effect on plant germination and growth.

Based on recent field observations (April 2007), this area appears to have been graded and gravel has been laid in the area. No sandblasting residue was visibly apparent. Soil removal activities do not appear to be warranted at this time.

Sandblasting residue containing paint chips and heavy metals may have been placed directly on the ground adjacent to the buildings. Aerial photographs, institutional knowledge, and the presence of a small remaining area of staining (near the telephone pole) indicate that stockpiling of this material may have occurred. Piles of this debris no longer exist at the site. The exact volume of material that was generated and perhaps placed in piles on the ground is unknown.

2.5.4 Rationale and Scope for Confirmatory Sampling

Institutional knowledge over past practices in these buildings, combined with the observation of dark sand-like material on the ground during the site visit and the review of aerial photographs suggest the potential for impact to the subsurface at this site. Most of the area surrounding both buildings has been landscaped with cobble stone which most likely required the excavation/scraping of the area. The confirmatory sampling will target two areas. One near a telephone pole south of Building 905 where a dark stained gritty area on the ground was observed and may represent the conditions identified in the 1988 RFA, and a second area south of Building 903 where piles of silica were observed staged in an aerial photograph dated 1996. These areas are shown on Figure 2-7.

Four soil borings will be installed in the locations shown on Figure 2-7 using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. One discrete sample from each boring (0-2.5-foot interval) will be submitted for laboratory analysis. Staining and/or odor may also be

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used to select the samples for analysis. The soil samples will be analyzed for TAL metals, TPH, SVOCs, and VOCs. A temporary groundwater sampling point will be installed in the completed borings at each location. A groundwater sample will be collected from each of the points or wells and submitted for laboratory analysis. The groundwater samples will be analyzed for TAL metals, TPH, VOCs, SVOCs, and TDS.

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2.6 SS-68, Asphalt Tank Spill Area

SWMU AOC-F is identified in the ERP as site SS-68, Asphalt Tank Spill Area. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.6.1 Location

The 1988 RFA states that aboveground and below ground tanks that were previously removed were located to the northwest of Building 121. The December HAFB Environmental Restoration Program Site Status Summaries Report places the location as 200 feet northeast of Creosote Avenue, which is different from the location identified in the 1988 RFA. This location coincides with the current piles of asphalt that are gathered from road work across the Base and recycled. While the exact location is unknown, the most likely location of these tanks (if they ever existed) would have been at the location used to stockpile and recycle asphalt pavement. Detailed layouts of this site and its surroundings are included as Figures 2-8 (1996 aerial photograph) and 2-9 (2004 aerial photograph).

There was no evidence or signs of any kind of tank in this area noted during the site visit on July 10, 2006.

2.6.2 Records Searched

The records searched to obtain information on this spill include:

- Aerial photographs taken in 1984, 1996, and 2004
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report.* (Kearney, 1988)

2.6.3 Dates of Operation and Description of Past and Current Practices

Weathered asphalt removed from road improvement projects at HAFB has been crushed and reused since the 1980s. Typically, after it has been removed, the asphalt has been staged in an undeveloped area east of Creosote Avenue and north of the base enlisted personnel housing area. Normally the asphalt is staged in piles until it is reused. This has been standard practice since the early 1980s. An aboveground tank has not been observed in the aerial photographs of the area taken in 1984, 1996, and 2004. Further, asphalt tanks are typically heated to keep the

material warm and flowable for use and that would make underground tanks unlikely for this kind of operation at HAFB. An interview with Mr. Darvin St. John of the 49th CES/CEV was conducted on July 13, 2006. Mr. St. John was responsible for documenting the removal of many USTs at HAFB in the 1990s and did not recall the presence of any kind of underground storage tank (UST) or AST in this particular area.

Despite that previously removed ASTs and USTs are mentioned in the 1988 RFA in connection with this site, no ASTs or USTs are identified within this area in Base records. Currently, 6 piles of asphalt are located approximately 700 feet south of Building 121. Aerial photographs from years 1996 and 2004 confirm the storage of asphalt in this area but do not confirm the presence of any tanks. No releases of hazardous constituents have been documented related to this site.

2.6.4 Rationale for Justification for No Further Action (NFA)

A source of contamination cannot be tied to this location. After contacting personnel familiar with the presence and removal of USTs at HAFB, and searching the records at the HAFB Office of Real Property, there remains no evidence of USTs or ASTs at this site and there is no documentation of releases to the environment. Storage of asphalt for reuse is not considered a hazardous waste practice. If a tank was present at the site during the 1988 RFA, it could have been a portable tank for fueling equipment or some other type of portable unit for processing the asphalt. Therefore, there are no plans to conduct confirmatory sampling at this site and a petition for No Further Action will be pursued.

