ENTERED

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

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT
Attn: Mr. James Bearzi
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Santa Fe NM 87105-6303

FROM: 49 CES/CD
550 Tabosa Ave
Holloman AFB NM 88330-8458

SUBJECT: Final Accelerated Corrective Measures Work Plan SD-27 Pad 9 Washrack Area (SMWU 141) (March 2009) Holloman AFB, NM6572124422 HWB-HAFB

1. The subject work plan is hereby submitted to NMED for review.

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 feel free to contact Mr. David Scruggs at (575) 572-5395.

for Michael A. Porto
A. DAVID BUDAK
Deputy Base Civil Engineer

Attachment:
Accelerated Corrective Measures (ACM) Work Plan

cc:

(w/Atch)	(w/o Atch)	(w/o Atch)
Mr. David Strasser	Mr. Will Moats	Ms. Laurie King
Hazardous Waste Bureau	Hazardous Waste Bureau	USEPA, Region 6 (6PD-F)
5500 San Antonio Dr. NE	5500 San Antonio Dr. NE	1445 Ross Ave., Ste 1200
Albuquerque, NM 87109	Albuquerque, NM 87109	Dallas, TX 75202-2733

FINAL

SD-27 PAD 9 WASHRACK AREA (SWMU 141)
ACCELERATED CORRECTIVE MEASURES WORK PLAN
HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

Prepared for:

Air Force Center for Engineering and the Environment
Brooks City-Base, Texas

Prepared by:

Tetra Tech, Inc.
800 Oak Ridge Turnpike, Suite A-600
Oak Ridge, Tennessee 37830

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

March 2009

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

This Page Intentionally Left Blank

ACRONYMS

ACC	Air Combat Command
AMC	Air Materiel Command
AOC	Area of Concern
EFH	Extractable Fuel Hydrocarbons
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
HAFB	Holloman Air Force Base
HGL	HydroGeoLogic, Inc.
HSWA	Hazardous and Solid Waste Amendments
IRP	Installation Restoration Program
LTM	Long Term Monitoring
MCLs	Maximum Contaminant Level
mg/kg	milligram per kilogram
mg/L	milligram per liter
NFA	No Further Action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environmental Department
PA/SI	Preliminary Assessment/Site Investigation
PR/VSI	Preliminary Review/Visual Site Inspection
RCRA	Resource Conservation Recovery Act
RI	Remedial Investigation
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SSL	Soil Screening Levels
SOP	Standard Operating Procedure
SVOCs	Semi-Volatile Organic Compounds
SWMU	Solid Waste Management Unit
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
TDS	Total Dissolved Solids
Tetra Tech	Tetra Tech, Inc.

USACE	United States Army Corps of Engineers
USAF	United States Air Force
µg/L	microgram per liter
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Accelerated Corrective Measures (ACM) Work Plan was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Holloman Air Force Base (HAFB) for SD-27 Pad 9 Washrack Area Solid Waste Management Unit (SWMU) 141 at HAFB, New Mexico. Tetra Tech has prepared this document under contract to the U.S. Air Force Center for Engineering and the Environment, Contract No. FA4890-06-D-0009, Task Order No. 5002.

1.1 INSTALLATION BACKGROUND

1.1.1 Location

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

1.1.2 History

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

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

1.2 SD-27 PAD 9 WASHRACK AREA (SWMU 141)

1.2.1 Location

The SD-27 Pad 9 Washrack Area (SWMU 141) is located east of Taxiway F near former Building T884. The site is located within the airfield, significantly limiting unauthorized access. The location of SD-27 with respect to the surrounding is shown on Figure 1-2.

1.2.2 Site Description

SD-27 is an inactive washrack that consists of a circular concrete pad with sump and drainage gallery. The drainage gallery/sump discharged accumulated wash water to a former drainage pit, located approximately 215 feet south of the concrete pad via an underground discharge pipe as shown in Figure 1-3. The washrack concrete pad is approximately 150 feet in diameter and appeared to be in relatively good condition, with only a few fractures and cracks evident. No petroleum or unusual stains were observed on the pad during Supplemental RCRA Facility Investigation (RFI) field activities [HydroGeoLogic, Inc. (HGL), 2007]. The concrete pad is connected to Taxiway F by a partially degraded asphalt service road. The sump, a 4-foot wide, 7-foot long, and 1 to 1.5-foot deep pit, was constructed of concrete and covered with a thick steel grate. Prior to Supplemental RFI field activities, the sump and associated drainage gallery, a 0.5-foot wide by 0.5-foot deep concrete-lined trough running the radius of the concrete washrack, was nearly filled with accumulated sediments, grasses, and a cactus. Upon removal of the accumulated sediments, the base of the sump was determined to be in good condition. No soil staining, unusual solids or liquids, or unknown odors were noted in the sediment contained within the former sump and concrete trench (HGL, 2007).