2.7 SS-69, Fighter Wing Flight Line Spill

SWMU AOC-I is identified in the ERP as site SS-69, Fighter Wing Flight Line Spill. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.7.1 Location

The 1988 RFA identifies the site as the location of a surface spill of approximately of 275 gallons of trichloroethylene and 200 gallons of carbon tetrachloride that occurred generally in the area of the 49th Tactical Air Command Flight Line. The HAFB Environmental Restoration Program Site Status Summaries Report (HAFB, 2005) states that the spill occurred approximately 200 feet southwest of Building 868. The source of this information could not be verified. Both documents identify the same general area as the location of the spill.

2.7.2 Records Searched

The records that were searched to obtain information on this spill include:

- Aerial photographs of the F-117 flight line taken in 1984, 1996, and 2003
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)

- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.7.3 Dates of Operation and Description of Past and Current Practices

Building 868 has been in existence for approximately 25 years and has served as a maintenance hangar for both F-117s and F-15s. There have been upgrades over the years, primarily during the early 1990s which is when the transition to the F-117s from the F-15s occurred. The aerial photographs of this period show a considerable addition to Building 868 and it tripled in length in approximately 1991. This can be seen in Figure 2-10.

A site visit was made on August 1, 2006. The flight line was examined with particular attention given to the suspected location of the spills (ie. 200 feet SW of Building 868). The entire area is covered with reinforced concrete since it serves as a taxi-way for heavy aircraft. There was no evidence of spills such as staining on concrete.

Presently, the use of solvents by the United States Air Force (USAF) is limited to parts cleaning (if at all) and for the most part the use of halogenated (i.e. TCE) and non-halogenated (i.e. acetone, toluene) solvents have been replaced with alternative chemicals as part of their pollution prevention programs.

The reported releases of trichloroethylene and carbon tetrachloride occurred over a hardened concrete surface (i.e. a flight line) approximately 12 inches thick that has low permeability. Visits were made to the HAFB Fire Department and to the Bio-Environmental organization to obtain any kind of record that would confirm the solvent spills but none was found, nor was there any personnel that recalled any spill in that area in the 1980s.

2.7.4 Rationale and Scope for Confirmatory Sampling

A spill of solvents onto the flight line was identified in the 1988 RFA. However, no visible evidence currently exists (such as staining, stressed vegetation, or discolored soil) at the site. Regardless, to provide documentation of current subsurface conditions at the site, three soil borings will be installed and sampled to determine conditions in the vicinity of the reported solvent spills.

The three borings will be placed in the locations shown on Figure 2-10 using DPT sampling equipment. The depth of the borings will be approximately 15 feet bgs or until groundwater is encountered. The borings will be continuously sampled. The samples will be field screened and one discrete sample from each boring exhibiting characteristics of potential contamination will be submitted for laboratory analysis. Staining and/or odor may also be used to select the samples for analysis. If the screening techniques do not indicate a clear selection for analysis the samples will be collected at the capillary fringe. The soil samples will be analyzed for TAL metals, TPH, SVOCs, and VOCs. A temporary groundwater sampling point will be installed in each of the completed borings and a groundwater sample will be collected from each point or well and

submitted for laboratory analysis. The three samples will be analyzed for TAL metals, TPH, VOCs, SVOCs, and TDS.

2.8 RW-70, Building 18, Product Storage Tank

SWMU AOC-M is identified in the ERP as site RW-70, Building 18 Product Storage Tank. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.8.1 Location

This UST has been included in the remediation activities conducted at ERP Site SS-17, SWMU AOC-Q (The Old BX Service Station). The RFA identifies this site as a gasoline leak from an underground gasoline storage tank that was located 50 feet northwest of Building 18. Building 18, along with the associated aboveground structures were demolished in 2003 and the contaminated soil in the vicinity of the SWMU AOC-M has been excavated (approximately 31,000 cubic yards) and removed. The extent of excavations in the area of SWMU AOC-M is shown on Figure 2-11.

2.8.2 Records Searched

The records that were searched to obtain information on this site include:

- Aerial photographs of the area taken in 1996 and 2004
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)

2.8.3 Dates of Operation and Description of Past and Current Practices

The BX Service Station featured a gas station, convenience store, and a car wash and operated since the early 1950s. In 1981, gas leaks from the underground storage tanks were discovered and an investigation was initiated that led to the removal of five underground tanks in 1992 which were replaced with three aboveground tanks that were installed so that the BX Station could continue to operate. A new BX Station was built further north on First Street in 2000 and the original BX Station was taken out of service that same year so that the entire area could be remediated by excavating and removing for disposal the petroleum-contaminated soil underneath.

There are no operations at this location other than the ongoing soil excavation and removal activities associated with remediation of the petroleum-contaminated soil. All structures, tanks, and ancillary equipment associated with the former operation of the BX Station have been removed. This was confirmed during the site visit on July 10, 2006.

2.8.4 Justification for NFA

The soil, structures, and product storage tanks that make-up site RW-70 were completely removed during the excavation and removal activities that have taken place in the past two years to remediate the much larger SS-17 site. Site RW-70 was co-located within the larger SS-17 site. Because the source of contamination at site RW-70 has been completely removed, a petition of No Further Action will be pursued with the NMED. Documentation of the remediation of this site will be provided in the AOC-Q (SS-17) closure report.

2.9 TU-71, Leaking Underground Storage Tank

SWMU AOC-S is identified in the ERP as site TU-71, Leaking Underground Storage Tank. This site is listed on Table A of the HAFB Hazardous Waste Facility Permit (No. NM6572124422).

2.9.1 Location

The 1988 RFA does not provide an exact location for the site. However, the HAFB Environmental Restoration Program Site Status Summaries Report (2005) locates the UST just north of Building 807. This site is located at the same facility as SWMU AOC-B (the Building 807 Test Cell Spill). Based upon the available information, both sites appear to be co-located. The site visit conducted on July 12, 2006, did not reveal any signs of an underground storage tank in this area.

2.9.2 Records Searched

The records that were searched to obtain information on this site include:

- Aerial photographs over several years (1972, 1979, 1996, and 2004)
- *HAFB Environmental Restoration Program Site Status Summaries* (December, 2005)
- *RCRA Facility Assessment Preliminary Review/Visual Site Inspection Report* (Kearney, 1988)
- *Construction Engine Test Stand (Phase I) Drawings HO 283B-6 Sheet 2 out of 5* (1980)
- HAFB Real Property Records

2.9.3 Dates of Operation and Description of Past and Current Practices

The site was used to test engines from F-15 and F-4 fighter aircraft during the 1970s and 1980s. During the phase-in of the F-117s in the 1990s, this test cell area was abandoned and replaced with testing facilities suitable for the F-117 which are located approximately 300 yards southeast of the site. There is no available information regarding the presence of a UST at this site. The information reviewed during the records search for SS-65, that included construction drawings

and records from the HAFB Real Property office, was useful during the records search of this site and confirmed that a leaking UST does not exist at the site.

2.9.4 Rationale and Scope for Confirmation Sampling

Based on the descriptions in the 1988 RFA Report for this site and site SS-65, it appears that these are very near to each other and possibly even co-located. Therefore, the confirmatory investigation for both sites will be combined. The records search was also combined. The review of construction drawings for the trim pads and Building 807, as well as the search of records at the HAFB Real Property office did not indicate that a UST ever existed at this site.

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3 ADDITIONAL INVESTIGATION ACTIVITIES

The previous sections have summarized what little background information has been found on these sites based on the efforts undertaken to date to search HAFB records. After comparing the information that was recorded during the 1988 RFA with the newly obtained information, it was evident that a source of contamination does not exist at some of the sites and as a result, the proper justification will be made to petition the NMED for an NFA determination on SWMUs AOC-F and AOC-M (ERP sites SS-68 and RW-70). Additional investigations are necessary to confirm the presumed source areas for sites SS-65, SS-66, SS-67, SS-69, and TU-71. It should be noted that the investigation of TU-71 will be combined with the investigation of SS-65.

The purpose of this section is to describe the pre-investigation requirements (Section 3.1) as well as the requirements necessary to conduct and successfully conclude the scope of the confirmatory sampling at each site (Section 3.2).

3.1 Pre-investigation Requirements

Before site-specific activities can begin, there are several pre-investigation documents and approval requirements to be met, including Air Force Form (AF Fm) 332 approval, Base dig permit(s) with utility clearances, site security measures, and facility manager notification of the intended operations. Bhate will coordinate project requests for Base installation support services through the 49th CES/CEV. Pertinent to the start of activities, a pre-construction meeting and site walk-through will be conducted with the USACE Resident Engineer, HAFB personnel, and Bhate Site Manager, to inspect site-specific conditions for equipment access, equipment staging, and decontamination area(s), potential site hazards, and emergency evacuation routes. Also reviewed at this time will be project procedures in accordance with the schedule and planned activities.

3.1.1 AF Form 332

Prior to initiating the confirmatory sampling activities, a completed and approved AF Fm 332 will be obtained. This form authorizes construction work at HAFB and is required for the initiation of any construction work. This work order describes what activities will take place at the location.

3.1.2 Dig Permit/Utility Clearances

Prior to the submittal of the dig permit(s) (AF Fm 103), the drilling locations will be clearly delineated with marker flags, stakes, or paint, as appropriate to the surface material. Utility clearance approvals will be completed by the appropriate HAFB utility office (e.g., telephone, sewer, water, natural gas etc.). Upon receipt of the approved dig permit (AF Form 103) with the utility clearances, the Bhate Site Manager or other authorized project personnel will complete a site walk-through confirming the dig permit authorizations and make any required changes.