A broken floor drain was present in the center of the sump floor. The floor drain was believed to connect the sump to the former drainage pit via an underground discharge pipe. The drain inlet was broken and filled-in with sediments. The outlet of the discharge pipe, located in the former drainage pit, was not observed during the Supplemental RFI site inspection. The former drainage pit was described in previous reports as being unlined approximately 50 feet in diameter by 12 feet deep. At the time of the Supplemental RFI site inspection, the drainage pit had been backfilled to within 2 to 3 feet of grade. The backfilled pit supported a thick concentration of shrubs, which were trimmed down prior to field sampling activities. No unusual stains or odors were noted on the surface soils within or around the former drainage pit. A partially standing fence surrounds the drainage pit. No surface expression of the only building formerly located on site, Building T884, was observed during the Supplemental RFI field event (HGL, 2007).

The area immediately surrounding SD-27 is unpaved, undeveloped and currently used as a safety buffer for Base runway operations. An active taxiway, Taxiway F, is located approximately 200 feet west of the SWMU.

1.2.3 Contamination History

The SD-27 Pad 9 Washrack Area was used to wash down drones and manned aircraft that had flown through clouds of nuclear blast materials in the late 1940s and early 1950s. Wash water would collect in the sump and discharge via the discharge pipe to the discharge pit (Radian, 1993). No information on the exact year when washrack activities ceased at SD-27 was obtained. However, according to former military personnel, no aircraft maintenance activities have occurred at SD-27 since the cessation of washing down potentially radioactive contaminated drones and manned aircraft (Radian, 1993).

1.3 SCOPE AND OBJECTIVE

The document provides an accelerated corrective measures plan and remedial strategy for the SD-27 Pad 9 Washrack Area. This remedial strategy includes a direct push technology (DPT) subsurface soil investigation, excavation of soils and sediment at the drainage pit, and installation of permanent groundwater monitoring wells to provide additional characterization of the soil and groundwater at the SD-27 Pad 9 Washrack Area. These actions should achieve a determination of Remedy in Place. Once completed, No Further Action (NFA) Site Closure with or without soil and groundwater land use controls (LUCs) which may include monitored natural attenuation (MNA) can be achieved.

1.4 WORK PLAN ORGANIZATION

This work plan is organized into five sections. Section 1 is the introduction; Section 2 presents the site specific environmental setting of the SD-27 Pad 9 Washrack Area; Section 3 provides the previous site investigations and Supplemental RFI activities; Section 4 presents the ACM for the site; and Section 5 presents the references cited in this work plan.

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

This Page Intentionally Left Blank

2.0 SITE-SPECIFIC ENVIRONMENTAL SETTING

The environmental setting information in the following subsections is reproduced primarily from the Supplemental RFI Report prepared by HGL for the SD-27 Pad 9 Washrack Area (HGL, 2007) unless cited otherwise.

2.1 DEMOGRAPHICS

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

2.2 CLIMATE

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

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

2.3 TOPOGRAPHY

The SD-27 Pad 9 Washrack Area is located in a generally flat portion of HAFB, although an overall southwestwardly dip is present. The drainage pit represents the lowest topographic feature on or near the SD-27 site. The base of the pit is extremely hummocky reflecting former backfilling activities.

2.4 SURFACE WATER

No surface water bodies or surface water drainage features are present within or adjacent to SD-27. No surface water was observed within the washrack sump, the drainage ditch, or within the former discharge pit. Precipitation falling onto the unpaved soil surrounding the site most likely either evaporates or infiltrates into the subsurface soil. No visual evidence of overland flow was observed immediately surrounding the site. Precipitation falling on the paved portion of SD-27 evaporates or infiltrates into the subsurface along the few observed cracks and fractures. If a sufficient amount of precipitation falls on the concrete-paved area, it discharges as an overland flow to the sump, drainage gallery, or surrounding unpaved areas (HGL, 2007).

2.5 SOILS

The soils beneath SD-27 are classified by the USDA Soil Conservation Service as belonging to the well-drained, sandy loam, and gypsum of the Holloman-Gypsum Land-Yesum complex (USDA, 1981). The soils of this association are formed from alluvial and eolian gypsiferous sediments. The Holloman unit makes up about 35% of the complex and is described as being a light brown to pink, very fine, sandy loam with high gypsum content. The soil is moderately permeable, calcareous, and mildly to moderately alkaline. The Gypsum Land unit makes up about 30% of the complex and is described as being a soft to hard white gypsum, typically overlain by less than one inch of very fine, sandy loam. The Yesum unit, which makes up 20% of the complex, is light brown to pinkish-white, very fine sandy loam that is also high in gypsum. The Yesum unit is moderately calcareous, and mildly alkaline (USDA, 1981).

2.6 GEOLOGY

Site-specific geologic information was obtained from soil borings completed during the Supplemental RFI (HGL, 2007) as well as from a Preliminary Assessment/Site Investigation (PA/SI) (Radian, 1993). Boring logs generated from soil borings completed for the previous investigations can be obtained from the previous investigation reports.

Based on a review of the boring logs, the soil beneath SD-27 is very heterogeneous. No single lithologic unit was observed to be continuous across the site (HGL, 2007). During the PA/SI, a 1- to 2-foot thick clay lens was encountered within the first 5 feet of soil beneath the eastern portion of SD-27 (Radian, 1993). However, this continuous unit was not observed in any of the Supplemental RFI borings (HGL, 2007).

Supplemental RFI borings completed through or in the immediate vicinity of the concrete pad encountered soil composed primarily of silty, very fine- to medium-grained sand. In addition, these borings encountered refusal between 8.5 and 13 feet bgs. No subsurface obstructions were observed that would result in borehole refusal. South of the concrete pad, subsurface soils were primarily sandy, silty, and sandy clay. Borings completed south of the pad were advanced to a maximum depth of 20 feet bgs without encountering refusal.

2.7 HYDROGEOLOGY

During the Supplemental RFI (HGL, 2007), multiple water bearing zones were encountered in the subsurface soils beneath SD-27 ranging from 5 feet bgs to 20 feet bgs. The majority of these zones were insufficient in yielding water for sampling. Groundwater of sufficient volume for sampling was not encountered beneath the concrete pad prior to borehole refusal (possibly resulting from the highly compacted soils encountered in the northern and central portions of the site) at a depth between 8.5 to 13 feet bgs. Within the former drainage pit, groundwater yield sufficient for sampling was encountered between 10 and 12 feet bgs. During investigations prior to the Supplemental RFI (Radian, 1993), groundwater was encountered between 5 and 8 feet bgs. The presence of groundwater at shallower depths within and in the vicinity of the former drainage pit as compared to beneath the concrete pad is most likely attributable to the increased porosity of the backfill material in the former drainage pit and an overall decrease in the vertical infiltration rate beneath the concrete pad.

This Page Intentionally Left Blank

3.0 SITE INVESTIGATIONS

3.1 BASE ENVIRONMENTAL RESTORATION PROGRAM

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

The SD-27 is one of the four ERP sites that was included and previously addressed in the Supplemental RFI Report (HGL, 2007). The SD-27 Pad 9 Washrack Area was placed on the original 1991 Holloman RCRA permit issued jointly by the U.S. EPA Region VI and NMED.

3.2 REGULATORY CRITERIA FOR ANALYTICAL DATA EVALUATION

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

3.2.1 Soil/Sediment

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

3.2.2 Groundwater

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

3.3 PREVIOUS INVESTIGATIONS

Previous investigations conducted at SD-27 include a radiation soil screening investigation, a PA/SI (Radian, 1993), and a Phase II RI (Radian, 1994). A general discussion of the previous investigations, results, and associated conclusions are presented below.

Analytical results associated with the PA/SI and the Phase II RI are summarized in Table 3-1 and 3-2, respectively.

3.3.1 Radiation Site Screening

In May 1976, a radiation site screening investigation was conducted at the SD-27 drainage pit. No information regarding this investigation was obtained from the Base Administrative Record. However, the results of the investigation were summarized in the 1993 PA/SI report. As presented in the PA/SI report, the radiation investigation determined that no radiation above background was present in the discharge pit soils (Radian, 1993). Based on the sampling results, the drainage pit was backfilled to grade (Radian, 1993). No additional information was presented in the PA/SI report on the number or locations of samples collected, radiological analyses performed, or the actual radiological analytical results.

3.3.2 Preliminary Assessment/Site Investigation

The PA/SI was conducted at SD-27 in 1993 and consisted of completing four soil borings (designated as BH-27-01 through BH-27-04). The borings were completed immediately south of the concrete pad, within the former drainage pit, and within the footprint of a former transformer. In addition, one background soil boring, BH-27-05, was completed and sampled approximately 500 feet north of SD-27. The PA/SI soil boring locations are depicted on Figure 3-2.

One soil sample per boring was collected for laboratory analyses, which included gross alpha and gross beta (4 samples), PCBs (1 sample), Extractable Fuel Hydrocarbons (EFH) (1 sample) and Purgable Fuel Hydrocarbons (1 sample). The PA/SI analytical sampling scheme was devised to address known or potential contaminants of concern associated with various areas of interest (i.e., drainage pit, sump, former transformer location, etc.) present on site. The PA/SI analytical sampling results are summarized on Table 3-1.

Within the drainage pit (i.e., borings BH-27-02 and BH-27-03), stained soils and fuel odors were encountered between 8 and 16 feet bgs, at and below the top of the underlying water table. No free phase hydrocarbons were noted in the collected soils. A soil sample collected from the stained area (8 – 10 feet bgs) contained TPH at 430 micrograms per kilogram (µg/kg), ethyl benzene at 680 µg/kg, toluene at 51 µg/kg, and xylenes at 2,700 µg/kg. The PA/SI soil analytical results were evaluated against current NMED SSLs, which are included in Table 3-1. None of the reported analyte concentrations exceeded applicable NMED SSLs. Fingerprint analysis of the hydrocarbons identified the EFH as kerosene. The total concentration of both extractable and purgable compounds were 3,861 ug/kg, which is several orders of magnitude below current residential (760,000 µg/kg) and industrial (1,810,000 µg/kg) New Mexico TPH guidelines for kerosene (NMED, 2006a). No groundwater samples were collected as part of the PA/SI report.

3.3.3 Phase II Remedial Investigation

After reviewing the PA/SI data, NMED required additional characterization. A Phase II RI was conducted in 1994 and consisted of advancing one soil boring (94-27-B01R) through the discharge pit to a maximum depth of 16 feet bgs (Figure 3-2). Three soil samples were collected from the boring for laboratory analysis. One sample each was collected between 10 and 12 feet bgs, 12 and 14 feet bgs and 14 and 15 feet bgs. All three soil samples were collected below the top of the underlying water bearing unit. The three samples were analyzed for VOCs, SVOCs, and total recoverable petroleum hydrocarbons (TRPH) (Foster Wheeler and Radian1996).