3.1.3 Site Security

Site security is concerned with safety at the site(s) during all drilling and sampling activities and will be addressed as outlined in the *Basewide Health and Safety Plan* (HASP) (Bhate, 2003b). At a minimum the exclusion zone at each site will be secured with caution tape, and traffic cones surrounding the perimeter of the site. The size of each exclusion zone will be determined by the size of the drilling and support equipment, and the prevailing site conditions. Open boreholes will not be left unattended without first securing the immediate area surrounding the borehole, and covering the opening so that it does not become a hazard.

3.2 Investigation Requirements

Field activities will be performed in accordance with the *Site-Specific Addendum to the Basewide Health and Safety Plan* (see Appendix E of this Work Plan), the *Quality Assurance Project Plan (QAPP) Addendum* (see Appendix F of this Work Plan), as well as other USACE mandated procedures for laboratories. The field work for these confirmatory sampling activities will be conducted in accordance with HAFB Standard Operating Procedures (SOPs) provided in the *Basewide Quality Assurance Project Plan* (Bhate, 2003a) and the *Bhate Standard Operating Procedures* (Bhate, 2002). These SOPs outline methodologies for soil boring advancement, soil sampling, soil sample description, groundwater well development and sampling, field screening, sample management, equipment decontamination, and chain-of-custody procedures. Sample nomenclature will follow the Environmental Restoration Program Information Management System (ERPIMS) format. The specific HAFB SOPs for this sampling event are listed below:

- HAFB SOP-1, Documentation, Sample Handling, Chain-of Custody, and Shipping
- HAFB SOP-2, Sampling Equipment Documentation
- HAFB SOP-3, Staking, Utility Clearance, and Permitting
- HAFB SOP-4, Direct Push Sampling for Soil and Groundwater
- HAFB SOP-5, Soil Sampling for Chemical Analysis
- HAFB SOP-6, Procedure for Field Screening of Volatile Organics
- HAFB SOP-7, Lithologic Description and Geotechnical Sampling
- HAFB SOP-8, Groundwater Sampling for Chemical Analysis
- HAFB SOP-9, Field Management of Investigation-Derived Waste
- HAFB SOP-10, Borehole Abandonment and Site Restoration

The following sections describe the procedures for DPT subsurface soil sampling, DPT groundwater sampling, and the analyses to be performed at the sites requiring confirmatory sampling.

3.2.1 Laboratory Analytical Methods

The analysis of soil and groundwater samples collected for this confirmatory sampling will follow the USEPA SW-846 protocol. The site-specific analytical requirements for soil and groundwater samples are summarized in Table 3-1. The soil and groundwater samples will be analyzed as follows:

- VOCs by USEPA Method 8260B (Soil and Groundwater)
- SVOCs by USEPA Method 8270C (Soil and Groundwater)
- TPH (Gasoline Range Organics [GRO], Diesel Range Organics [DRO], Oil Range Organics [ORO]) by modified USEPA Method 8015M (Soil and Groundwater)
- TAL Metals by USEPA Method 6010B/7470A/7471A (Soil and Groundwater)
- PCBs by USEPA Method 8082 (Soil and Groundwater)
- TDS by USEPA Method 160.1 (Groundwater only)

Samples selected for laboratory analysis will be labeled, handled, and prepared for shipment in accordance with HAFB SOP-1. The detection reporting limits for all analytical parameters and the quality assurance sampling requirements (trip blanks, duplicates, and matrix spike/matrix spike duplicates [MS/MSD]) are summarized in the QAPP Addendum. All samples for VOC analysis will require a trip blank. The samples will be placed on ice and shipped under strict chain-of-custody to Accutest Laboratories in Orlando, Florida. Residual soil from the soil sampling will be discarded in accordance with the waste management procedures established in Section 3.4 of this Work Plan, Investigation-Derived Waste (IDW) Management.

3.2.2 DPT Soil Sampling

Soil samples will be collected continuously from soil borings using DPT methodology in accordance with HAFB SOP No. 4. Each boring will be visually classified and lithology described in the field according to HAFB SOP No. 7 and the Unified Soil Classification System (USCS) (American Society for Testing and Materials [ASTM] D 2487-92 and ASTM D 2488-90). The specific locations of the borings may be modified based on site-specific (access, any observed or underground utilities, etc.) field conditions.

Soils will be field screened in accordance with HAFB SOP No. 6 using an organic vapor analyzer (OVA) with soil-headspace screening techniques at two foot intervals. Notation will also be made of any visual (discoloration) and/or aromatic observations that are indicative of potential contamination. The site-specific analytical requirements for subsurface discrete soil samples are summarized in Table 3-1.

A qualified surveyor will locate the DPT boreholes using a global positioning system (GPS). All horizontal coordinates will be referenced to the State Plane Coordinate System, New Mexico Central and surveyed to an accuracy of +/- 1.0 foot. Vertical elevations will be reference to North American Datum (NAD) 1983 coordinates.

3.2.3 DPT Groundwater Sampling

Each DPT soil borehole will be converted to a temporary groundwater sampling point by extending the probe to at least three feet below the water table. Groundwater will be collected for laboratory analysis directly from the aquifer after releasing the drive point and partially retracting the rods. Either a bailer or a peristaltic pump and Teflon tubing will be inserted through the drive rods and used to retrieve the sample. Low flow or low stress techniques will be used during purging activities for sampling to minimize the disturbance of the water column and generation of IDW. Procedures for DPT groundwater sampling are outlined in HAFB SOP-4. A single volume of the sampling device will be purged prior to sample collection (i.e., one volume of Teflon tubing or one bailer volume).

Due to the fine-grained, low permeability soil, the aquifer may not produce sufficient flow to immediately sample the groundwater. In the event that a DPT borehole location exhibits a very slow recharge or an insufficient volume of water for sampling, a temporary polyvinyl chloride (PVC) well will be left in place while additional borings at the site are completed. The temporary groundwater sampling point will be developed and sampled after sufficient recharge has occurred in accordance with Bhate SOP No. 10 (*Subsurface Water Investigation*) Subsections 3 and 4. If necessary, the turbidity of the water sample will be lowered by filtering the sample through a 0.45 micron filter. Following sampling, the well will be completely removed from the ground and the borehole will be sealed in accordance with HAFB SOP-10.

A total of 13 soil and 13 groundwater samples including one duplicate sample and one MS/MSD sample will be collected from the 13 DPT boreholes and will analyzed by an offsite laboratory as specified in Table 3-1. Every shipment of samples to the laboratory will include at least 1 trip blank for the VOC analysis only. On a daily basis, only 1 trip blank would be needed provided all samples analyzed for VOCs are packaged in the same sample cooler. Samples selected for laboratory analysis will be labeled, handled, and prepared for shipment in accordance with HAFB SOP-1.

3.3 Sample Identification System

Each environmental sample collected will be identified on the sample label and chain-of-custody (COC) records, regardless of type. Sample documentation, handling, and shipping will be in accordance with HAFB SOP-1. Sample collection information inclusive of the container type and quantity for the soil samples collected during the confirmatory sampling will be performed according to the QAPP Addendum. The field duplicate samples will appear in sequence with the regular samples. An example of the sample identification nomenclature for soil samples collected from DPT boreholes will be as follows:

SS65-DP01-5-a

Site alpha-numeric identifier: SS65 = Building 807 Test Cell Surface Spill

Sample type identifier: DP = direct push boring

Sequential direct push boring number: 01, 02, etc.

Ending depth of sample interval: 5

Reserved for quality assurance (QA) sample identifiers: a = field duplicate, TB = trip blank, MS = matrix spike, MSD = matrix spike duplicate

3.4 Investigation-Derived Waste Management

IDW will be managed and characterized according to HAFB SOP-9. Whenever possible, waste minimization techniques will be used to reduce the amount of IDW. The DPT drilling technique does not generate cuttings. Left over soil from the sample tubes will be placed in 55-gallon drums and will be transported and placed in the FT-31 Landfarm at HAFB. Liquid wastes will also be containerized in either a 55-gallon drum or holding tank until receipt of the groundwater sampling results. If results indicate the waste is non-hazardous, it will be transported and disposed of through the HAFB Wastewater Treatment Plant (WWTP). Personal protective equipment (PPE) and other site non-hazardous debris/waste shall be disposed of in standard trash receptacles.

Deleted: screened with the OVA for the presence of organic vapors. If the soil is free of organic vapors, it will be spread on the ground surrounding the well. A level of 300 parts per million (ppm) on the OVA will be used to determine if the soil

Deleted: , such as decontamination rinses,

Deleted: are anticipated to be non-hazardous and as such, can be

Deleted:).

3.4.1 General Decontamination Procedures

Small equipment, such as sampling tools, will be decontaminated in accordance with HAFB SOP-2. Heavy equipment such as the DPT rig will be decontaminated by steam cleaning at a temporary decontamination pad set up at the site. The containers and decontamination pad will be managed in a secure area and the decontamination water will be allowed to evaporate or discharged to the HAFB WWTP. Sediment remaining in the decontamination pad area after the water has either evaporated or been discharged to the WWTP, will be spread on the ground.

3.4.2 Personal Protective Equipment

Prior to disposal, used PPE, disposable items, and the decontamination pad liner will be rinsed clean with tap water and diluted detergent solution. Cleaned PPE and presumed clean, based upon non-contact with contaminated soils, water, or equipment, and other disposable clean items will be contained in trash bags and disposed of at the applicable onsite sanitary waste receptacle.