Five VOCs, seven SVOCs, and TRPH were detected in the Phase II RI soil samples. Most of the analytes maximum concentrations were detected primarily in the 10 to 12 feet bgs soil interval while the lowest concentrations were detected in the 12 to 14 feet bgs soil interval. Phase II RI soil analytical data are summarized in Table 3-2. Although NMED SSLs have been included in Table 3-2, the Phase II RI soil analytical data should not be compared to the SSLs since all three soil samples were collected below the water table. No groundwater samples were collected as part of the Phase II RI (Foster Wheeler and Radian 1996).

3.3.4 Site Closeout Petition

Based on the results of the PA/SI and Phase II RI, HAFB submitted a "No Further Action" and Site Close Out Petition letter for SD-27 (SWMU 141) in December 2001. In a March 5, 2002 letter, NMED responded to the NFA petition by requesting additional soil and groundwater characterization data. The following data gaps were identified by NMED (Bhate, 2003b):

- The condition of the washrack drainage gallery;
- The lack of soil and groundwater quality data beneath the washrack drainage gallery to determine the presence or absence of hazardous materials; and
- The lack of soil and groundwater quality data beneath drain pit to determine if any hazardous constituents are present in the subsurface directly below the pit.

3.4 SUPPLEMENTAL RFI ACTIVITIES

Supplemental RFI activities were conducted at SD-27 in May and June 2006 and in accordance with the NMED-approved Bhate work plan (Bhate, 2003b). A sample analytical summary table is included as Table 3-3. The Supplemental RFI soil boring locations are depicted on Figure 3-2.

3.4.1 Drainage Gallery Assessment

Evaluation of the former drainage gallery required sampling the sediments within the former sump, removal of the sediments and visual inspection of the former sump, and the collection of subsurface soils beneath the sump. All drainage gallery assessment activities were conducted in May 2006.

3.4.1.1 Sediment Sampling

The sediments within the sump were removed using a shovel. During removal, the sediments were field screened with a PID and a Victoreen radiological meter Geiger counter. No unusual odors were detected with the PID and no radiation readings over background were detected. In addition, no staining or liquids were observed on the sediment in the former sump. A composite sediment sample, designated as HGLSD27-01-0002, with sample location SD27-01 (Figure 3-2) was collected from the sump and submitted to the laboratory to analyze for VOCs, SVOCs, TPH-GRO, TPH-DRO, RCRA metals, and radionuclides. Sample compositing was conducted by collecting equal amounts of sediment from random locations and depths within the sump. After sample collection, the excavated sediment was stockpiled within plastic and stored on site until analytical results were obtained to determine the ultimate disposition of the sediment.

One VOC, 15 SVOCs, 6 RCRA metals, TPH-GRO, and TPH-DRO were all detected in the sediment sample. Sediment sample results are summarized in Table 3-4. Of the analytes detected, only benzo (a) pyrene, dibenzo(a,h)anthracene, chromium, and lead were detected at concentrations exceeding NMED SSLs. Benzo(a)pyrene and lead were detected at concentrations exceeding NMED residential and industrial SSLs. Lead also exceeded the NMED SSLs for construction workers. Dibenzo(a,h)anthracene and chromium were detected at concentrations exceeding residential SSLs. In addition, the radionuclides lead-210, radium-226, and radium-228 were detected above U.S. EPA radiological SSLs for direct ingestion of site soils.

After removal of the accumulated sediment, the washrack sump was determined to be approximately 7 feet long, 4 feet wide and ranged in depth from 1.0 to 1.5 feet below the grade of the pad. The metal grate covering the sump was in good condition. The sump was observed to be constructed of concrete sidewalls and a concrete floor with the floor sloping inward from the sidewalls to the center of the sump. The concrete appeared to be in good condition with no cracks or fractures observed. In addition, no concrete staining was observed. A floor drain covered with a broken cover was present in the center of the sump and filled with sediment (HGL, 2007).

The concrete-lined trench extended from the south end of the concrete slab, sloping towards the southern edge of the sump to promote drainage to the sump. The trench was approximately 0.5-feet wide and 0.5-feet deep. A small amount of sediment has accumulated on the floor of the trench. No staining of the trench sidewalls, floor, or sediment was observed and no unusual odors noted. Radiation field screening did not detect radiation above background in the trench (HGL, 2007).

The sediment within the former sump was removed and stockpiled within plastic pending analytical results. Based on the obtained analytical data, the sediment was transported off base on September 12, 2006 and disposed as non-hazardous material (HGL, 2007).

3.4.1.2 Subsurface Soil Sampling

After removal of the sediment from the former sump, a DPT drill rig was used to advance a soil boring at sample location SB-27-01 (Figure 3-2), through the base of the former sump to the underlying water table. Boring SB-27-01 was completed through the concrete base of the sump just east of center. The boring was to be advanced to 14 feet bgs; however, borehole refusal was encountered at 8.5 feet bgs. No subsurface obstructions accounting for borehole refusal were observed; rather, refusal appears to have resulted from the subsurface lithology, possibly resulting from the compaction of well-sorted sands encountered beneath the north and central portions of the site.

During borehole advancement, soil samples were continuously collected for lithologic characterization, field screening with a PID, and possibly for laboratory analysis. After sampling was completed, the boring was abandoned in accordance with HAFB SOPs (Appendix B). Based on field screening results, one soil sample, obtained from 6 to 8 feet bgs, was collected from the boring and submitted to analyze for VOCs, SVOCs, RCRA metals, TPH-GRO, TPH-DRO, and radionuclides.

The soil analytical results are summarized in Table 3-5. Six VOCs, TPH-GRO, TPH-DRO, barium, chromium, and six radionuclides were all detected in the soil sample collected from soil boring SB27-01. With the exception of lead-210, none of the detected analytes exceeded NMED SSLs. Lead-210 was detected above the U.S. EPA radionuclides SSL for direct ingestion of soil at a concentration of 1.19 picocuries per gram (pCi/g), slightly less than detected in sediment sample SD27-01, collected 4 feet above the soil sample. The data indicate that soils beneath the drainage gallery have not been impacted.

3.4.2 Soil and Groundwater Assessment

3.4.2.1 DPT Soil Assessment – Subsurface Soil Sampling

Eight soil borings, designated as SB-27-01 through SB-27-08, (Figure 3-2) were advanced within the washrack concrete pad, within the former drainage pit, and in the vicinity of the former discharge pipe. Initially, only three soil borings were proposed for assessing the soil and groundwater quality in the vicinity of the former drainage pit and discharge pipe. Soil and groundwater samples were anticipated from these three borings as well as boring SB-27-01 completed as part of the drainage gallery assessment. However, borehole refusals were encountered in two of the borings (SB-27-01 at 8.5 feet bgs and SB-27-04 at

10.5 feet bgs) prior to reaching the underlying water table. Consequently, additional borings SB-27-05 through SB-27-08 were completed at the site. Borehole refusal was experienced in both SB-27-05 (13 feet bgs) and SB-27-06 (11.5 ft bgs) prior to reaching the underlying water table. SB-27-07 was completed to 22.5 feet bgs near the former drainline by abandoning soil sampling activities and hydraulically hammering a sampler to the underlying water table. The remaining boring, SB-27-08, was completed in an inferred hydraulically upgradient location in an effort to assess background metals and radionuclides concentrations in groundwater. The locations of Supplemental RFI soil borings are depicted on Figure 3-2.

Continuous soil sampling was conducted for borings SB-27-01 through SB-27-05. Soil sampling was not performed during the advancement of borings SB-27-06 through SB-27-08 since the goal of these boreholes was to obtain groundwater samples. The lithologic logging data, field screening results, and visual observations were recorded during borehole advancement.

Elevated PID readings and stained soils were observed below 6 feet bgs in borings SB27-02 and SB-27-03. Consequently, two soil samples from borings SB27-02 and SB27-03 were analyzed for VOCs, SVOCs, RCRA metals, and radionuclides. The shallower soil sample was collected from a soil interval above the water table, which reflected the greatest potential for contamination based on field screening results and visual observations. The deeper soil samples were collected at or below the water table interface in accordance with the Bhate work plan (Bhate, 2003b). These samples were collected to evaluate soil quality beneath the water table, a soil zone previously sampled and determined to contain elevated concentrations of TRPH. With respect to borings SB-27-01, SB-27-04, and SB-27-05, refusal was encountered prior to reaching the underlying water table. Because field screening and visual observations did not indicate a preferential contaminated soil interval in the shallow subsurface, the soil interval immediately above where refusal was encountered was collected and analyzed for VOCs, SVOCs, RCRA metals, and radionuclides.

Soil analytical results are summarized on Table 3-5. Fourteen VOCs, three SVOCs, TPH-GRO, TPH-DRO, four metals (barium, chromium, lead, and silver), nine radionuclides, and gross beta/protons were detected in the site soils. TPH-DRO was detected in two samples but exceeded the NMED residential and industrial TPH SSLs in only one sample, collected from 11 to 12 feet bgs in boring SB27-02, located within the former disposal pit. The 11 to 13 foot bgs soil interval was below the water table but represents the floor of the former disposal pit based on previous reports. Three radionuclides, lead-210, radium-226, and radium-228, exceeded U.S. EPA radionuclides SSLs for the direct ingestion of soil. The exceedances occurred solely in boring SB27-02. Radium-226 was detected above screening value 6 to 8 feet bgs, the top of the water table; while lead-210 and radium-228 were detected in the 11 to 13 foot bgs soil sample, the former floor of the disposal pit.

3.4.2.2 Groundwater Sampling Results

After soil sampling activities were completed, soil borings SB27-02, SB27-03, SB27-07, and SB27-08 (Figure 3-2) were converted into 1-inch diameter, 10-foot long screen, temporary groundwater wells.

Groundwater samples were analyzed for VOCs, SVOCs, RCRA metals (total and dissolved), and radionuclides (total and dissolved). Dissolved RCRA metals and radionuclides were filtered in the field using a 0.4 micron in-line filter during the sample collection process. Sixteen VOCs, eight SVOCs, TPH-GRO, TPH-DRO, metals, and radionuclides were detected in the groundwater underlying SD-27 at concentrations exceeding the site-specific background groundwater sample collected from boring SB27-08. A summary of the groundwater analytical results is included as Table 3-6.