3.5 Site Restoration

Upon completion of the confirmatory sampling activities, the sites will be restored to their original condition. Sampling locations will have been backfilled or grouted to the surface. The sites will be canvassed for trash, debris, etc.

3.6 Decontamination Procedures

Small equipment, such as sampling tools, will be decontaminated in accordance with the *Basewide Quality Assurance Project Plan.* (Bhate, 2003a). Heavy equipment, such as the DPT rig, etc., will be decontaminated at a temporary decontamination pad set up at the site.

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4 PROJECT QUALITY ASSURANCE

The laboratory performing the chemical sample analysis will follow the *Basewide Quality Assurance Project Plan* (Bhate, 2003a) and the QAPP Addendum.

4.1 Standard Operating Procedures

Applicable SOPs for completing the confirmatory sampling activities are located in Appendix A of the *Basewide QAPP* (Bhate, 2003a).

4.2 Sample Identification

Each environmental sample will be identified on the sample label and COC records for each sample collected, regardless of type. Field duplicates will be paired with another field sample and will be classified as blind samples. The duplicate samples will appear in sequence with the regular samples. The identifier nomenclature will adhere to the procedures and guidelines established in the *Basewide QAPP*. Sample labeling will adhere to the format provided in the *Basewide QAPP*.

4.3 Project Documentation

The field operations documentation will provide consistent procedures and formats for documentation and management of field records and collected samples.

4.3.1 Sample Documentation

Sample documentation, identification, and tracking will adhere to the prescribed methods found in the *Basewide QAPP*. All sampling activities will include documentation of significant activities, potential environmental influences during sampling, field variances, and sample identification information. At a minimum, field logbooks will be utilized to record dates and times, sampling protocols, project numbers, and sampler's name. Daily Quality Assurance Reports will be completed and submitted weekly to the HAFB Project Manager. Other pertinent information will include COC numbers and air-bill tracking number. Chain-of-custody forms will be completed and included with each sample shipment; one COC per cooler.

At a minimum, the following sample collection information will be logged in the field book:

- Date and time
- Sample identification number
- Project number
- Sampler name
- Preservative (if any)

- Analysis
- Map or schematic of sampling location

If no map of sampling locations is available prior to sampling, a drawing of the site will be sketched on the left page of the field logbook to provide an illustration of all sampling points. Measured distances from sampling points to a fixed reference point will be recorded.

4.3.2 Field Logbook

Personnel will use only bound field logbooks for the maintenance of field records. The Project Manager will ensure that all field notes can be efficiently traced, filed, and retrieved. All entries will be recorded in indelible, waterproof ink. If errors are made, corrections will be made by crossing a single line through the error, correcting the information, and initialing and dating the correction. Entries will be made in the following format:

Documentation and reporting of events and activities will be made in chronological order on the right page of an open logbook. All entries will be dated and time of entry recorded. At the beginning of each day, the first two entries will be "personnel/contractors on site" and "weather". At the end of each day's entry, the personnel will draw a diagonal line originating from the bottom left corner of the page to the conclusion of the entry and sign along the line indicating the conclusion of the entry or the day's activity. Once completed, the field logbooks become accountable documents and will be maintained as part of the project files.

The following general requirements apply to field logbooks:

- The left page of the logbook will be used for auxiliary reporting such as sketches, tables, etc.
- The date will be recorded at the top of every page in the left-hand corner of the right page.
- The time of entry recordings will be in columnar form down the left-hand side of the right page.

4.3.3 Field Analytical Data

The field analytical data collected at the sites will include the field screening readings for selection of PPE, as well as field screening for headspace analysis. The breathing zone of the site will be screened for VOCs in the field at the time of sample collection utilizing an OVA. If a high humidity condition exists at the time of sample collecting, a flame-ionization detector (FID) is recommended since a photoionization detector (PID) is not a completely reliable screening instrument under these conditions. The field screening data will be recorded in the field logbook.

4.3.4 Data Reporting

Data obtained during confirmation sampling or field screening samples, will be reported according to the *Basewide QAPP*. In accordance with USACE EM200-1-6, the investigative

data is classified as definitive data. The data will be generated using rigorous, analyte-specific analytical methods where analyte identifiers and quantitations are confirmed and QA/Quality Control (QC) requirements have been satisfied. For this project, regular, field duplicate, and MS/MSD samples are to be collected concurrently. The data will meet the objectives of the project for level of accuracy and precision required, intended use of the data, analytical methods, time constraints, and allowable decision errors. An ERPIMS submittal will be required for this project.