Of the analytes detected, several VOCs (primarily petroleum-related), TPH-DRO, lead, dissolved selenium, radium-228 (total and dissolved) were detected at concentrations exceeding screening criteria. All of the non-radionuclide groundwater exceedances were detected in groundwater samples collected from the former disposal pit (i.e., boring SB27-02) or presumably hydraulically downgradient of the former disposal pit (i.e., boring SB27-03) with one exception. Lead was detected slightly above the U.S. EPA action level (15 μg/L) in the groundwater sample collected for boring SB27-07, located presumably hydraulically downgradient of the former concrete washrack. Lead was not detected in the field-filtered sample; consequently, the reported lead concentration is most likely attributable to a turbid sample. No other metals were detected in the total or dissolved groundwater samples.

Total and dissolved concentrations of radium-228 were detected above the U.S. EPA MCL in groundwater samples collected from borings SB27-03 (total and dissolved radium-228) and SB27-07 (total radium-228). A groundwater sample and duplicate sample were collected from boring SB27-03. Radium-228 was not detected in the groundwater sample, but was detected in the duplicate sample at concentrations exceeding screening criteria. A dissolved radionuclide sample was not collected from boring SB27-07 due to poor well yields.

3.4.3 Supplemental RFI Data Assessment

3.4.3.1 Sediment Contamination

The analytical data for the sediment showed that, of the analytes detected, only two polynuclear aromatic hydrocarbons and two metals (chromium and lead) exceeded residential and/or industrial SSLs. In addition, three radionuclides (lead-210, radium-226, and radium-228) were present at concentrations exceeding NMED SSLs for direct ingestion of soil. Several VOCs, TPH-DRO, metals, and radionuclides have been detected in the soils within the former drainage pit and in the groundwater within the drainage pit and downgradient of the washrack and drainage pit.

3.4.3.2 Soil Contamination

Analyte concentrations above SSLs have been detected solely within the former drainage pit at depths associated with the soil/groundwater interface (i.e., 6 to 10 feet bgs), the former bottom of the drainage pit (i.e., 11 to 13 feet bgs), and in the soil immediately below the former bottom of the drainage pit (i.e., 14 to 16 feet bgs). Contaminants detected in the soils at concentrations above criteria include benzene, total xylenes, TPH-DRO, lead-210, radium-226, and radium-228. Although these concentrations have been detected above criteria at or below the water table, all but lead-210 and radium-226 have been detected in the groundwater downgradient of the former pit at concentrations exceeding criteria.

3.4.3.3 Radionuclide Contamination

Several radionuclides lead-210, radium-226, and radium-228 have been detected in the former sump sediment and the soils of the discharge pit at concentrations exceeding residential NMED SSLs for the direct ingestion of soils. All of the associated concentrations were below industrial SSLs and well below 15 Pico curies/gram (PCI/g). In addition, gross alpha and gross beta concentrations were below the ORNL radionuclides screening level of 30 PCI/g and 15 PCI/L (gross alpha), indicating these concentrations are not of concern.

3.4.3.4 Groundwater Contamination

Halogenated VOCs (1, 2-dichloroethane and TCE), fuel-related VOCs (BTEX compounds), TPH-DRO, lead, selenium (dissolved) and radium-228 (total and filtered) were detected above screening criteria. Groundwater contamination appears to be centered on the former discharge pit; however, some contaminant migration to the southeast has occurred. The presence of TCE below screening criteria, lead, and radium-228 in the groundwater sample from boring SB27-07, indicates the integrity of the discharge pipe may be compromised.

3.4.4 Supplemental RFI Conclusions and Recommendations

Former aircraft washing activities at SD-27 resulted in the discharge of sediment and wash water containing VOCs, SVOCs, TPH-GRO, TPH-DRO, metals, and radionuclides to the washrack sump, drain pipe, and former drainage pit to the extent where the underlying media has been impacted above screening criteria. Sediments within the former sump were removed and disposed off site, eliminating any potential future impacts from his material. Soil contamination was detected solely at or below the underlying water table and appears to reflect contamination from discharge at the former disposal pit. Groundwater contamination implied that the integrity of the former sump's drainpipe or sump has been compromised as well as indicated that site contaminants have migrated downgradient. Neither the extent of the soil or groundwater contamination around SD-27 has been determined.

Based on the Supplemental RFI data, further investigation of SD-27 was recommended to determine appropriate remedial actions, if necessary. Field activities recommended include: 1) the sampling and potential removal of sediment within the washrack concrete trough which terminates at the concrete washrack, 2) a subsurface soil investigation to delineate the extent of impacted soils in the vicinity of the discharge pit targeting VOCs, TPH-GRO, TPH-DRO, metals, and radionuclides; 3) the installation of five permanent groundwater monitoring wells (i.e. one upgradient well, one downgradient of washrack, and three downgradient monitoring wells; and 4) at least one round of groundwater sampling to access VOCs, SVOCs, TPH-DRO, metals (total and dissolved), gross alpha and beta radionuclides (total and dissolved), and TDS concentrations in the underlying groundwater.

4.0 ACCELERATED CORRECTIVE MEASURES

This section presents the recommended accelerated corrective measures based on the results of the previous investigations. The site is located within the airfield, significantly limiting unauthorized access. Coordination with base personnel and the Airfield Manager is mandatory to access this site. A person with a Flight Line Drivers License and appropriate training and security clearance will be required as an escort on site at all times during field activities.

4.1 REMOVAL OF SEDIMENT FROM THE WASHRACK TROUGH

Based on documented historical site activities and collected analytical data, contaminated sediment and wash water was discharged to the washrack sump which discharged the collected water and sediment to the former discharge pit via an underground drain pipe.

Based on this process, most of the potential contaminant migration routes would have been to the subsurface via the discharge pit. No staining of the washrack concrete surface or the soil surrounding the washrack was observed during the Supplemental RFI (HGL 2007).

In spite of the low risk of potential contaminant from the sump area, the recently deposited visible sediment within the former washrack sump and the trough area will be removed, placed in drums, and disposed offsite at a permitted facility.

4.2 PROPOSED DPT SOIL BORING LOCATIONS

Based on the data collection and analysis during the Supplemental RFI, it is evident that the primary source of contamination resides in the drainage pit area soil. It is further supported by the fact that during the years when the concrete washrack was in active use, the contaminated washed-water from the pad area was directly delivered into the discharge pit via an underground discharge pipe. Most of the soil boring data that exceeded the NMED SSLs was obtained from the boring (SB27-02) located inside pit.

It is proposed to install DPT soil borings at nine locations in the drainage pit area. Five DPT soil borings will be installed inside the drainage pit consisting of one DPT soil boring at the center of the drainage pit and four DPT soil borings 5 feet inside the drainage pit perimeter as shown in Figure 4-1. The remaining four DPT soil borings will be installed 5 feet outside the drainage pit perimeter as shown in Figure 4-1. Four samples will be collected from each boring at depths of 7.5, 12.5, 17.5, and 22.5 feet bgs. This will represent the sampling depth range between 5-10, 10-15, 15-20, and 20-25 ft bgs, respectively. Since the historical sampling events did not indicate any contamination present at the surface of the drainage pit (0-5 feet bgs), it will be excavated and used for backfilling purposes. The details of the DPT sampling are presented in Table 4-1. The analytes and the analysis methods are presented in Table 4-2.

4.2.1 Excavation Location and Volume

An excavation around the drainage pit will be performed based on the results obtained from the DPT soil borings. The extent of excavation will be determined based on the exceedances using the criteria presented in Figure 3-1.

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

4.2.2 Waste Management

Excavation and Investigation-Derived Waste consisting of soil cuttings, decontamination water, mud and purge groundwater will be handled in accordance with HAFB SOP-9 (Field Management of Investigation-Derived Waste) (Appendix B). Based on analytical results obtained from the DPT soil samples, the excavated soils, if contaminated, will be removed and disposed of offsite at a permitted facility. Coordination with the Airfield Manager will be required in order to move trucks containing the soil for disposal across the airfield and to ensure that no Foreign Object Debris (FOD) is generated on the runways.

4.3 WELL INSTALLATION AND LONG TERM MONITORING

4.3.1 Well Location and Sampling Procedures

Five permanent monitoring wells will be installed using hollow stem augers at the location shown in Figure 4-2 to determine the horizontal extent of groundwater contamination at the SD-27 site. The monitoring wells will consist of 2-inch diameter polyvinyl chloride riser with 10-foot long, 0.010-inch slot screens. As recommended in the Supplemental RFI report, one monitoring well (TTMW-01) will be installed upgradient of the washrack area. It is proposed to install a monitoring well (TTMW-02) at a location where the drainage pipe that connects the sump turns towards the drainage pit (Figure 4-2). This location is selected since it had a high probability of water leakage from the pipe. Finally, three monitoring wells will be installed downgradient of the drainage pit where groundwater contamination is expected as determined in the Supplemental RFI report. The details of the monitoring well are presented in Table 4-3. A typical 2-inch monitoring well is presented in Figure 4-3.

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

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

4.3.2 LTM Sampling

All five permanent monitoring wells will be sampled initially to determine if LTM would be required. The number of wells, frequency, and analytes to be included for LTM will be determined after evaluating concentration data from the initial round of sampling and analysis. The chemicals to be analyzed and the analysis methods are presented in Table 4-4.

4.4 REPORTING

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

4.5 CONCLUSIONS

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

This Page Intentionally Left Blank

5.0 REFERENCES

Bhate (Bhate Environmental) 2003a. Basewide Quality Assurance Project Plan, Holloman AFB, Alamogordo, New Mexico, November.

Bhate (Bhate Environmental Associates, Inc.), 2003b. Phase II RFI Work Plan for SWMU 141, 49th CES/CEV, Holloman AFB, New Mexico. August.

Title 40 CFR, Section 261.24, Toxicity Characteristics.

Foster Wheeler (Foster Wheeler Environmental Corporation) and Radian (Radian Corporation), 1996. Technical Memorandum, Installation Restoration Sites SS-12, SD-27, and OT-45. June.

HGL (HydroGeoLogic, Inc.) 2005a. Draft Supplemental RCRA Facility Investigation Work Plan, Holloman Air Force Base, Alamogordo, New Mexico. July.