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5 HEALTH AND SAFETY REQUIREMENTS

Project Health and Safety practices will adhere to the *Basewide Health and Safety Plan* (Bhate, December 2003b) and the Site Specific Addendum to the *Basewide HASP*, as included in Appendix E of this Work Plan. It is anticipated that no greater than modified level D PPE will be required to complete the confirmatory sampling activities. This includes: Occupational Safety and Health Administration (OSHA) approved safety shoes, American National Standards Institute (ANSI) approved safety glasses (Z87.1) and hard hat (Z89.1-1997: Type I), sleeved shirt and long pants, and as required, hearing protection, leather work gloves, and/or nitrile gloves during sampling.

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6 ORGANIZATION AND SCHEDULE

Mr. Jim Moore, Professional Geologist (P.G.), will serve as the Bhate Field Manager during the additional investigations and will also ensure that required project documents, permits, contractual agreements, and other program tasks are completed. Mr. John Hymer will provide on-site management of any sub-contractors for the project. The additional investigation activities are anticipated to begin in the Spring 2007 and will last approximately 2 weeks.

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TABLE

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RESPONSE TO COMMENTS
Section Break (Next Page)

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Legend:

- Existing Borehole Location
- Proposed Borehole Location
- General Groundwater Flow Direction

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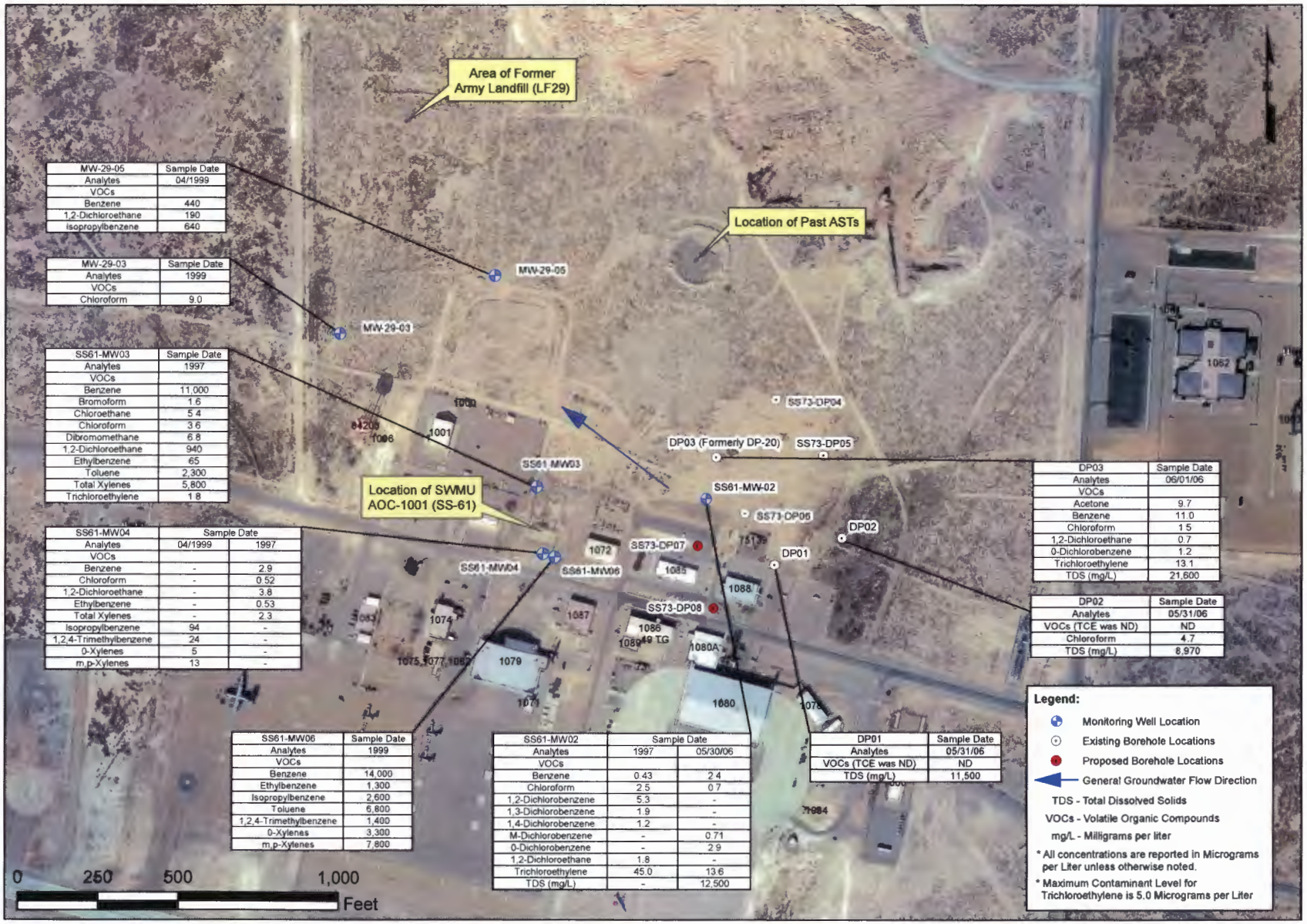
SWMU AOC-B (SS-65), SWMU AOC-S (TU-71) and Building 807 Layout
(Aerial photography taken in 2004)