HGL (HydroGeoLogic, Inc.), 2005b. Quality Assurance Project Plan Addendum, Supplemental RCRA Facility Investigation, Holloman Air Force Base, Alamogordo, New Mexico. July.

HGL (HydroGeoLogic, Inc.), 2006a. Response to Notice of Deficiency, Supplemental RFI Work Plan, SWMUs 101, 104, 105, 108, 109, 113B, 115, 116, 165, 177, 179, and 181, July 2005, Holloman Air Force Base, Alamogordo, New Mexico. March.

HGL (HydroGeoLogic, Inc.), 2006b. SD-27 (SWMU 141) Technical Memorandum Supplemental RCRA Facility Investigation Approach, Holloman Air Force Base, Alamogordo, New Mexico. May.

HGL (HydroGeoLogic, Inc.), 2007. Supplemental RCRA Facility Investigation DP-30/SD-33 (SWMU 113), SS-39 (SWMUs 165, 177, and 181) and SD-27 (SWMU 141) Holloman Air Force Base Alamogordo, New Mexico.

NMAC (New Mexico Administrative Code) 20.6.20.3103. Standards for Ground Water of 10,000 mg/l TDS Concentration or Less, Human Health Standards, Other Standards for Domestic Water Supply, and Standards for Irrigation Use.

NMED (New Mexico Environment Department), 2004. Holloman AFB Hazardous Waste Facility Permit No. NM65721244122. February.

NMED (New Mexico Environment Department), 2006a. New Mexico Environment Department TPH Screening Guidelines. October

NMED (New Mexico Environment Department), 2006b. Technical Background Document for Development of Soil Screening Levels, Revision 4.0; June.

NMED (New Mexico Environment Department), 2007. Letter of Approval regarding Supplemental RFI Workplan Addendum as modified by Response to Notice of Deficiency; January 17.

Radian Corporation, 1992. RI, Report, Volume II of III, Appendices A, B, C, and D, Investigation, Study and Recommendation for 29 Waste Sites.

Radian Corporation, 1993. Preliminary Assessment and Site Investigation Report, Investigation of Four Waste Sites, Holloman Air Force Base, New Mexico.

Radian Corporation, 1994. Draft Final Phase II RCRA Facility Investigation Report, Table 2 Solid Waste Management Units, Volume 1, Holloman AFB, New Mexico. October.

USAF (United States Department of the Air Force), 2004. Memorandum for New Mexico Environment Department regarding Characterization Requirements for Seven Solid Waste Management Units (SWMUs) at Holloman AFB, New Mexico. May 21.

USDA (US Department of Agriculture), 1981. Soil Survey of Otero Area, New Mexico; Parts of Otero, Eddy, and Chaves Counties. Soil Conservation Services and Forest Service.

U.S. EPA (U.S. Environmental Protection Agency), 1986. Guidelines for Groundwater Classification Under the USEPA Groundwater Protection Strategy, Final Draft. Office of Groundwater Protection (WH-550G), Washington, D.C. December.

U.S. EPA (U.S. Environmental Protection Agency), 2000. Soil Screening Guidance for Radionuclides: Technical Background Document (EPA/540-R-00-006). October.

U.S. EPA Reg IV (U.S. Environmental Protection Agency Region IV), 2007. Region 6 Human Health Medium Specific Screening Levels 2007.

WRRI (New Mexico Water Resources Research Institute), 2005. Proceedings, 49th Annual New Mexico Water Conference, Water Desalination and reuse Strategies for New Mexico.

This Page Intentionally Left Blank

TABLES

Table 3-1
Preliminary Assessment/Visual Inspection Soil Analytical Results
SD-27 (SWMU 141) - Pad 9 Washrack Area Work Plan
Holloman AFB, New Mexico

Analyses	Background [1]	NMED Soil Screening Level [2] Residential	NMED Soil Screening Level [2] Industrial	NMED Soil Screening Level [2] Construction Worker	BH-27-05 Background 4-6	BH-27-01 0-2	BH-27-02 6-8	BH-27-03 8-10	BH-27-04 0-2
Extractable Fuel Hydrocarbons (µg/kg)									
Kerosene	NA	760,000[2]	1,810,000[3]	--	--	--	--	430	--
Purgeable Fuel Hydrocarbons (µg/kg)									
Ethylbenzene	NA	128,000	128,000	128,000	--	--	--	680	--
Toluene	NA	252,000	252,000	252,000	--	--	--	51	--
Xylenes (total)	NA	82,000	82,000	82,000	--	--	--	2,700	--
Radioactivity (pCi/g)									
Gross alpha	NA	--	--	--	7.35	8.95	19.29	13.5	--
Gross beta	NA	--	--	--	7.68	16.69	15.31	12.15	--
PCBs (µg/kg)									
PCB-1254	NA	1,110	8,260	4,280	--	--	--	--	200

Notes:
(1) Radian, 1992 and 1993. Background provided for reference only.
(2) Obtained from Table A-1 (NMED, 2006c)
(3) Obtained from Table 2a (NMED, 2006a)

-- = not detected; not applicable
(mg/kg) = milligrams per kilogram
(pCi/g) = picocuries per gram
NA = not analyzed
NMED = New Mexico Environment Department
PCB = polychlorinated biphenyl