PROJECT NO.	SCALE	DATE	DRAWN BY
9050360	AS SHOWN	7/12/07	MRM/CM
			DRAWING NO. Figure 2-4

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-4



MW-29-05	Sample Date
Analytes	04/1999
VOCs	
Benzene	440
1,2-Dichloroethane	190
isopropylbenzene	640

MW-29-03	Sample Date
Analytes	1999
VOCs	
Chloroform	9.0

SS61-MW03	Sample Date
Analytes	1997
VOCs	
Benzene	11,000
Bromoform	1.6
Chloroethane	5.4
Chloroform	3.6
Dibromomethane	6.8
1,2-Dichloroethane	940
Ethylbenzene	65
Toluene	2,300
Total Xylenes	5,800
Trichloroethylene	1.8

SS61-MW04	Sample Date	
Analytes	04/1999	1997
VOCs		
Benzene	-	2.9
Chloroform	-	0.52
1,2-Dichloroethane	-	3.8
Ethylbenzene	-	0.53
Total Xylenes	-	2.3
Isopropylbenzene	94	-
1,2,4-Trimethylbenzene	24	-
0-Xylenes	5	-
m,p-Xylenes	13	-

SS61-MW06	Sample Date
Analytes	1999
VOCs	
Benzene	14,000
Ethylbenzene	1,300
Isopropylbenzene	2,600
Toluene	6,800
1,2,4-Trimethylbenzene	1,400
0-Xylenes	3,300
m,p-Xylenes	7,800

SS61-MW02	Sample Date	
Analytes	1997	05/30/06
VOCs		
Benzene	0.43	2.4
Chloroform	2.5	0.7
1,2-Dichlorobenzene	5.3	-
1,3-Dichlorobenzene	1.9	-
1,4-Dichlorobenzene	1.2	-
M-Dichlorobenzene	-	0.71
0-Dichlorobenzene	-	2.9
1,2-Dichloroethane	1.8	-
Trichloroethylene	45.0	13.6
TDS (mg/L)	-	12,500

DP01	Sample Date
Analytes	05/31/06
VOCs (TCE was ND)	ND
TDS (mg/L)	11,500

DP03	Sample Date
Analytes	06/01/06
VOCs	
Acetone	9.7
Benzene	11.0
Chloroform	1.5
1,2-Dichloroethane	0.7
0-Dichlorobenzene	1.2
Trichloroethylene	13.1
TDS (mg/L)	21,600

DP02	Sample Date
Analytes	05/31/06
VOCs (TCE was ND)	ND
Chloroform	4.7
TDS (mg/L)	8,970

Legend:

- Monitoring Well Location
- Existing Borehole Locations
- Proposed Borehole Locations
- General Groundwater Flow Direction

TDS - Total Dissolved Solids

VOCs - Volatile Organic Compounds

mg/L - Milligrams per liter

* All concentrations are reported in Micrograms per Liter unless otherwise noted.

* Maximum Contaminant Level for Trichloroethylene is 5.0 Micrograms per Liter

Confirmatory Sampling
Work Plan
Holloman AFB, New Mexico

Figure 2-3

SWMU (SS-73) Site Layout & Groundwater Concentration Map

(Aerial photography taken in 2004)

PROJECT NO.	SCALE	DATE	DRAWN BY:	DRAWING NO.
9050360	AS SHOWN	7/12/07	MRM/CM	Figure 2-3

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0 25 50 100 Feet

Legend:

- Existing Borehole Location
- Proposed Borehole Location
- General Groundwater Flow Direction

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SWMU AOC-F (SS-66)
Building 835 Layout
(Aerial photography taken in 2004)

PROJECT NO	SCALE	DATE	DRAWN BY
9050360	AS SHOWN	7/12/07	MRM
			DRAWING NO: Figure 2-6

RFA Phase II
PR/VSI and Sampling Visit
Work Plan
Holloman AFB, New Mexico

Figure 2-6

Legend:

- Existing Borehole Location
- Proposed Borehole Location
- General Groundwater Flow Direction

0 50 100 200 Feet

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SWMU AOC-E (SS-67) Layout and Proposed Sampling Locations
(Aerial photography taken in 2004)

PROJECT NO	SCALE	DATE	DRAWN BY
9050360	AS SHOWN	7/12/07	MRM/CM
			DRAWING NO Figure 2-7

Confirmatory Sampling Work Plan
Holloman AFB, New Mexico

Figure 2-7